

Max. Marks: 40

08

- Page 1 of 2

- 8)** Excluded volume is _____ times the actual volume of molecules.
- a) $\frac{1}{2}$ b) 2
- c) 3 d) 4

Q.2 Answer Any Four of the following. 08

- Write the rate constant expression for second order reaction with equal initial concentrations of reactants.
- For a straight line equation, $y = mx + C$, where, m is positive and C is zero, what will be the nature of the graph?
- State Boyle's law.
- Define molecularity of a chemical reaction.
- State Joule-Thomson effect.

Q.3 Write short notes on Any Two of the following. 08

- a) Rules of integration
- b) Carnot cycle
- c) Characteristics of second order reaction

Q.4 Answer Any Two of the following. 08

- The Van der Waals constants ' a ' and ' b ' for a gas are $2.253 \times 10^6 \text{ atm cc}^2 \text{ mol}^{-2}$ and $42.78 \text{ cc mol}^{-1}$ respectively. $R = 0.08206 \text{ litre atm per dg per mol}$. Calculate the critical constants of the gas in SI units.
- A second order reaction where $a = b$ is completed to the extent of 40 percent in 480 seconds. How long will it take for the reaction to go to 70 percent completion?
- What is a slope? Explain the characteristics of slope.

Q.5 Answer Any One of the following. 08

- What corrections are made by Van der Waals in the postulates of kinetic theory of gases? How did he deduce a new gas equation?
- Explain the factors affecting rate of chemical reactions.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - I) (CBCS) Examination: March/April – 2026
COMPUTER SCIENCE (Paper - II)
Programming Using C (22221121)

Day & Date: Tuesday, 12-05-2026
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 Multiple choice questions.**08**

- 1) Who invented C?

a) Dennis Ritchie	b) Charles Babbage
c) John McCarthy	d) Ken Thompson
- 2) Which is not a keyword?

a) int	b) float
c) var	d) char
- 3) Which operator gives remainder?

a) /	b) %
c) *	d) +
- 4) Infinite loop example _____.

a) for(;;)	b) while(0)
c) if(1)	d) break
- 5) String ends with _____.

a) '\0'	b) '\n'
c) '\t'	d) '\r'
- 6) Pointer symbol _____.

a) &	b) *
c) #	d) @
- 7) Structure keyword _____.

a) struct	b) union
c) class	d) record
- 8) Append mode _____.

a) r	b) w
c) a	d) x

- Q.2 Answer Any Four.** **08**
- a) Explain C tokens.
 - b) Explain operators in C.
 - c) Define string and operations.
 - d) Explain recursion.
 - e) Define pointer and its uses.
- Q.3 Short notes. (Any Two)** **08**
- a) Control statements
 - b) Dynamic array
 - c) Typedef
- Q.4 Answer Any Two.** **08**
- a) Explain call by value and reference with example.
 - b) What is array? Explain Types of array in details.
 - c) Write a program to reverse a string.
- Q.5 Answer Any One.** **08**
- a) Explain file handling modes and functions.
 - b) Write a program for addition of matrix.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - I) (CBCS) Examination: March/April – 2026
CHEMISTRY (Paper - II)
Inorganic Chemistry (22221107)

Day & Date: Wednesday, 13-05-2026
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary
 3) Figures to the right indicate full marks.
 4) Use of logarithmic table and calculator is allowed.
 (At. Wts.: H=1, C=12, O=16, N= 14, Na =23, Cl = 35.5)

Q.1 Multiple choice questions.**08**

- 1) Atomic number of an atom indicates _____.
 a) quantum numbers b) number of neutrons
 c) number of orbitals d) number of protons
- 2) _____ the most electronegative element in the periodic table.
 a) fluorine b) chlorine
 c) bromine d) iodine
- 3) The crystal structure of NaCl is _____.
 a) BCC b) FCC
 c) Cubic d) hexagonal
- 4) The bond formed by complete transfer of electrons from one atom to another is called as an _____.
 a) ionic b) covalent
 c) coordinate d) metallic
- 5) s-p bond is _____ than s-s bond.
 a) weaker b) stronger
 c) natural d) none of these
- 6) In NH₃ molecules _____ lone pair of electrons are present.
 a) 3 b) 2
 c) 1 d) 4
- 7) The bond order of Li₂ molecule is _____.
 a) 1 b) 2
 c) 0 d) 1.5
- 8) NO is _____ molecule.
 a) homonuclear diatomic b) heteronuclear diatomic
 c) Imaginary d) non-existent

- Q.2 Answer Any Four of the following. 08**
- a) Define ionization energy and electron affinity.
 - b) Draw the shape of d-orbitals.
 - c) Define coordination number and radius ratio.
 - d) What is hybridization? What are different types of hybridization?
 - e) What is mean by bonding and antibonding in MOT.
- Q.3 Write short notes on Any Two of the following. 08**
- a) Quantum numbers with their significance.
 - b) Characteristics of ionic compounds.
 - c) Aufbau principle and Pauli exclusion principle.
- Q.4 Answer Any Two of the following. 08**
- a) Explain the trends in atomic radius, ionization energy, and electronegativity across a period and down a group.
 - b) Distinguish between bonding and antibonding molecular orbitals.
 - c) Explain the molecular orbital diagram of C_2 molecule.
- Q.5 Answer Any One of the following. 08**
- a) Explain the details of heteronuclear diatomic molecules NO w.r.t. bond order stability and magnetic properties.
 - b) Discuss the crystal structure of NaCl in the context of unit cell, radius ratio, coordination number and Stoichiometry.

Set P

B.Sc. (Plain) (Semester - I) (CBCS) Examination: March/April - 2026
MICROBIOLOGY (Paper - I)

Introduction to Microbiology and Microbial Diversity (22221114)

Day & Date: Wednesday, 13-05-2026

Max. Marks: 40

Time: 03:00 PM To 05:00 PM

Instructions: 1) All questions are compulsory.

2) Draw neat diagrams and give equations wherever necessary.

3) Figures to the right indicate full marks.

4) Use of logarithmic table and calculator is allowed.

(At. Wts.: H=1, C=12, O=16, N= 14, Na =23, Cl = 35.5)

Q.1 Multiple choice questions.

08

- 1) Actinomycetes is link between bacteria and _____.
 - a) fungi
 - b) viruses
 - c) algae
 - d) protozoa
- 2) Mycology is the study of _____.
 - a) viruses
 - b) bacteria
 - c) fungi
 - d) algae
- 3) _____ known as father of Microbiology.
 - a) Louis Pasteur
 - b) Joseph Lister
 - c) Robert Koch
 - d) Antony von leewen Hock
- 4) NCCS Stands for _____.
 - a) National Centre for Computer Science
 - b) National Centre for Cell System
 - c) National Centre for Cell Service
 - d) National Centre for Cell Science
- 5) In *Proteus vulgaris*, *Proteus* indicates the name of _____.
 - a) species
 - b) class
 - c) family
 - d) genus
- 6) Rocky mountain spotted fever is caused by _____ organism.
 - a) Rickettsia
 - b) Actinomycetes
 - c) Protozoa
 - d) Archaeobacteria
- 7) _____ type of ribosomes is present in a eukaryotic cell.
 - a) 60S
 - b) 80S
 - c) 40S
 - d) 70S

- 8) Causative agent of Tuberculosis and cholera is discovered by _____.
a) Louis Pasteur b) Robert Koch
c) Antonie Van Leeuwenhoek d) Joseph Lister**

Q.2 Answer Any Four of the following. 08

- Enlist various Branches of Microbiology.
- Define Virus and give example.
- Give 2 contributions of Louis Pasteur.
- Write characteristics of Archaeobacteria.
- Draw the four different shapes of Bacteria.

Q.3 Write short note on Any Two of the following. 08

- Draw neat labelled diagram of typical bacterial cell and explain cell organelle in short.
- Explain in short Germ theory of disease.
- Give general characteristics of Fungi.

Q.4 Answer Any Two of the following. 08

- Give general characteristics of Rickettsia
- Explain about the contribution of Martinus Beijerinck and Sergei Winogradsky.
- Write general principles of bacterial nomenclature.

Q.5 Answer Any One of the following. **08**

- Describe in detail about contribution of Louis Pasteur and describe in short about swan neck flask experiment.
- Write difference between Prokaryotic and eukaryotic cell.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - I) (CBCS) Examination: March/April – 2026
PHYSICS (Paper - I)
Mechanics and properties of Matter (22221104)

Day & Date: Thursday, 14-05-2026
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 Multiple Choice Question.**08**

- 1) Moment of inertial in rotational motion is analogous to the in _____.
 a) angular momentum b) Kinetic energy
 c) torque d) mass
- 2) S.I. unit of moment of inertia is _____.
 a) kg. m^2 b) gm. cm^2
 c) gm/cm^2 d) kg. s^2
- 3) The angular acceleration of a compound pendulum is directly proportional to its _____.
 a) linear displacement b) mass
 c) angular displacement d) velocity
- 4) The time period of compound pendulum is maximum when _____.
 a) $l = k$ b) $l = 0$
 b) $l = 2k$ d) $l = 3k$
- 5) The ratio of tensile stress to tensile strain is called _____.
 a) Young's modulus b) Bulk Modulus
 c) Modulus of rigidity d) Poisson's ratio
- 6) The theoretical limiting values of Poisson's ratio are _____.
 a) -1 and -0.5 b) +1 and +0.5
 c) -1 and +0.5 d) -1 to +1
- 7) The tendency of a liquid surface to contract is due to the following property _____.
 a) adhesion b) surface tension
 c) cohesion d) viscosity

- 8) Bernoulli's equation deal with the law of conservation of _____.
a) mass b) momentum
c) energy d) work**

Q.2 Answer Any Four of the following. 08

- Define moment of inertia.
- Draw schematic diagram of Katter's pendulum.
- State Hooke's law of elasticity.
- State any two applications of surface tension.
- Define streamline flow of fluid with diagram.

Q.3 Write short note on Any Two of the following. 08

- a) A spherical shell of mass 500 gm has diameter 15 cm. Calculate moment of inertia about
 - i) the diameter
 - ii) the tangent
- b) Describe the experimental method to determine Poisson's ratio of rubber tube.
- c) Describe Jaeger's method to determine surface tension of the liquid.

Q.4 Answer Any Two of the following. 08

- Calculate the difference of pressure between the two sides of the surface of a spherical drop of water of radius 0.5 mm. Surface tension of water is 0.075 N/m.
- Show that shear strain is equivalent to compression and extension strain.
- Describe torsional pendulum. Derive an expression for the period of oscillation of a torsion pendulum.

Q.5 Answer Any One of the following. **08**

- Obtain an expression for M.I. of a rectangular lamina about an axis passing through its centre and parallel to one of its sides. Hence find M.I. about one of its sides.
- Obtain Poiseuille's equation to determine the coefficient of viscosity of liquid.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - I) (CBCS) Examination: March/April – 2026
PHYSICS (Paper - II)
Optics (22221105)

Day & Date: Friday, 15-05-2026
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Use of logarithmic table and calculator is allowed.
 4) Draw neat diagrams and give equations wherever necessary

Q.1 Choose the correct alternatives from the options. 08

- 1) In case of a lens producing spherical aberration _____ gives position of best possible image.
 - a) axial rays
 - b) circle of least confusion
 - c) focus of marginal rays
 - d) focus of paraxial rays
- 2) The rays that are incident on lens near the edges of the lens are called _____ rays.
 - a) co-axial
 - b) paraxial
 - c) axial
 - d) marginal
- 3) Cross-wires cannot be used with _____ eye-piece.
 - a) Huygen's
 - b) Gauss
 - c) Ramsden's
 - d) None of these
- 4) _____ of the following is not part of a spectrometer.
 - a) turn table
 - b) micrometre
 - c) collimator
 - d) telescope
- 5) In case of parallel faced thin film the condition for destructive interference for reflected light is _____.
 - a) $2\mu t \cos r = n\lambda$
 - b) $2\mu t \cos r + \lambda/2 = n\lambda$
 - c) $2\mu t \cos r = (2n + 1) \lambda/2$
 - d) $2 \sin \theta = n\lambda$
- 6) In Fraunhofer diffraction, incident wavefront is _____.
 - a) cylindrical
 - b) spherical
 - c) plane
 - d) elliptical
- 7) The phenomenon of diffraction is explained on the basis of _____.
 - a) Fermat's principle
 - b) rectilinear propagation of light
 - c) Huygen's theory of secondary wavelets
 - d) Newton's corpuscular theory

- 8) Ruby laser is a _____ laser.
- a) liquid state
 - b) optical state
 - c) gas state
 - d) solid state

Q.2 Answer any four of the following. 08

- a) State Fermat's principle of extremum time.
- b) The focal length of the eye lens in Huygen's eye piece is 5 cm. calculate the focal length, of field lens.
- c) Define the interference of light.
- d) Distinguish between interference and diffraction.
- e) What is population inversion?

Q.3 Write Short Notes. (Any Two) 08

- a) With a neat ray diagram, explain construction and working of Ramsden's eyepiece.
- b) Give the comparison between prism and grating spectra.
- c) Explain the principle and working of He- Ne laser.

Q.4 Answer any Two of the following. 08

- a) Give construction of optical bench. Explain use of optical bench for any one application.
- b) Explain the elementary theory of plane diffraction grating. Obtain the relation $d \sin \theta = n\lambda$ for principal maxima in the n th order.
- c) What are the applications of laser?

Q.5 Answer any one of the following. 08

- a) Explain chromatic aberration. Derive condition for achromatic combination of two thin lenses separated by a finite distance.
- b) Explain how Newton's rings are formed. Obtain an expression for wavelength of monochromatic light in terms of diameters of Newton's rings of different orders produced by reflected light.

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B.Sc. (Plain) (Semester - I) (CBCS) Examination: March/April – 2026
MATHEMATICS (Paper - I)
Algebra (22221116)

Day & Date: Monday, 18-05-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Multiple choice question.

08

- 1) The Rank of the matrix $\begin{bmatrix} 1 & 2 & 5 & 6 \\ 3 & 4 & 7 & 8 \\ 0 & 0 & 0 & 9 \end{bmatrix}$ is _____.
a) 0
b) 1
c) 2
d) 3
- 2) An Eigen values of a square matrix A is $\lambda = 0$, then _____.
a) $|A| = 0$
b) $|A| \neq 0$
c) $|A| = 1$
d) $|A| = 2$
- 3) The characteristic equation of the matrix $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ is _____.
a) $\lambda^2 + 7\lambda + 6 = 0$
b) $\lambda^2 - 7\lambda - 6 = 0$
c) $\lambda^2 - 7\lambda + 6 = 0$
d) $\lambda^2 + 7\lambda - 6 = 0$
- 4) The system of Linear equations $AX = B$ in n variables has infinite solution if _____.
a) $\rho(A) = \rho(A:B) = n$
b) $\rho(A) \neq \rho(A:B)$
c) $\rho(A) = \rho(A:B) < n$
d) $\rho(A) < \rho(A:B)$
- 5) The Polar form of the complex number $1 + i\sqrt{3}$ is _____.
a) $2 \left(\cos \frac{\pi}{2} + i \sin \frac{\pi}{2} \right)$
b) $2 \left(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3} \right)$
c) $2 \left(\cos \frac{\pi}{4} + i \sin \frac{\pi}{4} \right)$
d) $2 \left(\cos \frac{\pi}{6} + i \sin \frac{\pi}{6} \right)$
- 6) If $z = \cos \theta + i \sin \theta$ then $z^7 - z^{-7} =$ _____.
a) $2 \sin 7\theta$
b) $2 \cos 7\theta$
c) $2i \sin 7\theta$
d) $2i \cos 7\theta$
- 7) $\cos(iz) =$ _____.
a) $i \sin z$
b) $i \cos z$
c) $\cosh z$
d) $\sinh z$

- 8) The value of $\cosh(0) = \underline{\hspace{2cm}}$.
- | | |
|---------|--------|
| a) -1 | b) 2 |
| c) 1 | d) 0 |

Q.2 Answer the following. (Any Four)

08

- a)** Reduce the matrix $A = \begin{bmatrix} 1 & 3 & 4 & 5 \\ 1 & 2 & 6 & 7 \\ 1 & 5 & 0 & 10 \end{bmatrix}$ into Row Echelon Form and find its rank.
- b)** Test for consistency the following equations
 $x + y + z = -3, \quad 3x + y - 2z = -2, \quad 2x + 4y + 7z = 7$
- c)** Simplify $\frac{(\cos 2\theta + i \sin 2\theta)^3 (\cos 3\theta - i \sin 3\theta)^2}{(\cos 4\theta + i \sin 4\theta)^5 (\cos 5\theta - i \sin 5\theta)^4}$
- d)** Find all the values of $(i)^{1/4}$
- e)** Prove that $\cosh z + \sinh z = e^z$

Q.3 Attempt the following. (Any Two)

08

- a) State and prove Cayley- Hamilton theorem.
- b) Solve the system of Linear equations
 $x + 3y - 2z = 0, 2x - y + 4z = 0, x - 11y + 14z = 0$
- c) If α and β are the roots of equations $x^2 - 2x + 2 = 0$ then prove that
$$\alpha^n + \beta^n = 2^{\frac{(n+1)}{2}} \cos\left(\frac{n\pi}{4}\right)$$

Q.4 Answer the following. (Any Two)

08

- a) Find all the Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
- b) Solve $x^7 - x^4 + x^3 - 1 = 0$ using De Moivre's Theorem.
- c) If $\cos(\alpha + i\beta) = x + iy$ then prove that
 - i) $\frac{x^2}{\cosh^2 \beta} + \frac{y^2}{\sinh^2 \beta} = 1$
 - ii) $\frac{x^2}{\cos^2 \alpha} - \frac{y^2}{\sin^2 \alpha} = 1$

Q.5 Answer the following. (Any One)

08

- a)** State and prove De Moivre's Theorem.
b) If x is real then prove that
- $\cosh^{-1} x = \log \left(x + \sqrt{x^2 - 1} \right)$
 - $\sinh^{-1} x = \log \left(x + \sqrt{x^2 + 1} \right)$

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Max. Marks: 40

08

- Page 1 of 2

- Q.2 Answer any four of the following. 08**
- a) Write the reactions for hydration of ethene and propene.
 - b) Define bond length and bond angle.
 - c) Write the structure of 2, 3 dihydroxy butanoic acid.
 - d) Define hemolytic fission with one example.
 - e) What is hybridization? Write its types.
- Q.3 Write short note on any two of the following. 08**
- a) Write note on optical isomerism in tartaric acid.
 - b) Write note on sp^2 hybridization.
 - c) Explain types of reagents with examples.
- Q.4 Answer any two of the following. 08**
- a) Write types of substitution reactions with example.
 - b) Explain plane of symmetry and center of symmetry.
 - c) What are cycloalkanes? Write internal Wurtz reaction for formation of cycloalkanes.
- Q.5 Answer any one of the following. 08**
- a) What is Friedel Craft's reaction? Explain mechanism of Friedel Craft's acylation reaction.
 - b) Write two methods of formation of 1,3 butadiene. What are products when propene reacts with:
 - i) H_2/Ni
 - ii) Dil $KMnO_4$
 - iii) $HBr/peroxide$
 - iv) HCl

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No.Set **P**

**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April – 2026
CHEMISTRY Paper-IV
Analytical Chemistry (22221209)**

Day & Date: Wednesday, 29-04-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of logarithmic table and calculator is allowed.

Q.1 Multiple choice questions**08**

- 1) NaOH , KOH are _____ bases.

a) diacidic	b) monoacidic
c) triacidic	d) None
- 2) The homogenous mixture of two or more chemical component is called _____.

a) Solution	b) Solvent
c) Solute	d) Precipitate
- 3) η Represents symbol of _____.

a) Surface tension	b) Viscosity
c) Parachor	d) Refraction
- 4) Refractive index of molecule is measured by instrument is called _____.

a) Refractometer	b) Viscometer
c) Stalagmometer	d) Conductometer
- 5) Lassaigne's test is used to detect _____ element

a) N	b) S
c) X	d) All
- 6) In chromatography _____ type of filter paper are mostly used.

a) Butter paper	b) Filter paper
c) Whatman paper	d) Sample paper
- 7) _____ gas is used for preservation of chips.

a) O_2	b) CO_2
c) NH_3	d) N_2
- 8) Preservation of milk by heating at 63°C for 30 min is called as _____.

a) Homogenisation	b) Canning
c) Pasteurisation	d) Saving

- Q.2 Answer the following. (Any Four) 08**
- a) Define solute & dilute solution.
 - b) Draw neat labelled diagram to determine viscosity of liquid.
 - c) Give Snell's law.
 - d) What is the dipole moment of CO_2 & CS_2 molecule.
 - e) How will you identify water from milk.
- Q.3 Write short notes. (Any Two) 08**
- a) Mole fraction
 - b) Paper chromatography
 - c) Combustion method to determine carbon & hydrogen
- Q.4 Answer the following. (Any Two) 08**
- a) Write four advantages of refractometer.
 - b) Give four uses of chromatography.
 - c) Name four chemical methods of food preservation.
- Q.5 Answer the following. (Any One) 08**
- a) How will you determine surface tension of liquid by stalagmometer experimentally.
 - b) Define quantitative analysis. How will you determine halogen by Carius method?

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April – 2026
PHYSICS (Paper - III)
Heat and Thermodynamics (22221205)**

Day & Date: Thursday, 30-04-2026

Max. Marks: 40

Time: 12:00 PM To 02:00 PM

- Instructions:** 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of logarithmic table and calculator is allowed.

Q.1 Choose correct alternatives: 08

- 1) The mean free path of gas molecules is inversely proportional to _____.
 a) square of the diameter of the molecule
 b) square root of the diameter of the molecule
 c) molecular diameter
 d) fourth power of the molecular diameter
- 2) In Linde's air liquefier, the air is passed through the KOH solution to remove _____ from air.
 a) dust
 b) smell
 c) minerals
 d) CO₂ gas and water vapour
- 3) The gas which cannot be liquified by Linde's method is _____.
 a) Nitrogen
 b) Oxygen
 c) Hydrogen
 d) Carbon dioxide
- 4) Entropy of reversible process _____.
 a) increases
 b) decreases
 c) remains constant
 d) zero
- 5) The adiabatic compression ratio in Diesel engine is _____.
 a) less than 10
 b) more than 10
 c) equal to zero
 d) in the range 15-20
- 6) In an adiabatic expansion, internal energy _____.
 a) Increases
 b) decreases
 c) remains constant
 d) none of these
- 7) In refrigeration system, Carnot's cycle considered is _____ Carnot's cycle.
 a) forward
 b) reversed
 c) fast
 d) slow

- 8) In refrigerator, heat is extracted from _____ and delivered to _____.
a) sink and source b) source and sink
c) atmosphere and sink d) atmosphere and source

Q.2 Answer any four of the following. 08

- a) What is reversible process?
- b) What is Joule-Thomson effect?
- c) The diameter of nitrogen molecule is 3.2×10^{-10} m. The number of molecules at 0°C and 1 atmospheric pressure is 2.69×10^{25} per m^3 . Calculate mean free path for nitrogen molecules.
- d) Define coefficient of performance.
- e) Give applications of air conditioning systems.

Q.3 Write short note on any two of the following. 08

- a) Carnot's ideal heat engine
- b) Experimental set up for adiabatic demagnetisation of paramagnetic substance
- c) Properties of liquid He II

Q.4 Answer any two of the following. 08

- a) What is isothermal process and derive an expression for the work done in isothermal process.
- b) Show that $PV^\gamma = \text{constant}$ for adiabatic process.
- c) With neat diagram give construction of vapour compression refrigeration cycle.

Q.5 Answer any one of the following. 08

- a) Obtain an expression for coefficient of viscosity of a gas. How viscosity of a gas depends upon temperature.
- b) What is Otto cycle? Explain its operation and derive an expression for efficiency of Otto engine.

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**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April – 2026
MICROBIOLOGY Paper – III
Microbial Metabolism and Cultivation (22221220)**

Day & Date: Saturday, 02-05-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat and well labeled diagrams wherever necessary.

Q.1 Choose the correct alternatives.

08

- 1) Cellulose differs from starch mainly due to _____.
 a) Type of monosaccharide b) Type of glycosidic linkage
 c) Molecular weight d) Solubility
- 2) First law of thermodynamics states _____.
 a) Energy is destroyed b) Energy is conserved
 c) Entropy decreases d) Heat flows cold to hot
- 3) Apoenzyme refers to _____.
 a) Protein part of enzyme without cofactor
 b) Non-protein component
 c) Fully active enzyme
 d) Substrate binding site
- 4) Extracellular enzymes function _____.
 a) Inside nucleus b) Inside cytoplasm
 c) Outside the cell d) In mitochondria
- 5) Net ATP produced in glycolysis per glucose is _____.
 a) 2 ATP b) 1 ATP
 c) 4 ATP d) 6 ATP
- 6) Under aerobic conditions, pyruvate is converted into _____.
 a) Lactate b) Ethanol
 c) Acetyl CoA d) Glucose
- 7) Chemoautotrophs obtain energy from chemicals and carbon from _____.
 a) Organic compounds b) CO₂
 c) Proteins d) Lipids

- 8) Semi-synthetic media contains _____.
a) Only natural components
b) Only chemicals
c) Both natural and defined components
d) No nutrients

Q.2 Answer the following question briefly. (Any Four) 08

- a) What are the different types of RNA? Give the role of each.
- b) Give the difference between constitutive and induced enzymes with suitable examples.
- c) What is serial dilution?
- d) What is living media? Give its significance.
- e) What is induced fit hypothesis?

Q.3 Write short notes. (Any Two) 08

- a) Write an account on Nutritional requirements of microorganisms.
- b) Explain the EMP pathway.
- c) Give the structure and function of lipids.

Q.4 Write short notes. (Any Two) 08

- a) Write an account on 'Proteins'.
- b) Explain different types of high energy compounds. Give the structure of ATP molecules.
- c) Describe the differential media and selective media with suitable examples.

Q.5 Answer the following question. (Any One) 08

- a) Explain different methods of obtaining pure culture using solid media.
- b) Explain the nutritional classification of microorganisms depending on the carbon and energy source.

Max. Marks: 40

d) conductance

- 8) On multiplying a vector by an operator j , the vector is rotated through an angle _____.
 a) 360° b) 180°
 c) 120° d) 90°

Q.2 Answer Any Four of the following. 08

- State Biot-Savarts law.
- Define self-inductance of a coil.
- Define the terms: reactance, susceptance.
- Draw the circuit symbols of npn and pnp transistors.
- Define ripple factor.

Q.3 Write Short Note on Any Two of the following. 08

- Owen's bridge
- Positive and negative clippers
- Constants of Ballistic galvanometer

Q.4 Answer Any Two the following. **08**

- a)** Explain working of Common Emitter transistor amplifier.
- b)** Series L, C, R circuit is connected to a variable frequency 230 V ac.
 $L = 5 \text{ H}$, $C = 80 \mu\text{F}$, $R = 40 \Omega$
Find:
 - i) Resonant frequency
 - ii) Quality factor
- c)** Derive expression for measurement of charge using Ballistic galvanometer.

Q.5 Answer Any One of the following. 08

- Derive an expression for growth of current in a circuit containing an inductance (L) and resistance (R) and a source of constant e.m.f. (E) in series. Hence define time constant of LR circuit.
- Explain the V-I characteristics of a Zener diode. How is a Zener diode used as a voltage regulator?

Seat No.	

Set **P****B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:****March/April - 2026****MICROBIOLOGY (Paper – IV)****Applied Microbiology (22221221)**

Day & Date: Monday, 04-05-2026

Max. Marks: 40

Time: 03:00 PM To 05:00 PM

- Instructions:** 1) All questions are compulsory.
 2) Draw neat diagrams whenever necessary.
 3) Figures to the right indicate full marks.

Q.1 Multiple choice questions:**08**

- 1) _____ is transmitted by mosquito.
 - a) Typhoid
 - b) Malaria
 - c) Cholera
 - d) Tuberculosis
- 2) Confirmed test is carried on _____ agar.
 - a) EMB
 - b) Nutrient
 - c) Milk
 - d) Starch
- 3) Disinfection of water is done by _____.
 - a) Acid
 - b) Alcohol
 - c) Chlorine
 - d) Nitrogen
- 4) An individual carrying pathogen without showing symptoms is known as _____.
 - a) Vector
 - b) Fomite
 - c) Vehicle
 - d) Carrier
- 5) Differentiation of E. coli from E. aerogenes is carried out by _____ test.
 - a) IMVic
 - b) MPN
 - c) SPC
 - d) BOD
- 6) _____ is disease casting ability of organism.
 - a) Motility
 - b) Pathogenicity
 - c) Mortality
 - d) Morbidity
- 7) _____ is used for treating sewage of individual family.
 - a) Oxidation Pond
 - b) Trickling Filter
 - c) Septic tank
 - d) Lagoon
- 8) Strength of sewage is determined by _____ test.
 - a) MPN
 - b) IMVic
 - c) SPC
 - d) BOD

- Q.2 Answer Any Four of the following. 08**
- a) Define DO.
 - b) Define Epidemic diseases.
 - c) Define Typical Colony.
 - d) Define Chronic infection.
 - e) Define fecal pollution.
- Q.3 Write short note on Any Two of the following. 08**
- a) MPN Test
 - b) Chemical treatment of Sewage
 - c) Types of Diseases
- Q.4 Answer Any Two of the following. 08**
- a) Describe in detail IMVic test.
 - b) Describe in detail biological method of Sewage treatment
 - c) Describe the modes of transmission of diseases.
- Q.5 Answer Any One of the following. 08**
- a) Describe in detail Municipal methods of water purification.
 - b) Describe in detail prevention and control of Microbial diseases.

Seat No.	

**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April – 2026
STATISTICS (Paper – III)
Descriptive Statistics - II (22221211)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat & well labelled diagrams wherever necessary.
4) Use of Calculator allowed

Q.1 Fill in the blanks by choosing correct alternatives. 08

- 1) If all the plotted points lie on a straight line falling from upper left hand corner to lower right hand corner then it is called _____.
a) perfect positive correlation b) perfect negative correlation
c) positive correlation d) negative correlation
- 2) In 1890 the concept of product moment correlation was given by _____.
a) Galton b) R.A. Fisher
c) Karl Pearson d) None of these
- 3) The limits of Spearman's rank correlation (R) is _____.
a) 0 to 1 b) 0 to ∞
c) -1 to 1 d) none of these
- 4) The linear equation $Y = a + bx$ is called as regression equation of _____.
a) X on Y b) Y on X
c) between X and Y d) None of these
- 5) Using the regression coefficients we can calculate _____.
a) $\text{cov}(X, Y)$ b) $SD(X)$
c) correlation coefficient d) coefficient of variance
- 6) Index number for base year is always considered as _____.
a) 100 b) 101
c) 201 d) 1000
- 7) In Laspeyre's price index number weight is considered as _____.
a) quantity in base year b) quantity during current year
c) prices in base year d) prices in current year
- 8) Which index number is called as ideal index number?
a) Laspeyre's b) Paasche's
c) Fisher d) None of the above

- Q.2 Answer any four of the following. 08**
- Define positive correlation with one example.
 - Prove that $Cov(X, X) = Var(X)$
 - Define regression coefficient.
 - Define Laspeyre's price index number.
 - Define Fisher's quantity index number.
- Q.3 Write short note on Any Two of the following. 08**
- What is the effect of change of origin and scale on covariance?
 - For a bivariate data $\bar{x} = 4, \bar{y} = 50, b_{yx} = 0.57$ and $b_{xy} = 1.12$. find
 - Correlation between X and Y
 - Estimate Y when $X = 7$
 - State important uses of index number.
- Q.4 Answer any two of the following. 08**
- For 10 pairs of observations the sum of squares of differences in ranks is 66. Find Spearman's rank correlation coefficient without ties.
 - Explain the concept of lines of regression.
 - Explain the types of averages used in index number
- Q.5 Answer any one of the following. 08**
- With usual notation, prove that

$$R = 1 - \frac{6\sum d_i^2}{n^3 - n}$$
 - What is time reversal test? Verify the same for Laspeyre's index number.

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**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April – 2026
ZOOLOGY (Paper – III)
Comparative Anatomy of Vertebrates (22221232)**

Day & Date: Tuesday, 05-05-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams and give equations wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic table and calculator is allowed.

(At. Wts: H=1, C=12, O=16, N=14, Na=23, Cl=35.5)

O.1 Multiple choice questions.

08

- 1) Presence of hair on skin is characteristic of _____.
a) Birds
b) Fishes
c) Mammals
d) Frog
- 2) Clavicle is a part of _____.
a) leg
b) Hip
c) pectoral girdle
d) Pelvic girdle
- 3) Fish respire with the help of _____.
a) Gills
b) Lungs
c) skin
d) air sacs
- 4) Presence of teeth only on upper jaw is seen in _____.
a) Scoliodon
b) Birds
c) Frog
d) Rat
- 5) Four chambered heart is seen in _____.
a) Fish
b) Amphibian
c) Reptile
d) Mammals
- 6) Optic lobes gives the sense _____.
a) sight
b) smell
c) taste
d) touch
- 7) Presence of feathers on skin is seen in _____.
a) Fish
b) Birds
c) Reptiles
d) Frog
- 8) Fish is an example of _____.
a) ureotelic
b) ammonotelic
c) uricotelic
d) none of the above

- Q.2 Answer any four of the following. 08**
- a) Name the parts of pectoral girdle.
 - b) Give two names of respiratory organs.
 - c) Name any two parts of brain.
 - d) Name two types of kidney.
 - e) Name two parts alimentary canal.
- Q.3 Write short note on any two of the following. 08**
- a) Describe functions of skin.
 - b) Describe metanephros kidney.
 - c) Functions of Brain
- Q.4 Answer any two of the following. 08**
- a) Describe structure of skin of bird.
 - b) Describe heart of frog.
 - c) Describe brain of scoliodon.
- Q.5 Answer any one of the following. 08**
- a) Describe alimentary canal of Rat.
 - b) Give brief account of Air sacs in birds.

Set P

**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April – 2026
STATISTICS (Paper – IV)
Discrete Probability Distribution (22221212)**

Day & Date: Tuesday, 05-05-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat & well labelled diagrams wherever necessary.
4) Use of Calculator allowed.

Q.1 Fill in the blanks by choosing correct alternatives. 08

- [illegible]

- 7) If X is a geometric r.v. then $P[X \geq 5/X \geq 2]$ is equal to _____.
 a) $P[X \geq 5]. P[X \geq 2]$ b) $P[X \geq 5]$
 c) $P[X \geq 5]/P[X \geq 3]$ d) $P[X \geq 3]$
- 8) Negative binomial distribution $NB(k, p)$ reduces to geometric distribution when k equal to _____.
 a) 0 b) 1
 c) ∞ d) None of these

Q.2 Answer the following. (Any Four) 08

- a) Define cumulative distribution function of r. v. X .
 b) Define expectation of function of r. v. X .
 c) Define Hypergeometric distribution.
 d) Define Geometric distribution.
 e) Define negative binomial distribution.

Q.3 Write short note. (Any Two) 08

- a) A discrete random variable X has following probability distribution.

$X:$	-2	-1	0	1	2	3
$P(x):$	0.1	0.1	0.2	0.2	0.3	0.1

- Find i) $E(X)$ ii) $V(X)$
 b) Find mean and variance of two point distribution.
 c) Find the recurrence relation for probability of negative binomial distribution.

Q.4 Answer the following. (Any Two) 08

- a) Find mean and variance of binomial distribution.
 b) The probability mass function of a r. v. X is given by

$$P(x) = \frac{x+1}{10}; x = 0, 1, 2, 3$$

- Find i) $P(X \leq 2)$ ii) $P(X > 1)$
 c) Find mean and variance of geometric distribution.

Q.5 Answer the following. (Any One) 08

- a) Let the probability distribution of X be

X	:	0	1	2	3	4	5	6
$P(X = x):$		$2c$	c	$3c$	$2c$	c^2	$4c^2$	$5c^2 + c$

- i) Find the value of c
 ii) Calculate $P(X \geq 3)$
 iii) If $P(X \leq k) > \frac{1}{2}$, find the minimum value of k
 iv) Find mode of X
 b) Define Poisson distribution, find its p. g. f. Hence find its mean and variance.

Set P

**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April – 2026
ZOOLOGY (Paper – IV)
Developmental Biology of Vertebrates (22221233)**

Day & Date: Wednesday, 06-05-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of logarithmic table and calculator is allowed.
(At. Wts.: H=1, C=12, O=16, N=14, Na=23, Cl=35.5)

Q.1 Multiple choice questions.

08

- 1) Spermatogenesis occurs in _____.
a) ovary
b) testis
c) uterus
d) kidney
- 2) Fertilization is fusion of _____.
a) tissues
b) organs
c) gametes
d) cells
- 3) Cleavage results in _____.
a) embryo
b) blastula
c) fetus
d) placenta
- 4) Gastrulation forms _____.
a) tissues
b) germ layers
c) organs
d) gametes
- 5) Metamorphosis occurs in _____.
a) frog
b) rat
c) pigeon
d) snake
- 6) Placenta connects _____.
a) embryo and uterus
b) brain and heart
c) lung and heart
d) skin and bone
- 7) Twins are formed by _____.
a) fertilization
b) division of embryo
c) mutation
d) respiration
- 8) Ultrasound is used in _____.
a) digestion
b) imaging fetus
c) respiration
d) excretion

- Q.2 Answer the following. (Any Four) 08**
- a) Apoptosis
 - b) Epiboly
 - c) Types of fertilization
 - d) Functions of placenta
 - e) Define spermatogenesis
- Q.3 Write short notes on. (Any Two) 08**
- a) Structure of Hen's egg
 - b) Mechanism of fertilization in human
 - c) Applications of Ultrasound
- Q.4 Answer the following. (Any Two) 08**
- a) Describe Blastulation in chick.
 - b) Describe patterns of cleavage.
 - c) Write different causes of miscarriage.
- Q.5 Answer the following. (Any One) 08**
- a) Describe Types of twins in human.
 - b) Describe metamorphosis in frog.

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**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April – 2026
MATHEMATICS (Paper – III)
Geometry (22221223)**

Day & Date: Wednesday, 06-05-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Multiple choice questions.

08

- 1) The conversion formula from polar to cartesian are given by ____.

a) $x = r \cos \theta, y = r \sin \theta$ b) $x = r \cos \theta, y = 0$

c) $x = -r \cos \theta, y = r \sin \theta$ d) $x = r \cos \theta, y = r \sin \theta$
- 2) $r = a$, represents ____.

a) Straight line b) Parabola

c) Circle d) Ellipse
- 3) The radius of sphere $x^2 + y^2 + z^2 - 4x - 6y + 8z + h = 0$ is ____.

a) 5 b) -5

c) 4 d) 3
- 4) Intersection of two spheres is ____.

a) circle b) straight line

c) plane d) sphere
- 5) The general second degree equation represents an ellipse if and only if ____.

a) $\Delta \neq 0, ab - h^2 < 0$ b) $\Delta \neq 0, h^2 - ab = 0$

c) $\Delta \neq 0, ab - h^2 > 0$ d) $\Delta \neq 0, a = h, b = 0$
- 6) The number of arbitrary constants in the equation $Ax + By + Cz + D = 0$ is ____.

a) 1 b) 2

c) 3 d) 4
- 7) The length of the perpendicular from origin to the plane $12x + 4y + 3z + 26 = 0$ is ____.

a) 12 b) 2

c) 26 d) 4

- 8) The two planes $a_1x + b_1y + c_1z + d_1 = 0$ and $a_2x + b_2y + c_2z + d_2 = 0$ are perpendicular if _____.
- a) $a_1b_1 + a_2b_2 + c_1c_2 = 0$ b) $a_1a_2 + b_1b_2 + c_1c_2 = 0$
 c) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ d) $a_1a_2 = b_1b_2 = c_1c_2$

Q.2 Attempt any four of the following.

08

- a) Find the polar equivalents of cartesian equation $x^2 + y^2 = a^2$
 b) Find the cartesian equivalents of the polar equation $r^2 \sin 2\theta = 2a^2$
 c) Find centre of the sphere $x^2 + y^2 + z^2 + 2x - 4y - 6z + 5 = 0$
 d) Find equation of sphere having the join of $A(1, -2, 3)$ and $B(-3, 1, 2)$ as a diameter.
 e) Find equation of plane whose x intercept, y intercept and z intercept are 3, 4 and 7 respectively.

Q.3 Attempt any two of the following.

08

- a) Transform the equation $x^2 - 4xy + 3y^2 - 10x + 16y + 21 = 0$ to parallel axes through the point $(1, -2)$.
 b) Find the equation of a tangent plane to the sphere $x^2 + y^2 + z^2 - 6x - 4y + 10z + 12 = 0$ at $(2, -1, -1)$
 c) Show that the three points $(-2, 3, 5)$, $(1, 2, 3)$, $(7, 0, -1)$ are collinear.

Q.4 Attempt any two of the following.

08

- a) Identify the conic $4x^2 - 12xy + 9y^2 + 4x + y - 5 = 0$
 b) Find K , if $(2, -1, 1)$ lies on the sphere $x^2 + y^2 + z^2 + 4x + 2y - 2z - K = 0$ and with this K find equation of sphere.
 c) Find angle between the two planes $2x - y + z = 6$ and $x + y + 2z = 3$

Q.5 Attempt any one of the following.

08

- a) If by rotation of axes the expression $\alpha x + \beta y$ changes $\alpha^1 x^1 + \beta^1 y^1$ then show that $\alpha^2 + \beta^2$ is an invariant.
 b) Prove that the plane $Ax + By + Cz = D$ touches the sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ if and only if $(Au + Bv + Cw + D)^2 = (A^2 + B^2 + C^2)(u^2 + v^2 + w^2 - d)$

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**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April – 2026
BOTANY (Paper – III)
Plant Ecology (22221202)**

Day & Date: Thursday, 07-05-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat & well labelled diagram wherever necessary.

Q.1 Rewrite the sentence by choosing correct alternative

08

- 1) Study of soil science is called as _____.
a) Ecology
b) Phycology
c) Pedology
d) Climatology
- 2) Term ecosystem was coined by _____.
a) Tansley
b) Lindeman
c) Mishra
d) None of these
- 3) Multilayered epidermis is found in _____.
a) Hydrilla
b) Eichhornia
c) Nerium
d) All of these
- 4) Floristic composition is _____ character of the community.
a) qualitative
b) quantitative
c) Simple
d) complex
- 5) Study of plant community is known as _____.
a) Phytoecology
b) Phytosociology
c) Phytogeography
d) Phytoplankton
- 6) Energy flow in ecosystem is always _____.
a) Bidirectional
b) multidirectional
c) Unidirectional
d) Circular
- 7) _____ is the pioneer stage of Xerarch succession.
a) Crustose lichen
b) foliose lichen
c) shrub stage
d) Moss stage
- 8) Plants are called as _____.
a) Consumers
b) Producers
c) Predators
d) Decomposers

- Q.2 Answer the following. (Any Four) 08**
- a) Define term ecology?
 - b) What are heliophytes?
 - c) What is food chain?
 - d) Define succession.
 - e) What is stratification?
- Q.3 Write short notes. (Any Two) 08**
- a) Edaphic factors
 - b) Xerophytic adaptations
 - c) Useful effects of wind
- Q.4 Answer the following. (Any Two) 08**
- a) Explain any four qualitative characters of community in detail.
 - b) Explain food webs with example, give its significance.
 - c) Describe fresh water pond ecosystem.
- Q.5 Answer the following. (Any One) 08**
- a) Explain in detail ecological pyramids along with labeled diagrams.
 - b) Describe hydrosere.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April - 2026
MATHEMATICS (Paper - IV)
Differential Equations (22221224)**

Day & Date: Thursday, 07-05-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Select the correct alternative of the following. **08**

- 1) The solution of the differential equation $x^2 dx - y^2 dy = 0$ is _____.
 - a) $x - y = c$
 - b) $x^2 - y^2 = c$
 - c) $x^3 - y^3 = c$
 - d) $x^4 - y^4 = c$
- 2) The differential equation $\frac{dy}{dx} = \frac{ax+by+c}{a'x+b'y+c'}$ is called _____ differential equation.
 - a) exact
 - b) variable separable
 - c) homogeneous
 - d) non-homogeneous
- 3) In the differential equation $M(x, y)dx + N(x, y)dy = 0$, if $\frac{\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}}{M} = f(y)$ then corresponding integrating factor is _____.
 - a) $e^{\int f(x)dy}$
 - b) $e^{\int f(y)dx}$
 - c) $e^{\int f(x)dx}$
 - d) $e^{\int f(y)dy}$
- 4) The equation $M(x, y)dx + N(x, y)dy = 0$ is said to be exact if _____.
 - a) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$
 - b) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$
 - c) $\frac{\partial M}{\partial y} = -\frac{\partial N}{\partial x}$
 - d) $\frac{\partial^2 M}{\partial x \partial y} = \frac{\partial^2 N}{\partial y \partial x}$
- 5) The value of $\frac{1}{D}x^3$ is _____ (where $D = \frac{d}{dx}$)
 - a) $\frac{x^3}{3}$
 - b) $\frac{x^4}{3}$
 - c) $\frac{x^3}{4}$
 - d) $\frac{x^4}{4}$

- 6)** The value of $\frac{1}{(D-3)^3} e^{3x} =$ _____
- a) $\frac{x^3 e^{3x}}{4}$
- b) $\frac{x^3 e^{3x}}{5}$
- c) $\frac{x^3 e^{3x}}{6}$
- d) $\frac{x^3 e^{3x}}{3}$
- 7)** The solution of the differential equation $\frac{d^2 y}{dx^2} + 5 \frac{dy}{dx} + 4y = 0$ is _____.
- a) $y = c_1 e^{-x} + c_2 e^{-4x}$
- b) $y = c_1 e^x + c_2 e^{-4x}$
- c) $y = c_1 e^{-x} + c_2 e^{4x}$
- d) $y = c_1 e^x + c_2 e^{4x}$
- 8)** The value of $\frac{1}{f(D)} [e^{ax} V] =$ _____.
- a) $e^{ax} \frac{1}{f(D)} [V]$
- b) $e^{ax} \frac{1}{f(D-a)} [V]$
- c) $e^{ax} \frac{1}{f(D+a)} [V]$
- d) $e^{ax} \frac{1}{f(D^2)} [V]$

Q.2 Attempt the following. (Any Four)

08

- Solve $\sqrt{1-y^2} dx + \sqrt{1-x^2} dy = 0$
- Solve $(\sin x \cdot \cos y + e^{2x})dx + (\cos x \sin y + \tan y)dy = 0$
- Solve $(D-1)^3 y = 0$
- Solve $\frac{dy}{dx} + \frac{2xy}{1+x^2} = \frac{1}{1+x^2}$
- Solve $\frac{d^2 y}{dx^2} + 4y = 0$

Q.3 Attempt the following. (Any Two)

08

- Explain the method of solving differential equation of the form $\frac{dy}{dx} + Py = Q$, where P and Q are functions of x only.
- Show that $\frac{1}{D-a}X = e^{ax} \int X e^{-ax} dx$
- Solve $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = x$

Q.4 Attempt the following. (Any Two)

08

- a)** Explain the method of solving homogeneous differential equation of the form $\frac{dy}{dx} = \frac{f(x,y)}{g(x,y)}$, where $f(x,y)$ and $g(x,y)$ are both homogeneous function of same degree in x and y .
- b)** Solve $(x^2 + 1) \frac{dy}{dx} + 2xy = 4x^2$

c) Solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = e^{2x}$

Q.5 Attempt the following. (Any One)

08

- a) Show that the necessary and sufficient condition for the differential equation $M(x, y)dx + N(x, y)dy = 0$ to be an exact is that $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$
- b) i) Prove that $\frac{1}{f(D^2)} [\sin ax] = \frac{1}{f(-a)^2} [\sin ax]$, when $f(-a^2) \neq 0$
- ii) Solve $\frac{d^2y}{dx^2} + y = \sin 2x$

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April - 2026
BOTANY (Paper – IV)
Taxonomy of Angiosperms (22221203)**

Day & Date: Friday, 08-05-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Rewrite the following sentences by choosing the correct alternative. 08

- 1) Taxonomy is the science of: _____.
 a) Naming only
 b) Classification only
 c) Identification, naming and classification
 d) Evolution only
- 2) The term "taxonomy" was first used by: _____.
 a) Linnaeus
 b) A.P. de Candolle
 c) Darwin
 d) Bentham
- 3) One of the main aims of taxonomy is: _____.
 a) To study physiology
 b) To classify organisms
 c) To study genetics only
 d) To study ecology
- 4) Identification of plants can be done using: _____.
 a) Keys
 b) Floras
 c) Herbarium
 d) All of the above
- 5) System of classification of plants presented by Bentham and Hooker was published in _____.
 a) Enquiry into Plants
 b) Handbook of British Flora
 c) Genera Plantarum
 d) Flora of British India
- 6) International Code of Botanical Nomenclature is based on the set of _____ principles.
 a) Five
 b) Six
 c) Seven
 d) Ten
- 7) _____ for the first time proposed that every living being has binomial name.
 a) Bentham
 b) Hooker
 c) Linnaeus
 d) Mayer

- 8) Scientific names are treated as _____ regardless of their origin.
- | | |
|----------|------------|
| a) Latin | b) English |
| c) Hindi | d) Marathi |

Q.2 Answer the following. (Any Four) 08

- a) Define taxonomy.
- b) What is classification?
- c) Enlist types of classification.
- d) What is mean by Interpretative approach?
- e) Define nomenclature.

Q.3 Answer the following. (Any Two). 08

- a) Write a note on artificial classification.
- b) Write a note on phylogenetic classification.
- c) Write short note on Binomial nomenclature of plants.

Q.4 Answer the following. (Any Two) 08

- a) What are the principles of taxonomy?
- b) What are the aims of taxonomy?
- c) Write short note on Identification.

Q.5 Answer the following. (Any One) 08

- a) Comment upon outline of the system of classification presented by Bentham and Hooker.
- b) Comment up on characters considered before plant identification.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April – 2026
GEOLOGY (Paper - III)
Structural Geology (22221214)**

Day & Date: Saturday, 09-05-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat & well labelled diagram wherever necessary.

Q.1 Rewrite the sentence by choosing correct alternative**08**

- 1) In _____ younger rocks are surrounded by older formations.
 - a) Outlier
 - b) Inlier
 - c) Columnar
 - d) Strike
- 2) The best example of fold mountain is _____.
 - a) Sahyadri
 - b) Satpuda
 - c) Himalaya
 - d) Vindhyan
- 3) Geological time gap or break is represented by _____.
 - a) Faults
 - b) Unconformity
 - c) Folds
 - d) Joints
- 4) Angle between Fault plane and horizontal surface is called _____ of a fault.
 - a) Dip
 - b) Hade
 - c) Heave
 - d) Throw
- 5) In recumbent fold, axial plane is _____.
 - a) vertical
 - b) horizontal
 - c) inclined
 - d) all of these
- 6) Anticline fold shows _____ nature in upward direction.
 - a) convex
 - b) concave
 - c) a) & b)
 - d) all of these
- 7) Which of the following instrument is used to study strike and dip of outcrop in field?
 - a) Seismometer
 - b) Brunton compass
 - c) Ammeter
 - d) Contact Goniometer
- 8) True dip is always _____ to strike.
 - a) inclined
 - b) vertical
 - c) parallel
 - d) perpendicular

- Q.2 Answer the following. (Any Four) 08**
- a) What are Joints?
 - b) Draw labelled diagram of Isoclinal fold
 - c) What is Unconformity?
 - d) Define Structural Geology.
 - e) Draw labelled diagram illustrating Strike Joints
- Q.3 Write short notes. (Any Two) 08**
- a) Strike & Dip
 - b) Columnar Joints
 - c) Angular unconformity
- Q.4 Answer the following. (Any Two) 08**
- a) Explain Nonconformity.
 - b) Define Bedding and Diagonal Joints.
 - c) Distinguish between Anticline and Syncline folds.
- Q.5 Answer the following. (Any One) 08**
- a) Define Folds. Describe Symmetrical and Asymmetrical folds.
 - b) Define Faults. Describe Normal and Reverse faults.

Set P

**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April - 2026
GEOLOGY (Paper - IV)
CRYSTALLOGRAPHY (22221215)**

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams wherever necessary.
3) Figures to the right indicate full marks.

08

- Cubic crystal system shows _____ crystallographic axes.
 - 1
 - 3
 - 4
 - 2
- Normal prism has _____ indices.
 - (111)
 - (101)
 - (110)
 - (001)
- In hexagonal crystal system _____ axes are horizontal.
 - 1
 - 2
 - 3
 - 4
- Tetragonal system shows _____ planes and axes of symmetry.
 - 5
 - 7
 - 9
 - 13
- A substance having well developed faces, edges, interfacial angles with perfect atomic structure is called _____.
 - mineral
 - rock
 - joint
 - crystal
- Cube has _____ equal faces.
 - 2
 - 4
 - 6
 - 8
- Basal pinacoid cuts _____ axis.
 - vertical
 - horizontal
 - inclined
 - All the above
- Which one of the following is used to measure interfacial angle?
 - clinometer
 - brunton compass
 - contact goniometer
 - voltmeter

- Q.2 Answer any four of the following. 08**
- a) Define crystal.
 - b) What are closed and open forms?
 - c) Define parameters.
 - d) What are Planes of symmetry?
 - e) What are interfacial angles?
- Q.3 Write short notes on any two of the following. 08**
- a) Basal pinacoid.
 - b) Index system of miller.
 - c) Galena type form of cubic system.
- Q.4 Answer any two of the following. 08**
- a) Describe the forms of tetragonal crystal system.
 - b) Describe the form of beryl type of hexagonal system.
 - c) Describe the forms of barite types in orthorhombic system.
- Q.5 Answer any one of the following. 08**
- a) Describe monoclinic crystal system.
 - b) Describe the crystallographic axes of each crystal system.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New Old) (CBCS) Examination:
March/April – 2026
CHEMISTRY (Paper – V)
Organic Chemistry (22221330)**

Day & Date: Thursday, 02-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagram and give equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of logarithmic table and calculator is allowed.
5) All questions carry equal marks.
(At. Wts: H=1, C=6, O=16, N= 14, Na =23, Cl = 35.5)

Q.1 Choose the correct alternative for each of the following:**08**

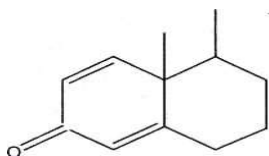
- 1) 1,3- cyclohexadiene is _____ type of diene.
 - a) Homoannular
 - b) Heteroannular
 - c) Exocyclic
 - d) None of these
- 2) Reimer-Tiemann reaction involves the following intermediates.
 - a) Carbocation
 - b) Carbanion
 - c) Carbene
 - d) Free radical
- 3) In Beckmann transformation the product obtained is _____.
 - a) Oxime
 - b) N- substituted amide
 - c) Aldehyde
 - d) Ketone
- 4) Phenol is also called _____.
 - a) Benzyl alcohol
 - b) Salicylic acid
 - c) Benzoyl alcohol
 - d) Carboic acid
- 5) Epoxide ring is _____ membered ring.
 - a) Four
 - b) Five
 - c) Three
 - d) Six
- 6) In aldehydes, carbon of CHO group is _____ hybridized.
 - a) SP
 - b) SP²
 - c) SP³
 - d) SP³d
- 7) The aliphatic monocarboxylic acids are also known as _____.
 - a) Halo acids
 - b) Acid halides
 - c) Fatty acids
 - d) Hydroxy acids

- 8) Benzyl alcohol is obtained from benzaldehyde by ____ reaction.
- Cannizarro
 - Perkin
 - Aldol
 - Knoevenagel

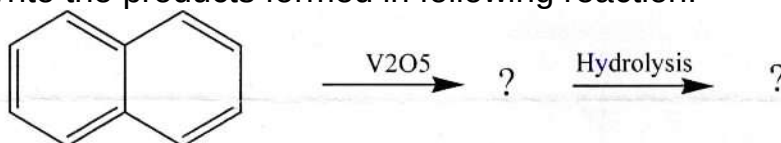
Q.2 Answer the following. (Any Four)

08

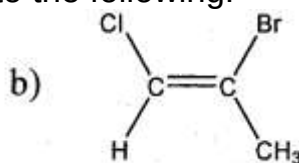
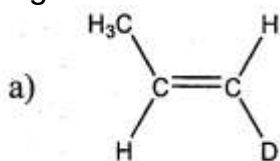
- a) Calculate λ_{max} for the following compound.



- Write Claisen reaction with example.
- Write reactions involved in action of a) H^+/H_2O and b) HBr on ethylene oxide.
- What is crossed Aldol condensation reaction?
- Write the products formed in following reaction.



- f) Assign E and Z configurations to the following.



Q.3 Attempt the following. (Any Two)

08

- What are the uses of ethylene glycol? Write reactions involved in oxidation of ethylene glycol with lead tetra acetate.
- Write two methods of preparation of acrylic acid and its uses.
- In Zeisel's method 1.38×10^{-3} kg of an organic compound having molecular formula $C_7H_{22}O_2$ gave 4.7×10^{-3} kg of silver iodide. Calculate percentage and number of $-OCH_3$ groups present in the organic compound.

Q.4 Answer the following. (Any Two)

08

- Explain Benzoin condensation reaction with mechanism.
- Explain Knoevenagel reaction with mechanism.
- Write reactions involved in the bromination and oxidation of cinnamic acid.

Q.5 Answer the following. (Any One)

08

- Describe the types of electronic transitions in UV spectroscopy.
- Describe conformational analysis of n-butane with the help of energy profile diagram.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April - 2026
Computer Science (Paper - V)
Data Structure (22221320)**

Day & Date: Saturday, 04-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Choose the correct alternatives:**08**

- 1) Which of the following sorting method uses queue data structure?
 - a) Bubble
 - b) Merge
 - c) Radix
 - d) Selection
- 2) Empty slots are reused in _____ type of queue.
 - a) Linear
 - b) Circular
 - c) Deque
 - d) Priority
- 3) _____ operation of data structure leads for 'underflow' situation?
 - a) Create
 - b) Full
 - c) Insert
 - d) Remove
- 4) The degree of leaf node is _____.
 - a) Exactly two
 - b) One
 - c) More than two
 - d) Zero
- 5) Node of _____ linked list has two parts.
 - a) Singly
 - b) Doubly
 - c) Both a and b
 - d) None of these
- 6) Stack is used for _____.
 - a) String reversal
 - b) Recursion
 - c) Expression conversion
 - d) All of these
- 7) If size of array is 'N' then last element will be stored at _____ index.
 - a) N+1
 - b) N-1
 - c) N
 - d) Both a and b
- 8) _____ tree traversal produce sorted data as output.
 - a) Preorder
 - b) Inorder
 - c) Postorder
 - d) BFS

- Q.2 Answer the following. (Any Four) 08**
- a) What is pendant node in graph?
 - b) Write the difference between stack and queue.
 - c) What is advantage of B+ tree over B tree?
 - d) Write the importance of sorting?
 - e) Why hash function is useful?
 - f) List out advantages of dynamic implementation of data structure.
- Q.3 Answer the following. (Any Two) 08**
- a) Explain Merge sort algorithm with example.
 - b) Write short note on: Output Restricted Deque.
 - c) Explain count_leaf() operation of binary search tree.
- Q.4 Answer the following. (Any Two) 08**
- a) What is collision in hashing? Explain any two hash function in detail.
 - b) Write an algorithm that converts infix expression to postfix form using stack.
 - c) Explain ADT for Queue.
- Q.5 Answer the following. (Any One) 08**
- a) Write a program to implement doubly circular linked list with following operations.
 - i) Insert_end()
 - ii) Remove_Between()
 - iii) Display()
 - iv) Count()
 - b) What is Circular queue? Explain its following operations.
 - i) Insert()
 - ii) Remove()
 - iii) isFull()
 - iv) Display()

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April - 2026
CHEMISTRY (Paper – VI)
Inorganic Chemistry (22221331)**

Day & Date: Monday, 06-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagram and give equations wherever necessary.
4) Use of logarithmic table and calculator is allowed.

Q.1 Multiple choice questions.

08

- 1) Coordination number increases with increase in _____.
a) size of ligand
b) atomic number of central metal atom
c) repulsion between ligands
d) charge of central metal ion
- 2) _____ is bidentate ligand.
a) Ammonia
b) EDTA
c) Triethyltetrammine
d) Glycine
- 3) The ligand which forms metal chelate with metal ion is termed as _____.
a) Complexing
b) Chelating
c) Oxidizing
d) Reducing
- 4) _____ is hardest acid.
a) Cs^+
b) Li^+
c) Mn^{2+}
d) K^+
- 5) In 3d transition elements _____ element shows highest oxidation states.
a) Fe
b) Mn
c) Cu
d) Cr
- 6) The colour of d-block elements is due to _____ transition of electron.
a) s-s
b) d-d
c) p-p
d) d-f

- 7) The properties of second and third series elements are same due to ____.
- same size
 - different size
 - same electronic configuration
 - same atomic number
- 8) The following ____ compound does not follows the Pearson's principle.
- H_2SO_4
 - HF
 - HCl
 - CdI_2

Q.2 Answer the following. (Any Four) 08

- Define double salts and give its examples.
- Draw the structure of ethylenediamine and 8-hydroxyquinoline (Oxine).
- Define Lewis acid and Lewis base.
- Give the observed electronic configuration of Chromium and Copper.
- What are characteristic of hard acid and hard base?
- Draw the structure of geometrical isomerism of $[\text{PtCl}_2(\text{NH}_3)_2]$.

Q.3 Write short note of the following. (Any Two) 08

- Write note on geometrical isomerism.
- Explain HSAB principle and discuss its applications.
- Give the general characteristics properties colour of transition elements.

Q.4 Answer the following. (Any Two) 08

- Give the difference between metal chelate and metal complex.
- What is chelation? Give the structural requirements for chelate formation.
- What do you mean by magnetic character? Explain the Gouy method for measuring the paramagnetism.

Q.5 Answer the following. (Any One) 08

- According to Werner's theory, how will you formulate $\text{CoCl}_3 \cdot 6\text{NH}_3$, $\text{CoCl}_3 \cdot 5\text{NH}_3$, $\text{CoCl}_3 \cdot 4\text{NH}_3$ and $\text{CoCl}_3 \cdot 3\text{NH}_3$.
- Give the name, atomic symbol and electronic configuration of 3d and 4d transition elements and explain abnormality in the electronic configuration.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April - 2026**

**COMPUTER SCIENCE (Paper – VI)
Software Engineering (22221321)**

Day & Date: Tuesday, 07-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Multiple choice question.**08**

- 1) SDLC stands for _____.
 - a) System Development Life Cycle
 - b) Structure Design Life Cycle
 - c) System Design Life Cycle
 - d) Structure Development Life Cycle
- 2) What is Black-box Testing?
 - a) Testing user interface components
 - b) Compiling application source files
 - c) Testing with no access to source code
 - d) Testing only backend interactions
- 3) External entities may be a _____.
 - a) Source of input data only
 - b) Source of input data or destination of result
 - c) Destination of result only
 - d) Repository of data
- 4) The longest method of conversion is _____.

a) Direct	b) Parallel
b) Pilot	d) Phased
- 5) System performs well through such circumstances like incorrect input, malfunctioning of hardware then the software system is _____.

a) Reliable	b) Robust
c) Efficient	d) Portable
- 6) _____ indicates the appropriate actions that are to be taken, when a condition is satisfied.

a) Condition Stubs	b) Condition Entries
c) Action Stubs	d) Action Entries

- 7) Software Engineering aims at developing?
- a) Reliable software
 - b) Cost effective software
 - c) Reliable and cost effective software
 - d) None of above
- 8) _____ is sometimes referred as 'Bubble Diagram'.
- a) Flowchart
 - b) ER- Diagram
 - c) Decision table
 - d) DFD

Q.2 Answer any four of the following. 08

- a) What is Decision Tree?
- b) Write the steps in prototyping.
- c) Define the term 'System'.
- d) What is Software Testing?
- e) What is HIPO chart?
- f) List out the types of Risk.

Q.3 Write short note on any two of the following. 08

- a) Feasibility study
- b) Software Quality - Reliability and Efficiency
- c) Explain the importance of DD.

Q.4 Answer any two of the following. 08

- a) Explain the various roles played by the system analyst.
- b) Differentiate between the Physical and Logical DFD.
- c) Explain different types of system maintenance.

Q.5 Answer any one of the following. 08

- a) Explain the various types of system in detail.
- b) Explain top-down incremental implementation. State its advantages and disadvantages.

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**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April - 2026
PHYSICS (Paper - V)
General Physics and Sound (22221304)**

Day & Date: Wednesday, 08-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Neat diagrams must be drawn wherever necessary.
4) Use of log table and calculator is allowed.

Q.1 Multiple choice questions:

08

- 1) The divergence of vector field $\vec{\nabla} \cdot \vec{V}$ is _____.
a) a scalar b) a vector
c) a constant d) a unit vector
- 2) The rise and fall of axis of rotation of a rotating body is called _____.
a) Precession b) Rotation
c) Nutation d) Vibration
- 3) The relation between magnitudes of precessional torque (τ_1) gravitational torque (τ_2) and centripetal torque (τ_3) is _____.
a) $\tau_1 = \tau_2 - \tau_3$ b) $\tau_1 = \tau_2 + \tau_3$
c) $\tau_1 = \tau_3 - \tau_2$ d) $\tau_2 = \tau_1 - \tau_3$
- 4) The rate of precession Φ is _____.
a) $\Phi = \tau_1/I\omega$ b) $\Phi = \tau_1/\omega$
c) $\Phi = \tau_1 I\omega$ d) $\Phi = \omega/\tau_1$
- 5) In bending beam the surface which is neither elongated nor compressed is called _____.
a) neutral surface b) plane of bending
c) cantilever d) bending moment
- 6) The beam horizontally fixed at one end and loaded at free end is called _____.
a) cantilever b) free beam
c) oscillating beam d) column
- 7) The viscosities of two liquids may be compared with the help of _____.
a) Searle's Viscometer b) Ostwald's Viscometer
c) Rotation Viscometer d) Rankin's Viscometer

- 8) The carbon microphone is _____ microphone
- | | |
|----------------|-------------|
| a) Pressure | b) Velocity |
| c) Temperature | d) Mass |

Q.2 Answer any four of the following. 08

- a) What is Precession?
- b) What is cantilever?
- c) Define Bending moment.
- d) State meaning of negative intercept in Searl's viscometer?
- e) What is scalar triple product?
- f) State significance of curl.

Q.3 Write short note on any two of the following. 08

- a) Explain vector triple product.
- b) Write a note on Gyroscope.
- c) What are factors affecting on acoustics?

Q.4 Answer any two of the following. 08

- a) Explain the Rotational viscometer for determining the coefficient of viscosity.
- b) Explain Sabine's experimental work and obtain expression for reverberation time.
- c) A horizontal iron bar of length 2 m is fixed at one end and loaded at free end with a mass of 2 kg. What is the depression produced if the bar has depth and breadth each equal to 10^{-2} m?

Q.5 Answer any one of the following. 08

- a) Obtain an expression for angle of lean of the disc and radius of curvature of the path for rolling disc.
- b) Define divergence of vector field and give physical significance of divergence of vector.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026
Bio-Chemistry (Paper - I)
Biomolecules (22221306)**

Day & Date: Thursday, 09-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Choose the correct alternative from the options. 08

- 1) Which of the following is an Aldohexose?

a) glucose	b) glyceraldehyde
c) ribulose	d) ribose
- 2) _____ is an acidic amino acid.

a) aspartic acid	b) glycine
c) tyrosine	d) alanine
- 3) _____ is phospholipid.

a) lecithin	b) cholesterol
c) sterol	d) oils
- 4) _____ linkages are present in DNA.

a) peptide	b) glycosidic
c) ester	d) phosphodiester
- 5) Guanine forms _____ hydrogen bonds with cytosine.

a) 3	b) 2
c) 4	d) 1
- 6) Fructose is a _____.

a) aldo triose	b) Keto pentose
c) Keto hexose	d) aldo pentose
- 7) Vitamin B6 is also called as _____.

a) Riboflavin	b) niacin
c) thymine	d) pyridoxine
- 8) _____ is a water soluble vitamin.

a) vitamin C	b) vitamin B1
c) vitamin B2	d) All of the above

Q.2 Answer the following. (Any Four) **08**

- a) Define reducing sugar.
- b) Write two differences between starch and cellulose.
- c) Name two amino acids with sulphur.
- d) Name two purine and two pyrimidine bases found in nucleic acids.
- e) Define proteins.
- f) What are phospholipids.

Q.3 Attempt any two of the following. **08**

- a) Write the structure of
 - i) Tyrosine
 - ii) Glycine
 - iii) Palmitic acid
 - iv) Glucose
- b) What are compound lipids. Write name of types of compound lipids with one example of each.
- c) Write two physical and two chemical properties of amino acids.

Q.4 Answer the following. (Any Two) **08**

- a) Write about structure and function of m-RNA.
- b) Write a note on structure of glycogen.
- c) Write a note on Fluid mosaic model of plasma membrane.

Q.5 Answer the following. (Any One) **08**

- a) Discuss about primary, secondary, tertiary and quaternary structure of protein.
- b) Write about structure, biological role and deficiency disorders of Riboflavin.

Set P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026**

Plant Protection (Paper - V)

Major Crops and Methods of Integrated Plant Protection (22221312)

Day & Date: Thursday, 09-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams and give equations wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic table and calculator is allowed.

Q.1 Multiple choice questions:

08

- 1) Origin of jawar is _____.
a) Britan b) India
c) Canada d) U.S.A.
- 2) Plant Protection means _____.
a) Protection of plants from wind
b) Protection of plants from sunlight
c) Practice of management of pests, diseases & weeds
d) None of these
- 3) Soya milk obtained from _____.
a) G. nut b) Tur
c) Soyabean d) Buffalow
- 4) Sugarcane belongs to family _____.
a) *Malvaceae* b) *Gramineae*
c) *Solanaceae* d) *Mimosaceae*
- 5) Chemicals are used to check bacteria are known as _____.
a) Rodenticides b) Bactericides
c) Pesticides d) None of these
- 6) Sticky bands are used to prevent _____.
a) Aves Movement
b) Reptile movement
c) Movement of crashing insect towards host
d) None of these
- 7) After ploughing, Sunlight trapping on the soil are known as _____.
a) Soil solarization b) Soil binding
c) Soil salinity d) Soil mixing

- 8) When ribbon tide over the crops & it reflects rays cause birds move away from the crop known as _____.
a) Light traps b) Tin bands
c) Sticky bands d) Detergent bands**

Q.2 Answer the following. (Any Four) **08**

- What is crop rotation?
- Give the role of organic farming in agriculture.
- What is crop hygiene?
- Give the benefits of Shaking Plants.
- What are nematicides?
- Why the plant quarantine, need in India?

Q.3 Attempt the following. (Any Two) **08**

- a) Soil solarization
- b) Biological control
- c) Fungicides

Q.4 Attempt the following. (Any Two) **08**

- Write on – Use of sticky bands.
- Give the benefits of use of resistant varieties.
- Explain – bagging.

Q.5 Answer the following. (Any One) 08

- a)** Give the crop identification, soil type, tillage, seed rate & spacing, intercultural operations, fertilizers, irrigation, yield & economic importance of Grapevine.
- b)** Give the crop identification, soil type, tillage, seed rate & spacing, intercultural operations, fertilizers, irrigation, yield & economic importance of Sugarcane.

Set P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April - 2026
PHYSICS (Paper - VI)
Electronic Devices and Applications (22221305)**

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of logarithmic table and calculator is allowed.

08

- 1) In differential amplifier, input is applied in between _____.
a) two bases b) two emitters
c) base and ground d) collector and base
- 2) In phase shift oscillator, one RC network produces phase shift of _____.
a) 90° b) 60°
c) 360° d) 180°
- 3) In the Colpitt's oscillator, the feedback is obtained by _____.
a) tapping of the inductor b) tapping of the condenser
c) RC network d) None of these
- 4) UJT has $\eta = 0.6$ and $R_{BB} = 10\text{ K}\Omega$ the value of R_{B_1} is _____.
a) $4\text{ K}\Omega$ b) $10\text{ K}\Omega$
c) $2\text{ K}\Omega$ d) $6\text{ K}\Omega$
- 5) The logical circuit used to perform addition of three binary bits is called as _____.
a) half adder b) full adder
c) flip-flop d) parallel adder
- 6) Flip - flop is nothing but _____.
a) astable multivibrator b) monostable multivibrator
c) bistable multivibrator d) None of these
- 7) When negative feedback is used in amplifier, it's gain _____.
a) increases b) decreases
c) remains the same d) becomes zero
- 8) If the negative potential on the control grid of CRT is increased, then the intensity of spot-on screen of CRT _____.
a) is increased b) is decreased
c) remains constant d) None of these

- Q.2 Answer any four the following. 08**
- a) What is mean by biasing?
 - b) State the Barkhausen criterion for sustained oscillator.
 - c) Write any four uses of CRO.
 - d) Give the comparison between normal amplifier and differential amplifier.
 - e) A differential amplifier has an open-circuit voltage gain of 100. The input signal are $V_1 = 3.30$ volt and $V_2 = 3$ volt. Calculate the output voltage of differential amplifier?
 - f) What is Flip-Flop?
- Q.3 Attempt any two of the following. 08**
- a) Describe the construction and working of J-K flip-flop.
 - b) With neat diagram, explain RC coupled amplifier.
 - c) Write a short note on Phase shift oscillator.
- Q.4 Answer any two of the following. 08**
- a) Write a short note on Colpitts oscillator.
 - b) State and prove De Morgan's First theorem.
 - c) In UJT relaxation oscillator, charging resistance is $22\text{ K}\Omega$ and capacitor is $0.01\text{ }\mu\text{F}$, Calculate the frequency of saw tooth wave form produced by relaxation oscillator. (Given $\eta = 0.6$).
- Q.5 Answer any one of the following. 08**
- a) Draw the Block diagram of CRO and explain the function of each block.
 - b) With neat diagram, explain construction and working of FET.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026
BIO-CHEMISTRY (Paper - II)
Biochemical Techniques (22221307)**

Day & Date: Saturday, 11-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat labeled diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Multiple choice questions.**08**

- 1) DNSA reagent used for reducing sugar estimation contains _____.
 a) 3,5 Di Nitro Salicylic Acid b) 3,6 Di Nitro Salicylic Acid
 c) 2,4 Di Nitro Salicylic Acid d) 2,6 Di Nitro Salicylic Acid
- 2) Reaction with Orcinol reagent is specific for _____ sugars.
 a) Triose b) Tetrose
 c) Pentose d) Hexose
- 3) The following detergent is used in denaturing polyacrylamide gel electrophoresis.
 a) TDS b) SRS
 c) DTS d) SDS
- 4) In chromatography, which of the following can the mobile phase be made of?
 a) Solid or liquid b) Liquid or gas
 c) Gas only d) Liquid only
- 5) Gel permeation chromatography is based on separation of components based on their molecular _____.
 a) size b) charge
 c) affinity d) density
- 6) The _____ blotting technique is used for blotting of protein bands.
 a) southern b) northern
 c) western d) eastern
- 7) Which of the following is used as a catalyst during polymerization of Acrylamide gel?
 a) TEMED b) EDTA
 c) DTT d) NADH

- 8) In polymerase chain reaction the commonly used thermostable polymerase is _____.
a) Bam polymerase b) E. Coli polymerase
c) Taq Polymerase d) Staph polymerase

Q.2 Answer any four of the following. (Any Four) 08

- a) What is the use of SDS in electrophoresis?
- b) Explain the terms Absorbance and Transmittance.
- c) Write names of modern biochemical techniques.
- d) Draw a labeled diagram of instrumentation of a colorimeter.
- e) What is the application of BLAST tool in bioinformatics?
- f) Write principle of DNA estimation by DPA method.

Q.3 Answer any two of the following. (Any Two) 08

- a) Write a note on mechanism of separation of compounds by Gel permeation chromatography.
- b) Write a note on Agarose gel electrophoresis for nucleic acids.
- c) What are the advantages of spectrophotometer over colorimeter?

Q.4 Answer any two of the following. (Any Two) 08

- a) Give different applications of bioinformatics.
- b) What is ELISA? Describe the types of ELISA.
- c) Describe methods for biochemical estimation of proteins.

Q.5 Answer any one of the following. (Any One) 08

- a) Describe the technique and applications of PCR.
- b) Describe in detail Polyacrylamide Gel electrophoresis and its applications.

Set P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026
PLANT PROTECTION (Paper - VI)
Crop Diseases and Their Management (22221313)**

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagram wherever necessary.
3) All questions carry equal marks.

08

- 1) Harmful deviation from normal functioning of physiological process is _____.
a) Pest b) Disease
c) Infection d) Pathogen
- 2) _____ is disease causal organism.
a) Pathogen b) Symptoms
c) Host d) None of these
- 3) _____ is the non-infectious disease factor.
a) Bacteria b) Virus
c) Soil d) Mycoplasma
- 4) Causal organism of Grain smut of jowar is _____.
a) *Sphacelotheca sorghi* b) *Xanthomonas citri*
c) *MLOS* d) *Hibiscus I*
- 5) Arka Anamika is the resistant variety of _____.
a) Citrus b) Jawar
c) Bhendi d) None of these
- 6) Downy mildew of grape is caused by _____.
a) Virus b) Fungus
c) Bacterial d) Mycoplasma
- 7) *Phakospora pachyrrhiza* is causal organism of _____ host plant.
a) Groundnut b) Soybean
c) Okra d) Cucurbit
- 8) Rust of Groundnut infected by _____ fungus.
a) *Puccinia grachidis* b) *Albugo candida*
c) *Sphacelotheca sorghi* d) None of these

- Q.2 Answer any FOUR of the following. 08**
- a) Symptoms
 - b) Inoculation
 - c) Diseases
 - d) Write the causal organism of Little leaf of Brinjal.
 - e) Write any two symptoms of Fungal diseases of plant.
 - f) Mention host plant of Bacterial diseases.
- Q.3 Write short note on any TWO of the following. 08**
- a) Write the Kitch's Postulates.
 - b) Control measures of Grain Smuts of Jowar
 - c) Etiology
- Q.4 Answer any TWO of the following. 08**
- a) Give an account on Okra.
 - b) Write on Rust of Soyabean.
 - c) Describe the Downy Mildew.
- Q.5 Answer any ONE of the following. 08**
- a) Write the principles of plant disease management.
 - b) Give an account on classification of plant diseases.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April - 2026
STATISTICS (Paper – V)
Probability Distributions (22221308)

Day & Date: Monday, 13-04-2026
 Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Use of Calculator is allowed.

Q.1 Choose the correct alternatives. 08

1) Let the joint probability mass function of two random variables X and Y be

$$P(x, y) = \frac{x+y}{21}; x = 1, 2, 3, y = 1, 2$$

Then $P(X = 2/Y = 2)$ is _____.

a) $\frac{1}{3}$	b) $\frac{2}{3}$
c) $\frac{1}{2}$	d) $\frac{1}{4}$

2) The joint p. m. f. of a bivariate r. v. (X, Y) is

$$P(x, y) = k(x + y); x = 1, 2, y = 1, 2$$

Then the value of k is _____.

a) $\frac{1}{6}$	b) $\frac{1}{9}$
c) $\frac{1}{4}$	d) $\frac{1}{12}$

3) Which of the following is not a p. d. f.?

- a) $f(x) = \begin{cases} 2x & ; 0 < x < 1 \\ 0 & ; \text{otherwise} \end{cases}$
- b) $f(x) = \begin{cases} x & ; 0 < x < \frac{1}{2} \\ 0 & ; \text{otherwise} \end{cases}$
- c) $f(x) = \begin{cases} \sin x & ; 0 < x < \frac{\pi}{2} \\ 0 & ; \text{otherwise} \end{cases}$
- d) $f(x) = \begin{cases} 1 & ; 0 < x < 1 \\ 0 & ; \text{otherwise} \end{cases}$

- 4)** A continuous random variable X has probability density function $f(x)$ is given by

$$f(x) = \begin{cases} \frac{c}{\sqrt{x}} & ; \quad 0 < x < 4 \\ 0 & ; \quad \text{otherwise} \end{cases}$$
 Then the value of c is _____.
 a) 4 b) 1
 c) $\frac{1}{4}$ d) 2
- 5)** If $f(x) = \begin{cases} 0.5 & ; \quad -1 < x < 1 \\ 0 & ; \quad \text{otherwise} \end{cases}$ is the pdf or r.v. X , then $P(X < 0) =$ _____.
 a) $P(X > 0)$ b) $\frac{1}{4}$
 c) $\frac{3}{4}$ d) None of these
- 6)** Let (X, Y) be random variables with joint probability density function

$$f(x, y) = \begin{cases} cxy & ; \quad 0 < x < 1; 0 < y < 1 \\ 0 & ; \quad \text{otherwise} \end{cases}$$

 Then the value of c is _____.
 a) 8 b) 6
 c) 1 d) 4
- 7)** Two random variables X and Y are independently distributed if _____.
 a) Their joint density is equal to the product of their marginal densities
 b) $E(XY) = E(X).E(Y)$
 c) $f(X|Y = y) = f(x)$ and $f(Y|X = x) = f(y)$
 d) All the above
- 8)** If $F_x(x)$ is the cumulative distribution function of a continuous r.v. X , then it is _____.
 a) Decreasing function of X
 b) Non-increasing function of X
 c) Non-decreasing function of X
 d) None of these

Q.2 Answer the following. (Any Four)

08

- If (X, Y) be bivariate discrete r. v. Define conditional probability distribution of X given $Y = y$.
- Define conditional variance of X given $Y = y$, in case of two-dimensional discrete random variable (X, Y) .
- Define m.g.f. of continuous random variable X .
- Define Marginal density function of Y in case of two-dimensional continuous random variable (X, Y) .
- Define correlation coefficient between X and Y , in case of two-dimensional continuous random variable (X, Y) .
- Define arithmetic mean of a continuous r.v. X .

Q.3 Write Short Notes. (Any Two)

08

a) Define probability generating function. Show that the p.g.f. of sum of two independent random variable is equal to product of their p.g.f.

b) The p.d.f. of the continuous .v. X is given by

$$f(x) = \begin{cases} x & ; 0 < x < 1 \\ 2 - x & ; 1 < x < 2 \\ 0 & ; \text{otherwise} \end{cases}$$

Find m.g.f. of r. v. X hence find mean of X .

c) The joint probability mass function (p.m.f.) of two discrete random variable X and Y is given as

$X \backslash Y$	0	1	2
0	0.1	0.1	0.1
2	0.15	0.2	0.15
4	0.1	0.1	0

Obtain the marginal p.m.f. of Y . Compute the mean of Y .

Q.4 Answer the following. (Any Two)

08

a) For two dimensional discrete random variables (X, Y) , state and prove multiplication theorem of expectation.

b) A continuous random variable X has p.d.f.

$$f(x) = \begin{cases} kx^3 & , 1 \leq x \leq 3 \\ 0 & , \text{otherwise} \end{cases}$$

If $Y = 5X + 3$ Find $E(Y)$

c) Let (X, Y) is a bivariate continuous random variable with joint p.d.f. $f(x, y)$, then prove that

$$V(aX - bY) = a^2V(X) + b^2V(Y) - 2abCov(X, Y)$$

Q.5 Answer the following. (Any One)

08

a) A continuous random variable has the p.d.f.

$$f(x) = \begin{cases} kxe^{-x} & , 0 < x < \infty \\ 0 & , \text{otherwise} \end{cases}$$

Find :-

- the value of k
- $E(X)$
- $V(X)$

b) Let X and Y have joint probability density function

$$f(x, y) = \begin{cases} x + y & ; 0 < x < 1 \quad 0 < y < 1 \\ 0 & ; \text{otherwise} \end{cases}$$

Find :-

- Marginal probability density function of X
- Marginal probability density function of Y
- Conditional probability density function of X given $Y = y$
- Conditional probability density function of Y given $X = x$

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026
GEO-CHEMISTRY (Paper - I)
Introduction to Geochemistry (22221328)**

Day & Date: Wednesday, 15-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of logarithmic table and calculator is allowed.

Q.1 Multiple choice questions.

08

- 1) What is a colloid?
 - a) A homogeneous mixture of two or more substances
 - b) A heterogeneous mixture of two or more substances with particles in the range of 1-1000 nm
 - c) A solution with particles larger than 1000 nm
 - d) A suspension with particles smaller than 1 nm
- 2) Which of the following is an example of a homologous series?
 - a) Alkanes
 - b) Alkenes
 - c) Alkynes
 - d) All of the above
- 3) _____ is the structure of CsCl.
 - a) Face-centered cubic
 - b) Body-centered cubic
 - c) Hexagonal close-packed
 - d) Simple cubic
- 4) The empirical formula of a compound is _____.
 - a) The simplest whole-number ratio of atoms of each element in the compound
 - b) The actual number of atoms of each element in the compound
 - c) The molecular weight of the compound
 - d) The structural formula of the compound
- 5) What is the general trend in ionic radii for cations and anions?
 - a) Cations are larger than anions
 - b) Anions are larger than cations
 - c) Cations and anions have similar sizes
 - d) Ionic radii are independent of charge
- 6) Organic compounds are _____ in nature.
 - a) ionic
 - b) covalent
 - c) highly soluble
 - d) All of the above

- 7)** The coordination number of Na^+ in the NaCl structure is _____.
a) 4 b) 6
c) 8 d) 12
- 8)** The structure of sodium chloride is _____.
a) Face-centered cubic b) Body-centered cubic
c) Hexagonal close-packed d) Simple cubic

Q.2 Answer the following. (Any Four) **08**

- What is triple point in a phase diagram?
- Define lattice energy of crystals.
- What do you mean by empirical formula?
- Define Colloids.
- What is coordination number?
- Define the term degrees of freedom.

Q.3 Attempt the following. (Any Two) **08**

- Explain Goldschmidt's Mineralogical phase rule.
- Write a note on structure of Sodium Chloride.
- What are the general characteristics of organic compounds?

Q.4 Answer the following. (Any Two) **08**

- Write a note on geological evidences of silica and clay minerals.
- Explain general rules of the three-dimensional structure with the help of solid geometry.
- What are homologous series? Explain them.

Q.5 Answer the following. (Any One) **08**

- Discuss electrical, mechanical and optical properties of colloids.
- Describe phase diagram of water system.

Set P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026
ZOOLOGY (Paper – V)
Cell Biology (22221322)**

Day & Date: Wednesday, 15-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat & well labelled diagram wherever necessary.

Q.1 Multiple choice questions.

08

- The study of cell and its detail is called _____.
 - Cell Biology
 - Histology
 - Genetics
 - Physiology
- Smooth Endoplasmic Reticulum (SER) are concerned with _____.
 - Energy formation
 - Lipid synthesis
 - Protein synthesis
 - Carbohydrate synthesis
- Fluid mosaic model of plasma membrane is given by _____.
 - Robert Brown
 - Singer and Nicholson
 - De Duve
 - Camillo Golgi
- The pre existing lysosomes are generated from _____.
 - Golgi complex
 - Ribosomes
 - Nucleolus
 - Endoplasmic reticulum
- The cell drinking is called _____.
 - phagocytosis
 - exocytosis
 - pinocytosis
 - autophagocytosis
- The nucleopores are minute opening found on _____.
 - plasma membranes
 - endoplasmic reticulum
 - nuclear membrane
 - Golgi complex
- Microtubules are made up of _____ protein.
 - albumin
 - chitin
 - actin
 - tubulin
- The centromere is positioned at the terminal end of the Chromosome _____.
 - acrocentric
 - metacentric
 - sub-metacentric
 - telocentric

- Q.2 Answer the following. (Any Four) 08**
- a) Prokaryotic cell
 - b) ADP
 - c) Proteins in plasma Membrane
 - d) Microfilament
 - e) SER
 - f) Functions of Golgi apparatus
- Q.3 Write short notes. (Any Two) 08**
- a) Diffusion
 - b) Describe structure of RER and its functions.
 - c) Explain ultrastructure and functions of mitochondria.
- Q.4 Answer the following. (Any Two) 08**
- a) Explain Fluid mosaic model of plasma membrane.
 - b) Describe structure of Golgi complex and give its functions.
 - c) Explain ultrastructure of nucleus and give its function.
- Q.5 Answer the following. (Any One) 08**
- a) Describe types & chromosomes on the basis of centromere.
 - b) Define mitosis; give its all stage along with labelled diagram.

Set	P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April - 2026
STATISTICS (Paper – VI)
Statistical Methods - I (22221309)**

Day & Date: Thursday, 16-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations whenever necessary.
3) Figures to the right indicate full marks.
4) Use of logarithmic table and calculator is allowed.

Q.1 Choose the correct alternatives from the options.

08

- 1) The Corr ($X_{1.3}, X_{2.3}$) is _____.
a) r_{12} b) r_{13}
c) $r_{12.3}$ d) $r_{13.2}$
- 2) Vital statistics is a branch of biometry which deals with data and laws of _____.
a) births b) deaths
c) marriages d) All the above
- 3) The residual $X_{1.23}$ called as residual of order _____.
a) 0 b) 1
c) 2 d) 3
- 4) If N.R.R. < 1 then we interpret that _____.
a) increase in population b) reduction in population
c) constancy in population d) All the above
- 5) The number of possible samples of size n from a population of N units by using SRSWR is _____.
a) N^n b) $\binom{N}{n}$
c) $n!$ d) None of these
- 6) If N.R.R. < 1 then we interpret that _____.
a) increase in population b) reduction in population
c) constancy in population d) All the above
- 7) In India, the child bearing age is _____.
a) 20-24 years b) 15-49 years
c) 13-48 years d) 20-29 years

- 8) Simple random sample can be drawn with the help of _____.
 a) random number tables b) lottery method
 c) drawing chits d) All the above

Q.2 Answer the following. (Any Four) 08

- Define CDR.
- Define Sampling frame.
- Explain how S.D.R. is superior to C.D.R.
- State variance of sample mean in case of SRSWR.
- Write the plane of regression equation of X_2 on X_1 and X_3 .
- Define partial correlation.

Q.3 Write short notes. (Any Two) 08

- Show that sample mean is unbiased estimator of population mean in case of SRSWR.
- State and prove any two properties of residuals.
- Define G.F.R. and T.F.R.

Q.4 Answer the following. (Any Two) 08

- Find $R_{1.23}$ if $r_{12} = 0.6, r_{13.2} = 0.4$.
- Show that probability of selecting a specified unit at any draw is same as it is being selected at first draw.
- Define G.R.R. and N.R.R. and also state limitations of G.R.R.

Q.5 Answer the following. (Any One) 08

- Define multiple correlation coefficients and derive the formula for multiple correlation coefficients.
- With usual notations, prove that

$$var(\bar{y}_n)_{wr} = \frac{N-1}{Nn} S^2$$

Set P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026
METEOROLOGY (Paper - II)
General Meteorology (22221327)**

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagram and give equations wherever necessary.
4) Use of logarithmic table and calculator is allowed.

08

- For diffused reflection, if angle of incidence is equal to 30° then angle of reflection will be _____.
a) 15° b) 45°
c) 30° d) 90°
- Patches of thinned ozone are called _____.
a) ozone holes b) CFC
c) ODS d) exosphere
- The latitude of the line of cancer is _____.
a) 0° b) 23.5°
c) 10° d) 100°
- Two locations on the earth 100 meter apart have a pressure difference of 500 millibar. The pressure gradient between them will be _____.
a) 0.2 b) 600
c) 5 d) 400
- Which of the following force acts if a body is in motion in rotating frame of reference?
a) Frictional b) Coriolis
c) Lorentz d) Relative
- Which of the following device converts light energy into electrical energy?
a) LASER b) Photovoltaic cell
c) Thermocouple d) Heliostats
- "To every action there is equal and opposite reaction and the two acts simultaneously on two different bodies" is statement of Newton's _____ law of motion.
a) First b) Second
c) Third d) Zeroth

- 8)** In energy technology, worthless energy is called as _____.
a) synergy b) exergy
c) work d) anergy

Q.2 Answer the following. (Any Four)

08

- What are effects of scattering?
- Mention effects of ozone in troposphere.
- What is wind?
- State Buys-Ballots law.
- A typical output of a solar cell is $V = 0.45$ volts and $I = 20$ mA. Calculate its power output in watt.
- A force of 10 N displaces a body by 5 meters. Calculate the work done.

Q.3 Answer the following. (Any Two)

08

- Discuss variation of composition of Earth's atmosphere with altitude and latitude.
- Explain the Earth's rotational deflective force (Coriolis force).
- How is a satellite launched? Why are multistage rockets used to launch the satellite?

Q.4 Answer the following. (Any Two)

08

- Write a note on absorption of solar radiation by ozone.
- How do the local winds occur?
- Discuss energy science and energy technology.

Q.5 Answer the following. (Any One)

08

- a)** Write a note on green-house effect.
- b)** Describe depletion of ozone layer & formation of ozone hole.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026**

GEO-CHEMISTRY (Paper – II)

Introduction to Solar System and Geo-Sphers (22221329)

Day & Date: Friday, 17-04-2026

Max. Marks: 40

Time: 09:00 AM To 11:00 AM

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat diagrams and give equations wherever necessary.
 4) Use of logarithmic table and calculator is allowed.
 (At. Wts.: H=1, C=12, O=16, N=14, Na=23, Cl=35.5)

Q.1 Multiple choice questions.

08

- 1) The hydrosphere is the: _____.
 a) Continuous shell of water b) Discontinuous shell of water
 c) Uniform shell of water d) None of these
- 2) Siderites consist essentially of a _____.
 a) Nickle - iron alloy b) Nickel-iron alloy and silicates
 c) Silicates only d) Silicates and graphite's
- 3) The concentration of CO₂ in the atmosphere is gradually increasing due to burning of _____.
 a) Coal b) Petroleum
 c) fossil fuel d) all of these
- 4) Who was introduced the term siderophile, Chalcophile lithophile and atrophied?
 a) Goldschmidt (1923) b) Clarke (1924)
 c) Ringwood (1975) d) Cameron (1937)
- 5) What is the average percentage of SiO₂ in the igneous rock?
 a) 59.14% b) 55.50 %
 c) 79.15% d) 80.00 %
- 6) The Sun's major constituents are _____.
 a) H & He b) O₂ and N₂
 c) NH₃ and CO₂ d) None of these
- 7) Which of the following contains roughly 80% of the Earth's atmosphere?
 a) Troposphere b) Stratosphere
 c) Mesosphere d) Thermosphere

- 8) Which of the following is incorrect pair: ____.
- a) Siderophile-Silicates
 - b) Chalcophile-Sulfides
 - c) Lithophile-Silicate
 - d) Atmophile- Atmosphere

Q.2 Answer the following. (Any Four) 08

- a) What are the compositions of Sial and Sima?
- b) Name the two types of Aerolites.
- c) Define pyrolite.
- d) What is transitional zone?
- e) Name the geochemical elements which have the affinity towards sulphides.
- f) List the major constituents of Atmosphere.

Q.3 Write short notes. (Any Two) 08

- a) Structure of atmosphere.
- b) Gains and losses of elements in the oceanic water.
- c) Structure and composition of lower mantle.

Q.4 Answer the following. (Any Two) 08

- a) Describe in brief the geochemical classification of elements.
- b) Discuss the composition of planets.
- c) Describe in brief zonal structure of the earth.

Q.5 Answer the following. (Any One) 08

- a) Explain in brief an Evolution of the atmosphere and its addition and losses during geological time.
- b) Discuss the brief an composition of Meteorites and their types.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026
ZOOLOGY (Paper – VI)
Principles of Ecology (22221323)**

Day & Date: Friday, 17-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagrams and give equations wherever necessary.
4) Use of logarithmic table and calculator is allowed.

Q.1 Multiple choice questions.**08**

- 1) _____ is a sub-discipline of ecology that focuses on the study of individual species in their environment.

a) Synecology	b) Autecology
c) Ecosystem Ecology	d) Population Ecology
- 2) In population ecology _____ describes the number of individuals in a population over time.

a) Density	b) Natality
c) Mortality	d) Life Tables
- 3) _____ type of animal association involves a relationship where one species benefits while the other is neither helped nor harmed.

a) Commensalism	b) Mutualism
c) Parasitism	d) Predation
- 4) _____ abiotic factor affects the rate of photosynthesis and respiration in plants?

a) Temperature	b) Water Hardness
c) Soil	d) Light
- 5) _____ characteristic of a community refers to the variety and abundance of different species.

a) Species Richness	b) Dominance
c) Diversity Indices	d) Abundance
- 6) In a freshwater ecosystem _____ is characterized by slow-moving water and high nutrient levels.

a) Lentic	b) Lotic
c) Grassland	d) Desert

- 7) The term _____ describes the flow of energy through different trophic levels in an ecosystem.
- | | |
|--------------------------|-----------------|
| a) Ecological Pyramid | b) Food Chain |
| c) Ecological Succession | d) Biodiversity |
- 8) _____ is an example of a biodiversity hotspot in India.
- | | |
|----------------------------|-----------------------|
| a) The Thar Desert | b) The Western Ghats |
| c) The Himalayan Foothills | d) The Deccan Plateau |

Q.2 Answer the following. (Any Four) 08

- a) Describe the main differences between autecology and synecology.
- b) Explain the concept of survivorship curves and their significance in population ecology.
- c) What are the effects of soil on animal life in an ecosystem?
- d) Define and give an example of mutualism in animal associations.
- e) Discuss the importance of species richness in community ecology.
- f) What are the general characteristics of a desert ecosystem?

Q.3 Answer the following. (Any Two) 08

- a) Discuss Grassland Ecosystem.
- b) Explain the role of temperature and humidity as abiotic factors in terrestrial ecosystems.
- c) Describe the concept of ecological succession and its stages with reference to a pond ecosystem.

Q.4 Answer the following. (Any Two) 08

- a) Outline the general characteristics and faunal adaptations of aquatic ecosystems (both lotic and lentic).
- b) Discuss the concept of food chains and their role in the energy flow within an ecosystem.
- c) Provide an overview of biodiversity hot-spots in India and their significance for conservation.

Q.5 Answer the following. (Any One) 08

- a) Describe the characteristics, types, and examples of intraspecific and interspecific associations in animals.
- b) Explain the concept of ecological pyramids, their types, and their application in understanding energy dynamics in ecosystems.

Set P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April - 2026
MATHEMATICS (Paper – V)
Differential Calculus (22221316)**

Day & Date: Saturday, 18-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Choose the correct alternative for each of the following. 08

- 1) The sub-normal at any point of parabola $y^2 = 4ax$ is equal to _____.
 - a) a
 - b) $2a$
 - c) $3a$
 - d) $4a$
- 2) Polar sub-tangent is equal to _____.
 - a) $\frac{d\theta}{dr}$
 - b) $r \frac{d\theta}{dr}$
 - c) $r^2 \frac{d\theta}{dr}$
 - d) $\frac{1}{r} \frac{d\theta}{dr}$
- 3) The radius of curvature of the curve at any point is given by _____.
 - a) $\frac{ds}{d\psi}$
 - b) $\frac{d\psi}{ds}$
 - c) $\frac{dy}{dx}$
 - d) $\frac{dx}{dy}$
- 4) The radius of curvature at any point on the curve $s = 4a \sin \psi$ is _____.
 - a) $4a \sin \psi$
 - b) $4a \cos \psi$
 - c) $2a \sin \psi$
 - d) $2a \cos \psi$
- 5) If $x = r \cos \theta$ and $y = r \sin \theta$ then $\frac{\partial(x,y)}{\partial(r,\theta)} =$ _____.
 - a) x
 - b) y
 - c) r
 - d) θ
- 6) If $u = x^2 - y^2, v = xy$ then $\frac{\partial(u,v)}{\partial(x,y)} =$ _____.
 - a) $2(x^2 - y^2)$
 - b) $2(x^2 + y^2)$
 - c) $(x^2 - y^2)$
 - d) $(x^2 + y^2)$

- 7) A function $f(x, y)$ is maximum at point (a, b) if _____.
 a) $AC - B^2 < 0$ and $A > 0$ b) $AC - B^2 < 0$ and $A < 0$
 c) $AC - B^2 > 0$ and $A > 0$ d) $AC - B^2 > 0$ and $A < 0$
- 8) The maximum value of $\sin x + \cos x$ is _____.
 a) 1 b) 2
 c) $\sqrt{2}$ d) $\sqrt{3}$

Q.2 Attempt any Four of the following.**08**

- a) Find the equation of the normal at (a, a) to the curve $x^2 y^3 = a^5$
 b) Find $\frac{ds}{dx}$, for the curve $y^2 = 4ax$
 c) Find the radius of curvature of the curve $x^2 + y^2 = a^2$ at any point.
 d) If $u = x^2, v = y^2$ then find $\frac{\partial(u,v)}{\partial(x,y)}$
 e) If $x = u(1 + v)$ and $y = v(1 + u)$ then find $\frac{\partial(x,y)}{\partial(u,v)}$
 f) Find the maximum value of the function $f(x) = \frac{x^3}{3} - 2x^2 + 3x + 1$

Q.3 Attempt any Two of the following.**08**

- a) If $y = f(x)$ be an equation of curve in Cartesian form then show that
 the radius of Curvature of the curve is $\frac{\left\{1 + \left(\frac{dy}{dx}\right)^2\right\}^{3/2}}{\frac{d^2y}{dx^2}}$
 b) Find polar sub-tangent, polar subnormal and polar normal for the
 curve $r = a(1 + \cos \theta)$
 c) If $u = x + y - z, v = x - y + z$, and $w = x^2 + y^2 + z^2 - 2yz$ then find
 $\frac{\partial(u,v,w)}{\partial(x,y,z)}$

Q.4 Attempt any Two of the following.**08**

- a) Find the radius of curvature for the curve $r = a(1 + \cos \theta)$
 b) If z_1, z_2, z_3 are functions of three variables y_1, y_2, y_3 and y_1, y_2, y_3 are
 function of three variable x_1, x_2, x_3 then show that

$$\frac{\partial(z_1, z_2, z_3)}{\partial(x_1, x_2, x_3)} = \frac{\partial(z_1, z_2, z_3)}{\partial(y_1, y_2, y_3)} \frac{\partial(y_1, y_2, y_3)}{\partial(x_1, x_2, x_3)}$$

 c) Find the extreme values of the function $f(x, y) = x^2 + 2xy + 2y^2 + 2x + y$

Q.5 Attempt any One of the following.

08

- a)** Explain the Lagrange's Method of Undetermined Multipliers to find the extreme values of $u = f(x, y, z)$ subject to the conditions $\phi(x, y, z) = 0$ and $\psi(x, y, z) = 0$
- b)** If the parametric equation of the curve are $x = f(t)$ and $y = g(t)$ then show that the radius of curvature is $\frac{\{[f'(t)]^2 + [g'(t)]^2\}^{3/2}}{f'(t)g''(t) - g'(t)f''(t)}$

Set P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026
BOTANY (Paper - V)
Plant Anatomy (22221302)**

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat & well labelled diagram wherever necessary.

08

- 1)** The living tissue of xylem is _____.
a) Tracheids b) Xylem Parenchyma
c) xylem fibres d) Sieve tubes
- 2)** Lenticels are produced in _____.
a) Cork b) Dermatogen
c) Periderm d) Phellogen
- 3)** The mechanical tissue of plants is _____.
a) Phloem b) Vessels
c) Parenchyma d) Sclerenchyma
- 4)** _____ is the outermost layer of the stele.
a) Hypodermis b) Endodermis
c) Epidermis d) Ground tissue
- 5)** Porous & hard wood plants belong to _____.
a) Dicot b) Pteridophytes
c) Monocot d) Gymnosperm
- 6)** Histogen theory was proposed by _____ in 1870.
a) Hanstein b) Wanstein
c) Manstein d) Danstein
- 7)** The vascular bundles forming a ring are present in _____.
a) Monocot b) Dicot
c) Gymnosperm d) Pteridophytes
- 8)** The light yellow coloured wood developed in tree trunk is called as _____.
a) Sap wood b) Autumn wood
c) Spring wood d) Heart wood

- Q.2 Answer the following. (Any Four) 08**
- a) Give the function of collenchyma.
 - b) Define periderm.
 - c) Enlist the types of meristem based on plane of division.
 - d) What is function of stomata?
 - e) Define meristem.
 - f) Write the function of xylem.
- Q.3 Answer the following. (Any Two) 08**
- a) Write a short note on Sclerenchyma tissue.
 - b) Explain the general character of monocot root.
 - c) Give significance of Tunica carpus theory.
- Q.4 Answer the following. (Any Two) 08**
- a) Describe the structure of periderm.
 - b) Explain the conjoint vascular bundle.
 - c) Describe the anomalous secondary growth in *Dracaena* stem.
- Q.5 Answer the following. (Any One) 08**
- a) Describe types of wood with suitable diagram.
 - b) Describe the primary structure of Dicot stem.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April - 2026
MATHEMATICS (Paper - VI)
Laplace Transform (22221317)

Day & Date: Tuesday, 21-04-2026
 Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 Choose correct alternative for each of the following.**08**

1) Find $L^{-1} \left\{ \frac{1}{p^2 + 8p + 6} \right\} = \underline{\hspace{2cm}}$.

a) te^{4t}

b) t^2e^{4t}

c) te^{-4t}

d) t^2e^{-4t}

2) Find $L^{-1} \left\{ \frac{1}{p^2 + q^2} \right\} = \underline{\hspace{2cm}}$.

a) $a \sin at$

b) $\frac{1}{a} \sin at$

c) $a \sinh at$

d) $\frac{1}{a} \sinh at$

3) Find $L^{-1} \left\{ \frac{e^{-at} t^{n-1}}{(n-1)!} \right\} = \underline{\hspace{2cm}}$.

a) $\frac{1}{(p+a)^n}$

b) $\frac{1}{(p+a)^{n-1}}$

c) $\frac{1}{(p-a)^n}$

d) $\frac{1}{(p-a)^{n-1}}$

4) Find the Laplace transformation of the function $F(t) = 3t - 5$ is $\underline{\hspace{2cm}}$.

a) $\frac{3 + 5P}{p^2}$

b) $\frac{3P - 5}{p^2}$

c) $\frac{3P + 5}{p^2}$

d) $\frac{3 - 5P}{p^2}$

5) If $\frac{d^2y}{dx^2} + y = 0$ under the condition $y(0) = 1, y'(0) = 0$ then $L\{y\} = \underline{\hspace{2cm}}$.

a) $\frac{1}{p^2 + 1}$

b) $\frac{p}{p^2 + 1}$

c) $\frac{1}{p^2 - 1}$

d) $\frac{p}{p^2 - 1}$

- 6) If $y(x, t)$ is a function of x and t , then $L\left\{\frac{\partial y}{\partial t}\right\} = \underline{\hspace{2cm}}$.
- a) $p\bar{y}(x, p) - y(x, 0)$ b) $p\bar{y}(x, t) - y(x, 0)$
 c) $py(x, p) - y(x, 0)$ d) $py(x, t) - y(x, 0)$
- 7) Find $L^{-1}\left\{\frac{1}{\sqrt{p}}\right\} = \underline{\hspace{2cm}}$.
- a) $\frac{1}{t\sqrt{\pi}}$ b) $\frac{t}{\sqrt{\pi}}$
 c) $\frac{t^2}{\sqrt{\pi}}$ d) $\frac{1}{\sqrt{\pi t}}$
- 8) Find $L\{t \cos at\} = \underline{\hspace{2cm}}$.
- a) $\frac{p^2 - a^2}{(p^2 + a^2)^2}$ b) $\frac{p^2 + a^2}{(p^2 + a^2)^2}$
 b) $\frac{a^2 - p^2}{(p^2 + a^2)^2}$ d) $\frac{a^2 - p^2}{(p^2 - a^2)^2}$

Q.2 Attempt any Four of the following.**08**

- a) Evaluate $\int_0^{\infty} \frac{e^{-at} - e^{-bt}}{t} dt$
- b) Find the Laplace transform of the function $(t + 3)^2 \cdot e^t$
- c) Find $L^{-1}\left\{\frac{p}{p^2+2} + \frac{6p}{p^2-16} + \frac{3}{p-3}\right\}$
- d) Evaluate $L^{-1}\left\{\frac{p+1}{p^2+6p+25}\right\}$
- e) Solve $(D^2 + m^2)x = 0$ if $x(0) = x_0, x'(0) = x_1$
- f) Solve $\frac{d^2x}{dt^2} + x = f(t)$ if $x = x' = 0$ for $t = 0$

Q.3 Attempt any two of the following.**08**

- a) Solve $(D + 2)^2 y = 4e^{-2t}, y(0) = -1, y'(0) = 4$
- b) Find $L^{-1}\left\{\log\left(1 + \frac{1}{p^2}\right)\right\}$
- c) Show that $\int_0^{\infty} \frac{\sin t}{t} dt = \frac{\pi}{2}$

Q.4 Attempt any two of the following.**08**

- a) Solve $[tD^2 + (1 - 2t)D - 2]y = 0$, if $y(0) = 1, y'(0) = 2$
- b) Let $F(t)$ be continuous for all $t \geq 0$ and be of exponential order as $t \rightarrow \infty$ and if $F'(t)$ is of class A, then prove that
- $$\lim_{t \rightarrow 0} F(t) = \lim_{p \rightarrow \infty} PL\{F(t)\}$$

- c) If $L^{-1}\{f(p)\} = F(t)$ then prove that $L^{-1}\{f(ap)\} = \frac{1}{a}F\left(\frac{t}{a}\right)$

Q.5 Attempt any one of the following.

08

- a) State and prove Heaviside's expansion theorem.
- b) i) Find the Laplace transform of the function $F(t)$, where
- $$F(t) = \begin{cases} 2t, & 0 \leq t < 5 \\ 1 & t > 5 \end{cases}$$
- ii) Solve $(D^2 - 2D + 2)y = 0, y = Dy = 0$, when $t = 0$

Set P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026
BOTANY (Paper - VI)
Plant Metabolism (22221303)**

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams and give equations wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic table and calculator is allowed.

08

- 1) Nitrogen is absorbed by the plants in the form of _____.
a) Ammonium b) Nitrates
c) Nitrites d) All of these
- 2) _____ is produced with the combination of enzyme and Substrate.
a) Holoenzyme b) Enzyme substrate complex
c) Prosthetic group d) Enzyme product complex
- 3) Over 90% of Enzymes are made up of _____.
a) Fats b) Globular Proteins
c) Nucleic acids d) Vitamins
- 4) _____ only gaseous hormone also known as fruit ripening hormone.
a) Gibberellin b) Auxin
c) Ethylene d) Cytokinin
- 5) Apical bud dominance causes due to _____ plant hormone.
a) Auxins b) Ethylene
c) Abscisic acid d) Cytokinin
- 6) Nearly _____ % of the earth's atmosphere is composed of Nitrogen.
a) 78% b) 60%
c) 40% d) 100%
- 7) _____ required to plants in very small amounts ie. less than 10 M Mole per Kg of dry matter.
a) Fertilizers b) Microelements
c) Macroelements d) Essential elements

- 8) Ammonification is the process of _____.
a) Ammonia from nitrates by decomposers
b) Ammonia from nitrogen
c) Ammonia from amino acid by decomposer
d) Ammonia from nitrates by nitrogen fixers

Q.2 Answer any Four the following. 08

- a) Define Enzyme.
- b) Define Nitrogen Fixation?
- c) Enlist the categories of Carbohydrates.
- d) What is mineral nutrition?
- e) Define Nitrogen cycle.

Q.3 Attempt any Two of the following. 08

- a) Describe properties of enzymes.
- b) What are Auxins? Explain their physiological role?
- c) Explain the properties of Disaccharides.

Q.4 Answer any Two of the following. 08

- a) Write a note on Biological Nitrogen fixation.
- b) Give the roles of Nitrogen and Phosphorus.
- c) Explain Mechanism of lock and Key Hypothesis.

Q.5 Answer any one of the following. 08

- a) Describe the classification of carbohydrate.
- b) Explain the nitrogen cycle in detail.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/Apr – 2026
ELECTRONICS (Paper – V)
Electronic Circuits (22221318)**

Day & Date: Thursday, 23-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagrams and give equations wherever necessary.
4) Use of logarithmic table and calculator is allowed.

Q.1 Multiple choice questions

08

- 1) Breakdown occurs in Zener diode under _____ condition.
 - a) forward bias
 - b) positive bias
 - c) reverse bias
 - d) all of these
- 2) The basic purpose of a filter is to _____.
 - a) regulate input voltage
 - b) regulate output voltage
 - c) remove ripple
 - d) control current
- 3) Applying dc supply of proper polarity and magnitude is called as _____.
 - a) biasing
 - b) rectification
 - c) filtering
 - d) amplification
- 4) Operating point represents _____.
 - a) zero signal values of I_C and V_{CE}
 - b) the magnitude of signal
 - c) values of I_C and V_{CE} when I/P is applied
 - d) none of the above
- 5) The conversion efficiency of Class-A amplifier is _____ %.
 - a) up-to 50
 - b) 78.5
 - c) above 95
 - d) in between 25 to 50
- 6) In Class-A power amplifier the transistor conducts for _____.
 - a) 90°
 - b) 180°
 - c) less than 180°
 - d) 360°
- 7) Another name for positive feedback is _____ feedback.
 - a) degenerative
 - b) regenerative
 - c) generative
 - d) reductive

- 8) In Colpitt's oscillator, feedback is obtained _____.
a) from magnetic induction
b) from the centre of split capacitors
c) from a tickler coil
d) from the centre of split inductors

Q.2 Answer the following (Any Four) 08

- a) What is rectification? What are its types?
- b) What is biasing? What are its types?
- c) What is Barkhausen criterion for sustained oscillations?
- d) What is faithful amplification?
- e) What is need of multistage amplifier?

Q.3 Write a short note. (Any Two) 08

- a) Explain the working of full wave rectifier
- b) Explain in brief the working of two stage RC coupled amplifier
- c) Explain action of Phase shift oscillator

Q.4 Answer the following. (Any Two) 08

- a) Explain CLC filter.
- b) Explain working of Colpitt's oscillator.
- c) Explain the basic action of transistor as an amplifier.

Q.5 Answer the following (Any One) 08

- a) Explain working of Wein bridge oscillator. Give formula for frequency of oscillation. Determine frequency of oscillation If $R = 1K\Omega$ and $C = 1.59 \mu F$.
- b) What do you mean by feedback? Derive an expression for gain of the amplifier with negative and positive feedback

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026
GEOLOGY (Paper - V)
Mineralogy (22221310)**

Day & Date: Friday, 24-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat & well labelled diagrams wherever necessary.

Q.1 Multiple choice questions.**08**

- 1) What kind of a bond forms when one or more electrons are shared by two atoms?
 - a) Ionic bond
 - b) Covalent bond
 - c) Metallic bond
 - d) All of these
- 2) Which of the following minerals are built from the independent silicate structure?
 - a) Olivine
 - b) Pyroxene
 - c) Amphibole
 - d) Quartz
- 3) Which among the following shows silky lustre?
 - a) Quartz
 - b) Galena
 - c) Gypsum
 - d) Diamond
- 4) Which one of the following optical properties of minerals is NOT observed under crossed Nicols?
 - a) Extinction
 - b) Interference colour
 - c) Interference figure
 - d) Pleochroism
- 5) Chemical composition of Calcite is _____.
 - a) Al_2O_3
 - b) CaCO_3
 - c) Fe_2O_3
 - d) None of these
- 6) The direction along which a mineral tends to break is called _____.
 - a) Fracture
 - b) Form
 - c) Cleavage
 - d) All of these
- 7) Pale green to dark green pleochroism is shown by _____.
 - a) Hornblende
 - b) Microcline
 - c) Olivine
 - d) Biotite
- 8) Plagioclase shows _____ twinning.
 - a) Simple
 - b) cross hatched
 - c) Symmetrical
 - d) Repeated

- Q.2 Answer the following. (Any Four) 08**
- a) Define Isotropic and anisotropic mineral
 - b) Name any two minerals from Feldspar Group.
 - c) Give the any two examples of polymorphism.
 - d) Name the parts Lower assembly of Polarized microscope.
 - e) What is Twinning of a mineral?
 - f) Explain any two types of Lusters in Minerals with example.
- Q.3 Write Short Notes on: (Any Two) 08**
- a) Physical properties fracture and cleavage with suitable example.
 - b) Silicate structure with suitable diagram and example.
 - c) Define extinction angle. Explain in brief the types of extinction with suitable diagram.
- Q.4 Answer the following. (Any Two) 08**
- a) Explain the forms of minerals with suitable diagram.
 - b) Describe optical properties under PPL (Plane Polarised Light).
 - c) Discuss in brief the types of chemical bonding.
- Q.5 Answer the following. (Any One) 08**
- a) Describe members, chemical composition and physical properties of Pyroxene group minerals.
 - b) Define Mineral. Describe Physical properties, chemical composition, Optical properties of Muscovite and Biotite.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026
GEOGRAPHY (Paper – V)
Climatology (22221324)**

Day & Date: Thursday, 23-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagrams wherever necessary.

Q.1 Fill in the blanks by choosing correct alternatives given bellows. 08

- 1) _____ is the science of climate which studies the physical and spatial state of the atmospheric conditions.

a) Geomorphology	b) Climatology
c) Political	d) Oceanography
- 2) The nitrogen present in the atmosphere is _____ %.

a) 76.08	b) 77.08
c) 78.08	d) 79.08
- 3) The energy radiated from the Sun is called as _____.

a) Insolation	b) Insulation
c) Convection	d) evaporation
- 4) The line joining the places of equal temperature is called as _____.

a) Isotherm	b) Isobar
c) Isohyets	d) Isohaline
- 5) The standard air pressure at sea level is _____ mb.

a) 1013.25	b) 1010.30
c) 109.12	d) 101.01
- 6) _____ is a type of planetary wind.

a) Trade wind	b) Loo
c) Cyclone	d) Tornado
- 7) Horse latitude lie within _____.

a) The polar high	b) Equatorial low
c) Sub-tropical high	d) Sub polar low
- 8) The amount of actual water vapor of air is known as _____.

a) Absolute humidity	b) Dew point
c) Relative humidity	d) Condensation point

- Q.2 Answer the following. (Any Four) 08**
- a) Define the concept of Climatology.
 - b) Define the concept of Jet Stream.
 - c) Define the concept of normal laps rate.
 - d) Define the concept of weather.
 - e) Define the concept of temperature inversion.
 - f) Define the concept of wind.
- Q.3 Write short notes on any two of the following. 08**
- a) Elements of climate.
 - b) Heat Budget.
 - c) Tropical cyclone.
- Q.4 Answer the following. (Any Two) 08**
- a) Explain the types of humidity.
 - b) Explain the composition of the atmosphere.
 - c) Explain the terrestrial heat budget.
- Q.5 Answer the following. (Any One) 08**
- a) Explain the structure of the atmosphere.
 - b) Explain the types of planetary winds.

- Q.2 Answer the following. (Any Four) 08**
- a) Role of Gas vacuoles
 - b) Define Growth.
 - c) What is Osmoregulation?
 - d) Facilitated diffusion
 - e) What is function of Magnetosomes?
- Q.3 Write short notes. (Any Two) 08**
- a) Write in details of Glyoxylate bypass.
 - b) Continuous growth and Synchronous growth.
 - c) Write a short note Carboxysomes and their functions
- Q.4 Answer the following. (Any Two) 08**
- a) Role of Activators and Inhibitors in enzyme.
 - b) Effect of Osmotic pressure on growth of microorganism.
 - c) Nitrogenous and non-nitrogenous reserve food material and their role.
- Q.5 Answer the following. (Any One) 08**
- a) Explain cell membrane their Chemical composition, structure and function.
 - b) Write in details on modes of ATP generation.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April - 2026
ELECTRONICS (Paper - VI)
Pulse and Switching Circuits (22221319)**

Day & Date: Saturday, 25-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of a logarithmic table and calculator is allowed.

Q.1 Multiple choice questions.**08**

- 1) _____ circuit called as dc restorer circuit.
 - a) Differentiator
 - b) Clamper
 - c) Clipper
 - d) Integrator
- 2) If the input to an integrator circuit is a square wave, the output will be a _____.
 - a) Cosine wave
 - b) Square wave
 - c) Triangular wave
 - d) Sawtooth wave
- 3) A monostable multi-vibrator circuit _____.
 - a) has no stable state
 - b) gives two output pulses for a single input pulse
 - c) has no energy storage element
 - d) return to its stand-by state automatically
- 4) Trigger pulses in a 555 bistable multi-vibrator are applied to _____.
 - a) Pins 2 and 4
 - b) Pins 3 and 4
 - c) Pins 2 and 3
 - d) Pins 6 and 7
- 5) _____ circuit is used to pass low frequencies.
 - a) Differentiating
 - b) Clamping
 - c) Integrating
 - d) Rectifying
- 6) A transistor used as a switch then it is operated in _____.
 - a) saturation region
 - b) cut-off and active region
 - c) active region and saturation region
 - d) cut-off and saturation region
- 7) The time taken by a voltage to drop from its maximum value back to its initial value is called _____.
 - a) Restoration time
 - b) Charging time
 - c) Sweep time
 - d) All of these

- 8) Pin No. 7 of the IC 555 is _____.
a) Threshold b) Discharge
c) Trigger d) Control Voltage**

Q.2 Answer of the following. (Any Four) 08

- Give the necessity of the wave shaping circuit.
- List the various types of nonlinear wave-shaping circuits.
- Calculate the pulse width of the monostable multi-vibrator using IC 555. if the timing components are $R = 100\text{K}\Omega$ and $C = 100\mu\text{F}$.
- Define Intrinsic standoff ration? Give its formula.
- Define UTP and LTP of a Schmitt trigger.

Q.3 Write short notes on. (Any Two) 08

- Astable multi-vibrator using gates
- BJT as a Switch
- Diode as a negative clipper

Q.4 Answer of the following. (Any Two) 08

- What is a clamper circuit? Explain the negative clamper circuit.
- Explain in the brief working of a monostable multi-vibrator using IC 74151.
- Explain in brief working of Battery charger with IC 555.

Q.5 Answer of the following. (Any One) 08

- Explain Astable multi-vibrator by using IC 555. Derive the formula for frequency and duty cycle.
- Explain working of RC integrator and differentiator circuit.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026
GEOLOGY (Paper – VI)
Igneous Petrology (22221311)**

Day & Date: Monday, 27-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Draw neat diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Multiple choice questions.**08**

- 1) Gabbro is _____ Igneous rock.
 - a) intrusive
 - b) volcanic
 - c) extrusive
 - d) None of these
- 2) _____ is fine grained igneous rock.
 - a) Basalt
 - b) Trachyte
 - c) Rhyolite
 - d) All of these
- 3) The essential mineral in granite rock are _____.
 - a) quartz, feldspar
 - b) quartz, augite
 - c) quartz, olivine
 - d) olivine, augite
- 4) Unicomponent rocks are extremely _____.
 - a) Abundant
 - b) Moderate
 - c) Rare
 - d) None of these
- 5) Quartz is absent in _____ rock.
 - a) Acidic
 - b) Ultrabasic
 - c) Basic
 - d) None of these
- 6) The ultra basic magma, poor contains of _____.
 - a) Si, Na and K
 - b) Ca, Mg and Fe
 - c) K, Mg and Fe
 - d) Fe and Mg
- 7) The well-developed crystal faces in Igneous rock are called _____.
 - a) Euhedral
 - b) Anhedral
 - c) Subhedral
 - d) None of these
- 8) The final product of Bowens reaction relation in magma is _____.
 - a) Olivine
 - b) Pyroxene
 - c) Plagioclase
 - d) Quartz

- Q.2 Answer the following. (Any Four) 08**
- a) Define discordant forms.
 - b) What is magma and lava?
 - c) Define texture in igneous rock.
 - d) What is isotherm?
 - e) Define holohyaline texture.
 - f) What is eutectic point?
- Q.3 Write short notes. (Any Two) 08**
- a) Describe the sill and phacolith.
 - b) Describe volcanic igneous rock.
 - c) Describe the glass and crystals.
- Q.4 Answer the following. (Any Two) 08**
- a) Describe the any two textures in igneous rock.
 - b) Describe any two discordant forms of igneous rock.
 - c) Describe the crystallization of unicomponent magma.
- Q.5 Answer the following. (Any One) 08**
- a) Describe structures of igneous rock.
 - b) Describe the differentiation process in magma.

Set	P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April - 2026
GEOGRAPHY (Paper - I)
Geography of India (22221325)**

Day & Date: Saturday, 25-04-2026
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Figures to right indicate full marks.
- 3) Draw lie diagrams & give equations wherever necessary.
- 4) Use of maps stencil is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. 08

- 1) The _____ plateau is the oldest landmass of India.
a) Peninsular
b) Colombia
c) Siberia
d) Malwa
- 2) _____ soil is a type of soil formed by the deposition of sediments, primarily by rivers, and is known for its high fertility.
a) Regur
b) Alluvial
c) Red
d) Mountain
- 3) India is divided by Tropic of _____ 23°30' N in almost two equal parts.
a) Cancer
b) Capricorn
c) Equatorial
d) None of these
- 4) In 2011, India's population density was _____ persons per square kilometer.
a) 382
b) 372
c) 362
d) 352
- 5) _____ state has the lowest sex ratio in India in 2011 census.
a) Haryana
b) Punjab
c) U.P.
d) Kerala
- 6) _____ is estimated to be the top sugar-producing state in India in 2023-2024.
a) Uttar Pradesh
b) Maharashtra
c) Kolkata
d) Kerala
- 7) The decadal population growth rate in India from 2001 to 2011 was _____.
a) 14.64%
b) 15.64%
c) 16.64%
d) 17.64%

- 8) The largest union territory of India by area is _____.
a) Delhi b) Chandigarh
c) Jammu and Kashmir d) Ladakh**

Q.2 Answer any four of the following. 08

- What is the 2nd largest mountain range?
- Which is the 2nd largest tribe in India?
- Define the Alluvial soil.
- Which are the top 3 religion in India?
- Which city is the IT hub in India?
- Which are the top 5 most spoken languages in India?

Q.3 Write short notes of any two of the following. 08

- a) Age composition
- b) Regur soil
- c) Indian Island

Q.4 Answer any two of the following. 08

- Define the natural vegetation & explain its types.
- Describe the growth of population in India.
- Explain the present religion groups in India.

Q.5 Answer any one of the following. 08

- Explain the production and distribution of iron ore in India.
- Explain the factors affecting distribution of population.

Set P

**B.Sc. (Plain) (Semester - III) (New/Old) (CBCS) Examination:
March/April – 2026
MICROBIOLOGY (Paper – VI)
Fundamentals of Bacterial Genetics (22221315)**

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculator is allowed.

Q.1 Rewrite the following sentences by selecting correct answer from given alternatives. **08**

- 1) Replacement of purine by pyrimidine is known as _____.
 - a) Transition
 - b) Insertion
 - c) Transversion
 - d) Deletion
- 2) 5 Bromo Uracil is base analogue of _____.
 - a) Thymine
 - b) Cytosine
 - c) Adenine
 - d) Guanine
- 3) _____ number of bases are present per turn in B form of DNA.
 - a) 10
 - b) 12
 - c) 11
 - d) 8
- 4) _____ is termination codon.
 - a) GCC
 - b) UUU
 - c) UAG
 - d) AAA
- 5) The minimal genetic unit capable of recombination is called _____.
 - a) Muton
 - b) Recon
 - c) Exon
 - d) Cistron
- 6) The Thymine - Thymine dimer is formed when microorganisms are exposed to _____.
 - a) Hydroxyl amine
 - b) U.V. light
 - c) Acridine dyes
 - d) Nitrous acid
- 7) The process of production of RNA from DNA is called _____.
 - a) Translation
 - b) RNA splicing
 - c) Transcription
 - d) Transposition
- 8) The observable properties of organisms are called as _____.
 - a) Phenotype
 - b) Genotype
 - c) Genome
 - d) Gene

- Q.2 Answer the following. (Any Four) 08**
- a) What is Okazaki fragment?
 - b) Define genome.
 - c) Define missense mutation.
 - d) Enlist applications of plasmids.
 - e) Define mutation and mutagenic agents.
 - f) Explain split gene.
- Q.3 Attempt the following. (Any Two) 08**
- a) Explain Dark repair mechanism.
 - b) Explain mutations caused by base analogues.
 - c) Describe Griffith experiment.
- Q.4 Answer the following. (Any Two) 08**
- a) Explain Replica plate technique.
 - b) Discuss in detail types of plasmids.
 - c) Explain basic concepts of transcription and translation.
- Q.5 Answer the following. (Any One) 08**
- a) Describe mechanism of DNA replication.
 - b) What is genetic code? Describe properties of genetic code.

Set P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
Chemistry (Paper – VII)
Physical Chemistry (22221444)**

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

08

- 1) Body centered cubic lattice consist of _____ points at corners.
a) 2
b) 4
c) 6
d) 8
- 2) Unit of specific resistance is _____.
a) ohm cm⁻¹
b) mho cm⁻¹
c) ohm cm
d) ohm⁻¹ cm⁻¹
- 3) The Nernst's distribution law is also known as _____.
a) Henry's Law
b) Raoult's Law
c) Partition Law
d) Equilibrium Law
- 4) On dilution specific conductivity _____.
a) decrease
b) increase
c) both a and b
d) None of these
- 5) In an adiabatic expansion of an ideal gas _____.
a) $q = 0$
b) $dT = 0$
c) $\Delta E = 0$
d) $\Delta V = 0$
- 6) For the solution of NaOH which will have the lowest value of specific conductance?
a) 0.1M
b) 1.0M
c) 0.001M
d) 0.01M
- 7) Entropy change is given by the equation _____.
a) $\Delta S = q_{\text{rev}}T$
b) $\Delta S = q_{\text{rev}} + T$
c) $\Delta S = q_{\text{rev}}/T$
d) $\Delta S = q_{\text{rev}} - T$
- 8) If transport number of cation is 0.47, then that of anion is _____.
a) 0.53
b) 0.78
c) 1.22
d) 0.62

- Q.2 Answer the following questions briefly. (Any Four) 08**
- a) Mention laws of crystallography, and state the law of crystal symmetry.
 - b) Define Weiss and Miller indices.
 - c) Define the term equivalent conductance, mention its unit.
 - d) Define the entropy, give its unit.
 - e) State Kohlrausch's Law.
 - f) Explain the term absolute entropy.
- Q.3 Write short notes on the following. (Any Two) 08**
- a) How is entropy change determined in fusion of solid and vaporization of liquid?
 - b) State the law of partition and give its limitations.
 - c) The specific conductance of N/50 solution of CuSO_4 at 298 K is $0.02107 \text{ Ohm}^{-1} \text{ cm}^{-1}$. Calculate equivalent and molecular conductance's of CuSO_4 solution.
- Q.4 Answer the following. (Any Two) 08**
- a) Define transport number of an ion. Describe the moving boundary method.
 - b) Discuss entropy changes in irreversible process.
 - c) Give an account of the process of extraction.
- Q.5 Answer the following. (Any One) 08**
- a) What is Hittorf's rule? Discuss the application of Kohlrausch's Law.
 - b) What is mean by space lattice of crystal? Describe Bragg's equation for interplanar distances of crystal.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
COMPUTER SCIENCE (Paper - VII)
Core Java (22221429)**

Day & Date: Thursday, 09-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Multiple choice questions.**08**

- 1) Which method can be used to return a string in upper case letters?
 - a) toUpperCase()
 - b) touppercase()
 - c) upperCase()
 - d) tuc()
- 2) Which of the following is not OOPS concept in Java?
 - a) Inheritance
 - b) Encapsulation
 - c) Polymorphism
 - d) Compilation
- 3) Thread priority in Java is?
 - a) Integer
 - b) Float
 - c) double
 - d) long
- 4) Which of these collection class has the ability to grow dynamically?
 - a) Array
 - b) Arrays
 - c) ArrayList
 - d) None of these
- 5) What does AWT stand for in Java?
 - a) Application Widget Toolkit
 - b) Advanced Window Technology
 - c) Abstract Window Toolkit
 - d) Automatic Window Tool
- 6) Which part of code gets executed whether exception is caught or not?
 - a) throw
 - b) try
 - c) catch
 - d) finally
- 7) Which of these class is used to read characters in a file?
 - a) FileReader
 - b) FileWriter
 - c) FileInputStream
 - d) InputStreamReader
- 8) The process of creating an object from a class is known as _____.
 - a) Encapsulation
 - b) Instantiation
 - c) Inheritance
 - d) Abstraction

- Q.2 Answer the following. (Any Four) 08**
- a) What is class? Write syntax for class declaration.
 - b) What is array?
 - c) What is JVM?
 - d) What is use of extends keywords?
 - e) List out exception types.
 - d) What is method overriding?
- Q.3 Attempt any Two of the following. 08**
- a) Explain features of java programming.
 - b) Write a program which can demonstrate use of super keyword in single inheritance.
 - c) Explain thread life cycle.
- Q.4 Answer the following. (Any Two) 08**
- a) Write a program which can implement multiple catch block.
 - b) What is interface? How it is implemented?
 - c) Write a program which can read content of file.
- Q.5 Answer the following. (Any One) 08**
- a) Write a program to demonstrate use of abstract class and abstract method.
 - b) What is use of thread priority? Explain with example.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
CHEMISTRY (Paper – VIII)
Analytical & Industrial Inorganic Chemistry (22221445)**

Day & Date: Friday, 10-04-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculator is allowed.

Q.1 Choose the correct alternatives from given option.**08**

- 1) Solochrome black is _____ indicator.
 - a) metallochromic
 - b) acid base
 - c) auto
 - d) redox
- 2) $\text{Fe}(\text{OH})_3$ is a _____ precipitate.
 - a) amorphous
 - b) crystalline
 - c) curdy
 - d) gelatinous
- 3) 8-hydroxy quinoline is a _____ chelating agent.
 - a) unidentate
 - b) bidentate
 - c) tridentate
 - d) tetradentate
- 4) DMG gives _____ precipitate with Pd (II) ions.
 - a) yellow
 - b) scarlet red
 - c) green
 - d) blue
- 5) In Haber's process _____ is used as a promoter.
 - a) Fe
 - b) V
 - c) Pt
 - d) Mo
- 6) Bauxite is an ore of _____.
 - a) aluminum
 - b) ferrous
 - c) copper
 - d) silicon
- 7) Froth floatation method is generally used for the concentration of _____ ore.
 - a) oxide
 - b) sulphate
 - c) sulphide
 - d) carbonates
- 8) For making of ball bearing, _____ steel is used.
 - a) nickel
 - b) chrome
 - c) silicon
 - d) tungsten

- Q.2 Answer the following. (Any Four)** **08**
- a) Define the term:
 - i) Titrant
 - ii) End point
 - b) Draw the structure of EDTA and give full form of EDTA.
 - c) Define:
 - i) Coprecipitation
 - ii) Post-precipitation
 - d) Draw a neat labelled diagram of manufacturing plant for ammonia by Haber's process.
 - e) What is steel? Give chemical composition of chrome steel.
 - f) Give the merits of contact's process for the manufacture of sulphuric acid.
- Q.3 Write short notes on the following. (Any Two)** **08**
- a) Distinguish between Bessemer process and L.D. process
 - b) Explain types of ores.
 - c) What are heavy chemicals? Give physico-chemical principles of Haber's process for manufacture of ammonia.
- Q.4 Answer the following. (Any Two)** **08**
- a) Explain the advantages of organic precipitants.
 - b) Explain electrolytic reduction of aluminum.
 - c) Define heat treatment on steel and explain any two process.
- Q.5 Answer the following. (Any One)** **08**
- a) What is neutralization curve? Explain the choice of an indicator for titration between strong acid and strong base with help of neutralization curve.
 - b) Define precipitation. Explain process of precipitation.

Seat No.	

B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:**March/April – 2026****COMPUTER SCIENCE (Paper – VIII)****DBMS using Oracle (22221430)**

Day & Date: Friday, 10-04-2026

Max. Marks: 40

Time: 03:00 PM To 05:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Multiple choice question.**08**

- 1) DBA stands for _____.
 - a) Database Administrator
 - b) Database Analyst
 - c) Database Application
 - d) None of these
- 2) The initial state of a transaction is known as _____.
 - a) Active state
 - b) Partially committed state
 - c) Failed state
 - d) Aborted state
- 3) _____ key represent relationship between tables.
 - a) Primary key
 - b) Foreign key
 - c) Secondary key
 - d) None of these
- 4) Which of the following is used to declare a record?
 - a) %ROWTYPE
 - b) %TYPE
 - c) Both a and b
 - d) None of above
- 5) The point in the schedule where the transaction has obtained its final lock is known as _____.
 - a) Deadlock
 - b) Commit point
 - c) Lock point
 - d) None of these
- 6) The number of tuples of a relation is its _____.
 - a) Degree
 - b) Intension
 - c) Cardinality
 - d) None of the above
- 7) Which of the following implicit cursor returns the count of rows affected by an INSERT, UPDATE OR DELETE statement?
 - a) %FOUND
 - b) %NOTFOUND
 - c) %ISOPEN
 - d) %ROWCOUNT

- 8) Which of the following is a default mode for a parameter when its mode is not specified?
- a) IN
 - b) OUT
 - c) IN OUT
 - d) parameter mode must always be specified

Q.2 Answer the following. (Any Four) 08

- a) What is a transaction?
- b) Define the term:
 - i) Degree
 - ii) Tuple
- c) List Database Users.
- d) What is Serializability?
- e) What is View?
- d) What is Database Recovery?

Q.3 Write short notes on the following. (Any Two) 08

- a) Explain different types of attributes.
- b) Write a PL/SQL block to check whether given number is odd or even.
- c) Explain Generalization and specialization.

Q.4 Answer the following. (Any Two) 08

- a) Explain three problems of concurrency control with example.
- b) Explain shadow paging technique.
- c) Explain the string functions with example.

Q.5 Answer the following. (Any One) 08

- a) What is Stored Procedure? Explain in, out parameters with example.
- b) What is Cursor? Explain parameterized cursor with example.

Set P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
PHYSICS (Paper – VII)
Geometrical, Physical and Fiber Optics (22221405)**

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams and give equations wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of log table or calculator is allowed.

08

- 1) The obliquity factor is measured by _____.
a) $1 + \cos \theta$ b) $1 + \sin \theta$
c) $1 + \tan \theta$ d) $1 + \cot \theta$
- 2) The substances which rotate the plane of vibration of polarized light towards the left side are known as _____.
a) optically active b) laevo-rotatory
c) dextro rotator d) laevo as well as dextro rotatory
- 3) Optical fibres are composed of _____ material.
a) paraelectric b) ferroelectric
c) semiconductor d) dielectric
- 4) Langrange's law for magnification is given by _____.
a) $n_1 y_1 \tan \theta_1 = n_2 y_2 \tan \theta_2$ b) $n_1 y_1 \sin \theta_1 = n_2 y_2 \sin \theta_2$
c) $n_1 y_1 \tan \theta_1 = n_2 y_2 \sin \theta_2$ d) $n_1 y_1 \cos \theta_1 = n_2 y_2 \cos \theta_2$
- 5) The central maximum of one wavelength coincides with first minimum of second wavelength is the condition of _____.
a) geometrical resolution b) spectral resolution
c) source resolution d) space resolution
- 6) In double refraction, the ray having same velocity in all directions in the crystal is _____.
a) normal ray
b) ordinary ray
c) extraordinary ray
d) both ordinary and extraordinary ray

- 7) For an optical fibre, if ϕ_c is critical angle of incidence, n_1 be refractive index of material of core and n_2 be refractive index of material of cladding (rarer medium) then the relation between ϕ_c , n_1 and n_2 is ____.
- a) $\phi_c = \cos^{-1}\left(\frac{n_2}{n_1}\right)$ b) $\phi_c = \sin^{-1}\left(\frac{n_1}{n_2}\right)$
 c) $\phi_c = \sin^{-1}(n_1 - n_2)$ d) $\phi_c = \sin^{-1}\left(\frac{n_2}{n_1}\right)$
- 8) If medium on both sides of the lens system is same then ____.
- a) principal points coincide with focal points
 b) nodal points coincide with focal points
 c) principal points coincide with nodal points
 d) principal points not coincide with nodal points

Q.2 Answer the following. (Any Four)**08**

- a) Define nodal points and nodal planes for a lens system.
- b) When Michelson's interferometer is illuminated with sodium light of mean wavelength $5893 \text{ \AA}$ and the movable mirror is moved through a distance of 0.02942 cm , the fringe pattern changes from one consonance to the next consonance, find the difference between the lines of sodium doublet.
- c) Explain Zone plate.
- d) State the laws of rotation of plane of polarization.
- e) A 10% sugar solution taken in a polarimeter tube of length 20 cm rotates the plane of polarization of the light of wavelength $6000 \text{ \AA}$ through 12° . Calculate the specific rotation of sugar.
- f) Plane diffraction has 762 numbers of slits of lines on grating surface. Examine if D_1 and D_2 lines of sodium of wavelength $5890 \text{ \AA}$ and $5896 \text{ \AA}$ will be resolved by the grating in first order.

Q.3 Attempt any Two of the following.**08**

- a) Explain the formation and working of Fibre- optic communication system.
- b) Explain Graphical construction of image using cardinal points and obtain Newton's formula.
- c) Explain the construction and working of Fabry Perot Interferometer.

Q.4 Answer the following. (Any Two)**08**

- a) Obtain the relation between the lateral, longitudinal and angular magnifications.
- b) Explain step index fibre and graded index fiber.

- c) Explain the use of Michelson's interferometer for the determination of the wavelength of monochromatic light. Calculate the wavelength of the monochromatic light when the initial and final readings of Michelson's interferometer are 1.07345 cm and 1.07052 cm as 100 fringes get shifted through a point in the field of view.

Q.5 Answer the following. (Any One)

08

- a) Explain the principle, construction and working of Nicol Prism. Explain how Nicol prism can be used as analyzer.
- b) Derive an expression for resolving power of prism. Calculate the length of the base of a 60° prism capable of just resolving the sodium lines of wavelength 5896 and 5890 Å. The material of the glass has rate of change of refractive index with respect to the wavelength is 6.961×10^4 per meter.

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
BIO-CHEMISTRY (Paper – III)
Nutrition and Metabolism (22221408)**

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams and give equations wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic table and non-programmable calculator is allowed.

08

- Enzyme catalyzes first step of glycolysis is _____.
 - hexokinase
 - phospho fructokinase-1
 - glucokinase
 - pyruvate kinase
- _____ is the final product of purine degradation in mammals.
 - Guanine
 - Uric acid
 - Inosine
 - Hypoxanthine
- Important precursor in the purine pathway is _____.
 - aspartate
 - glutamine
 - leucine
 - glycine
- The study of energy relationship and conservations in biological systems is called as _____.
 - Biotechnology
 - Biophysics
 - Bioenergetics
 - Microbiology
- _____ is a saturated fatty acid.
 - Palmitic acid
 - Oleic acid
 - Linoleic acid
 - Erucic acid
- First amino group entering into urea cycle is _____.
 - citulline
 - carbamoyl phosphate
 - ornithine
 - argininosuccinate
- Enzymes for β -oxidation are present at _____.
 - mitochondria
 - nucleus
 - cytosol
 - golgi bodies

- 8)** The carbon atom source while producing urea in the urea cycle is _____.
a) CO₂ b) glucose
c) arginine d) aspartic acid

Q.2 Answer the following. (Any Four) 08

- What is lipid metabolism?
- Write two purine molecules.
- What are functions of water?
- Define Glycolysis.
- Define deamination.
- What are endergonic reactions?

Q.3 Attempt any Two of the following. 08

- Write note on Fate of pyruvate.
- Explain for components of respiratory chain.
- Explain Biosynthesis of palmitic acid.

Q.4 Answer the following. (Any Two) 08

- Write note on Urea cycle.
- Write note on oxidative phosphorylation.
- Write note on ethanol fermentation.

Q.5 Answer the following. (Any One) **08**

- Explain mechanism of electrolyte balance and acid base balance in body.
- Explain biosynthesis and degradation of purines.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
PLANT PROTECTION (Paper – VII)
Introduction to Weeds & Non-Insect Pests (22221417)**

Day & Date: Saturday, 11-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Multiple choice questions.**08**

- 1) Mesophytic weed plant means _____.
 a) Plant grow in wet condition
 b) Plant grow in mesic conditions
 c) Plant grow in xeric conditions
 d) Plant grow in rainy conditions
- 2) _____ is one of the xeric weed plant.
 a) *Portulaca oleracea*
 b) *Argemone Mexicana*
 c) *Acacia catechu*
 d) *A. Aurandifolia*
- 3) Hoeing takes place by _____.
 a) Vila
 b) Nails
 c) Khurapi
 d) None of these
- 4) *Euphorbia* sp. produce _____.
 a) Flavonoids
 b) Milky later
 c) Water sap
 d) Steroids
- 5) Mulching Practices helps to _____.
 a) enhance weed plant growth
 b) increase shoot tip
 c) control weed plant growth
 d) control weed plant branching
- 6) Effective weedicide is as _____.
 a) Sodium chloride
 b) Alachlor (Lasso 50 E.C)
 c) Urea
 d) Copper sulphate
- 7) Slugs have _____ on their bodies.
 a) thick hairs
 b) white spots
 c) non-calcareous shell
 d) calcareous shell

- 8)** Zinc phosphate is used to control _____.
a) mites b) thrips
c) jassids d) rats

Q.2 Answer any four of the following.

08

- a) Define Weeds.
- b) What is plant protection?
- c) What are poisonous weeds?
- d) What is biological control?
- e) What are snails?
- f) What are nematodes?

Q.3 Write short notes on any two of the following.

08

- Ploughing
- Aquatic weeds
- Write on nature of damage & management caused by mites.

Q.4 Answer any two of the following.

08

- Explain - crop rotation.
- Give the losses caused by weeds.
- Give the classification of weeds based on ecology.

Q.5 Answer any one of the following

08

- a) Give the gross morphology, reproduction, ecology, dispersal & management of *Argemone Mexicana*.
- b) Give the properties, mode of action, formulations & use of 2,4 – D.

Set	P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April - 2026
PHYSICS (Paper - VIII)
Modern Physics (22221406)**

Day & Date: Monday, 13-04-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Multiple choice questions.

08

- 1) The special theory of relativity was developed by _____.
a) Einstein b) Newton
c) Lorentz d) Galileo
- 2) According to special theory of relativity, the velocity of light in free space is _____.
a) increases b) decreases
c) remain constant d) zero
- 3) If the particle velocity is $c/2$, then the phase velocity of the matter wave associated with the particle is _____.
a) $c/2$ b) $2c$
c) $2/c$ d) c^2
- 4) Radiation has _____ nature.
a) Only particle b) Only wave
c) Dual d) Unique
- 5) The change in wavelength of scattered radiation due to Compton effect is proportional to _____.
a) $\sin^2 \frac{\theta}{2}$ b) $\sin \frac{\theta}{2}$
c) $\sin \theta$ d) $\sin 2\theta$
- 6) _____ is the most common type of coupling.
a) JJ b) SS
c) L-J d) LS
- 7) P- state corresponds to $l =$ _____.
a) 0 b) 1
c) 2 d) 3

- 8) Which of the following has the least wavelength?
- a) UV-rays
 - b) Visible rays
 - c) X-rays
 - d) IR rays

Q.2 Answer any Four of the following. 08

- a) State Einstein postulates on special theory of relativity.
- b) A body of mass 0.1 Kg is moving with a velocity of 10 m/s. Find its De Broglie wavelength. (Planck's constant $h = 6.62 \times 10^{-34} \text{Js}$)
- c) State Pauli's exclusion principle.
- d) Define Compton effect.
- e) State any two properties of X-rays.
- f) State Heisenberg's uncertainty principle.

Q.3 Attempt any Two of the following. 08

- a) Derive the expression for Galilean transformation equation.
- b) Describe in details principle, construction and working of Coolidge tube for the production X-rays.
- c) Describe the experimental set up to study normal Zeeman effect.

Q.4 Answer any Two of the following. 08

- a) Obtain Bohr's quantum condition on the basis of De-Broglie matter wave.
- b) State Hund's rule and explain magnetism in iron.
- c) Derive Bragg's law of X-ray diffraction.

Q.5 Answer any One of the following. 08

- a) Describe Michelson Morley Experiment in details.
- b) Derive an expression for change in wavelength for scattered photon.

Seat No.	

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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April - 2026
BIO-CHEMISTRY (Paper - IV)
Molecular Biochemistry & Diseases (22221409)**

Day & Date: Monday, 13-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Multiple choice questions.

08

- 1) Azidothymidine (AZT) drug used in AIDS is _____.
 a) protein inhibitor b) nucleoside inhibitor
 c) protein booster d) nucleoside booster
- 2) _____ cells is involved in cell-mediated immunity.
 a) T cells b) Mitochondria
 c) Thrombocytes d) Mast cells
- 3) Normal insulin concentration in plasma is _____.
 a) 20 – 30 $\mu\text{v/ml}$ b) 5 – 15 $\mu\text{v/ml}$
 c) 25 – 35 $\mu\text{v/ml}$ d) 40 – 50 $\mu\text{v/ml}$
- 4) S1 nuclease is an endonuclease which is specific for _____ nucleic acid.
 a) single stranded b) double stranded
 c) stable d) unstable
- 5) _____ is not a restriction endonuclease enzyme.
 a) Bam HI b) Hin d 11
 c) S1 nuclease d) Pst 1
- 6) In general AIDS patients die between _____ years after HIV infection.
 a) 1 to 2 b) 3 to 4
 c) 5 to 10 d) 15 to 20
- 7) K_m is the substrate concentration at which enzyme shows _____.
 a) one fourth of V_{max} b) V_{max}
 c) double of V_{max} d) half of V_{max}
- 8) Non-insulin dependent diabetes causes _____.
 a) over sleeping b) over eating
 c) over laughing d) over emotional

- Q.2 Answer any Four of the following. 08**
- a) What is natural immunity?
 - b) What are inducible genes?
 - c) Define neuropathy.
 - d) What is Gene cloning?
 - e) Define specific activity.
 - f) What is pinocytosis?
- Q.3 Write short notes on any Two of the following. 08**
- a) Write note on competitive and non-competitive enzyme inhibition.
 - b) Write note on Lysis of CD4 cells.
 - c) Write structure of IgG. What is phagocytosis?
- Q.4 Answer any Two of the following. 08**
- a) What is the mechanism of action for didanosine?
 - b) Explain Lock & key model.
 - c) Write applications of genetic engineering.
- Q.5 Answer any One of the following 08**
- a) Write note on transcription and translation in prokaryotes.
 - b) What are types of diabetes mellitus and its symptoms?

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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April - 2026
PLANT PROTECTION (Paper – VIII)
Insect Pests and Their Management (22221418)**

Day & Date: Monday, 13-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Multiple Choice Questions.

08

- 1) Any organism harmful to plant is _____.
a) Pest b) Host
c) Diseases d) None of these
- 2) _____ are insecticides to control stem borer.
a) 2-4D b) Endrin
c) CuSO₄ d) a & b
- 3) _____ is the mouth part of insect.
a) Abdomen b) Head
c) Mandible d) None of these
- 4) Metamorphosis of insect is _____.
a) Complete b) Incomplete
c) Without d) All above these
- 5) Identification mark of pulse beetle shows _____.
a) Adult brown colour b) Green colour
c) White colour d) White colour
- 6) _____ days is an incubation period of Egg.
a) 3-5 b) 8-10
c) 15-20 d) 21-30
- 7) _____ is the pest of stored grain.
a) Stem borer b) Jassid
c) Thrip d) Pulse beetle
- 8) Brinjal plant is generally affected by _____ pest.
a) Woolly aphid b) Fruit borer
c) Stem borer d) All above these

- Q.2 Answer any Four of the following. 08**
- a) Explain the mouth part of insect.
 - b) Mention two name of stored grain insect pest.
 - c) Write the mark of identification of White grubs.
 - d) Write any two chemical pest control on Red Spider.
 - e) Define Insecticides.
 - f) Classification of Insecticides.
- Q.3 Write short notes on any Two of the following. 08**
- a) Nature of damage of fruit borer
 - b) Control measures of trips of rose plant
 - c) Repellents
- Q.4 Answer any Two of the following. 08**
- a) General characters of typical insect pest, classification, identification mark and life cycle.
 - b) Give an account on Rice weevil.
 - c) Write the principles of insect pest control.
- Q.5 Answer any One of the following 08**
- a) Describe in details about pulse beetle.
 - b) Give an account on Stem borer.

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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
STATISTICS (Paper – VII)
Continuous Probability Distributions (22221411)**

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagram and given equations wherever necessary.
4) Use of logarithmic table and calculator is allowed.

08

- 1) If $X \sim N(0,1)$, then $P(-3 < X < 3)$ is _____.
a) 0.9545 b) 0.6827
c) 0.9973 d) None of these
- 2) If $X \sim U[2, 4]$ then $P(X < 3)$ is _____.
a) 0.5 b) 0.05
c) 0.3 d) 0
- 3) If $X \sim \beta_{II}(m, n)$ distribution, then $\frac{1}{x}$ has _____ distribution.
a) $\beta_{II}(m, n)$ b) $\beta_I(n, m)$
c) $\beta_{II}(n, m)$ d) None of these
- 4) Chi-square is distribution is _____.
a) Positively skewed b) Negatively skewed
c) Symmetric d) None of these
- 5) If X has chi-square variate with n d. f. then $\text{Var}(X)$ is _____.
a) n b) $2n$
c) 1 d) 2
- 6) If $t \sim t_n$ then distribution of t^2 is _____ distribution.
a) $F_{1,n}$ b) $F_{n1,n2}$
c) t_n d) None of the above
- 7) Let the r. v. X have exponential distribution with parameter θ , then $E(X)$ is _____.
a) θ^2 b) θ
c) $1/\theta$ d) $1/\theta^2$

- 8) If $X \sim N(\mu, 1)$ variate, then distribution of $Z = \frac{\bar{X} - \mu}{1/\sqrt{n}}$ is _____.
 a) Chi-square with n d. f. b) Student's t-distribution
 c) $N(0,1)$ d) None of these

Q.2 Answer the following. (Any Four) 08

- State uniform distribution.
- State beta distribution of second kind.
- Write pdf of normal distribution.
- Write definition of $\beta_{II}(m, n)$ distribution.
- Write definition of Snedecor's F- distribution.
- Write definition of $N(\mu, \sigma^2)$ distribution.

Q.3 Write short notes. (Any Two) 08

- Find MGF of exponential distribution.
- If $X \sim N(\mu, \sigma^2)$ then find distribution of $Y = aX + b$
- State and prove additive property of $G(\alpha, \lambda)$ distribution.

Q.4 Answer the following. (Any Two) 08

- Find mode of chi-square distribution with n d. f.
- If $X \sim \beta_{II}(m, n)$ then find distribution of $\frac{1}{x}$
- Find mean of $N(\mu, \sigma^2)$ distribution.

Q.5 Answer the following. (Any One) 08

- If $X \sim G(\alpha, \lambda_1)$ and $Y \sim G(\alpha, \lambda_2)$ and X & Y are independent variates then find distribution of $\frac{x}{x+y}$
- Derive the pdf of chi-square distribution with n d. f.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
GEO-CHEMISTRY (Paper – III)
Principles of Geochemistry (22221441)**

Day & Date: Wednesday, 15-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagram and equations wherever necessary.
4) Use of logarithmic table and calculator is allowed.

Q.1 Multiple choice questions.

08

- 1) According to Arrhenius, an acid is _____.
 - a) A substance that donates a proton (H^+)
 - b) A substance that accepts a proton (H^+)
 - c) A substance that increases the concentration of H^+ ions in solution
 - d) A substance that decreases the concentration of OH^- ions in solution
- 2) The primary source material for coal formation is _____.
 - a) Plant material
 - b) Animal material
 - c) Microorganisms
 - d) Algae
- 3) What is the primary form of carbon in sedimentary rocks?
 - a) Graphite
 - b) Diamond
 - c) Organic matter
 - d) Carbonate minerals
- 4) The stability of a chemical equilibrium is determined by _____.
 - a) The concentration of reactants and products
 - b) The temperature and pressure of the system
 - c) The equilibrium constant
 - d) All of the above
- 5) Which of the following statement defines the law of mass action?
 - a) A principle that describes the relationship between the concentrations of reactants and products at equilibrium
 - b) A principle that describes the rate of chemical reactions
 - c) A principle that describes the effect of temperature on equilibrium constants
 - d) A principle that describes the behavior of ideal gases
- 6) _____ is the primary form of carbon in sedimentary rocks.
 - a) Graphite
 - b) Diamond
 - c) Organic matter
 - d) Carbonate minerals

- 7) What role do carbon compounds play in geological processes?
- a) Oxidizing agents
 - b) Reducing agents
 - c) Catalysts
 - d) Inhibitors
- 8) _____ theory is the most widely accepted theory for the origin of petroleum.
- a) Abiogenic theory
 - b) Biogenic theory
 - c) Meteorite impact theory
 - d) Volcanic activity theory

Q.2 Answer the following. (Any Four) 08

- a) State Le Chatelier's principle.
- b) What is the Van't Hoff isotherm?
- c) Define sedimentation process.
- d) Name any two carbon compounds as a strong reducing agent.
- e) What is pH? Give the range of pH.
- f) Define isotope.

Q.3 Write short notes. (Any Two) 08

- a) Write a note on organic materials in sediments.
- b) What is the geological usage of acids and bases.
- c) Describe origin of coal.

Q.4 Answer the following. (Any Two) 08

- a) Write on isotope geochemistry w.r.t. kinds of isotopes.
- b) Explain Le Chatelier's principle with suitable example.
- c) Differentiate between radioactive and radiogenic isotopes.

Q.5 Answer the following. (Any One) 08

- a) Describe Van't Hoff isotherm.
- b) Discuss carbon compounds as reducing agents.

Set | P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
ZOOLOGY (Paper – VII)
Fundamentals of Biochemistry (22221432)**

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat & well labelled diagram wherever necessary.

08

- 1) Enzymes synthesized by living cell are called _____.
a) Biocatalysts b) Noncatalysts
c) Catocatalysts d) None of these
- 2) Such enzymes which exist in more than one form are called _____.
a) Monoenzymes b) Proenzymes
c) Isoenzymes d) Coenzymes
- 3) Vitamins are nothing but _____ essential to an organism in small quality.
a) Organic molecules b) Inorganic molecules
c) Metal d) All of the above
- 4) Carbohydrates is a type of molecules that contains _____.
a) C,H,O b) C,A,N
c) C,N,O d) H,Cl,P
- 5) Nucleotides are composed of a nitrogenous base containing _____.
a) Pentose Sugar & Phosphate
b) Only Sugar
c) Only Phosphate
d) Only Nitrogen
- 6) _____ molecule acts as molecular chaperones to assist the folding of proteins.
a) Vitamins b) Amides
c) Lipids d) Enzymes
- 7) The proteins are synthesized at _____.
a) Centrosomes b) Ribosomes
c) Golgi bodies d) Intestine
- 8) The simplest amino acid is _____.
a) Proline b) Methionine
c) Glycine d) None of the above

- Q.2 Answer the following. (Any Four) 08**
- a) Explain types of RNA.
 - b) Define & give examples of monosaccharide.
 - c) Describe the term conjugated protein.
 - d) Explain secondary protein.
 - e) Role of B complex vitamin
 - f) Significance of CO₂
- Q.3 Write short notes. (Any Two) 08**
- a) Describe properties of amino acids.
 - b) Write sources & chemical composition of Vitamins & also write various functions.
 - c) Write a brief note on the four level of protein structure.
- Q.4 Answer the following. (Any Two) 08**
- a) Explain biological significance of unsaturated fatty acid.
 - b) Write a note on denaturation of DNA.
 - c) What is the structure of purine and pyrimidine.
- Q.5 Answer the following. (Any One) 08**
- a) Which are the factors affecting enzyme action & also explain mechanism of enzyme action?
 - b) What is Vitamin? Give its classification & also write deficiency diseases of vitamins.

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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
STATISTICS (Paper – VIII)
Statistical Methods - II (22221412)**

Day & Date: Thursday, 16-04-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Choose the correct alternatives from the options.

08

- 1) If X is a exp(2) r.v. with $E(X) = \mu$ and $V(X) = \sigma^2$ then $P[|X - \mu| > 2\sigma]$ is _____.
a) ≤ 0.75 b) ≥ 0.25
c) ≤ 0.25 d) ≥ 0.75
- 2) If $\{X_n\}$ is a sequence of iid $P(1)$ r.v.s then $Z = \underline{\hspace{2cm}}$ has $N(0,1)$ distribution for large n .
a) $\bar{X}_n \sqrt{n}$ b) $(\bar{X}_n - 1)\sqrt{n}$
c) $\bar{X}_n / \sqrt{n}$ d) $(\bar{X}_n - 1)/\sqrt{n}$
- 3) In fitting of trend represented by second degree parabola _____ number of constants are to be estimated.
a) 0 b) 1
c) 2 d) 3
- 4) When components in time series are independent _____ model is suitable.
a) additive b) multiplicative
c) both (a) and (b) d) neither (a) nor (b)
- 5) Accepting H_0 when it is true is _____.
a) type I error b) type II error
c) not committing error d) None of these
- 6) Degrees of freedom for statistic χ^2 in case of contingency table of order 2×2 is _____.
a) 3 b) 4
c) 2 d) 1
- 7) Paired t-test is applicable when the observations in the two samples are _____.
a) paired b) uncorrelated
c) equal in number d) All (a), (b) and (c)

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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
METEOROLOGY (Paper – IV)
Meteorological Instruments (22221439)**

Day & Date: Thursday, 16-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculator is allowed

Q.1 Multiple choice question:

08

- 1) Which of the following is not a form of precipitation?

a) rain	b) dew
c) hailstones	d) Condensation
- 2) The absolute zero is nothing but ____.

a) 0 K	b) 0 °C
c) 0 °F	d) 0 °R
- 3) Which of the following instrument uses mercury?

a) Aneroid barometer	b) Fortin's barometer
c) Barograph	d) Cup anemometer
- 4) Which of the following formula is incorrect?

a) Atmospheric pressure: $P = -\rho gz$
b) pressure gradient = $\frac{dP}{dz}$
c) velocity gradient = $\frac{dV}{dt}$
d) temperature gradient = $\frac{dT}{dl}$
- 5) Which of the following is the best wind vane?

a) ordinary wind vane	b) ordinary rain gauge
c) air foil wind vane	d) splayed wind vane
- 6) The motivating force that brings air mass in motion arises due to ____.

a) pressure gradient	b) velocity gradient
c) temperature gradient	d) concentration gradient

- 7) Which of the following instruments is used to measure relative humidity?
- wet and dry bulb thermometer
 - hair hygrometer
 - hygrograph
 - All of these
- 8) If 'e' is thermo-emf and ' θ ' is the temperature of the hot junction then at neutral temperature, for a thermocouple, $\frac{de}{d\theta} = \underline{\hspace{2cm}}$.
- 1
 - 0
 - +1
 - ∞

Q.2 Answer any four of the following. 08

- The automatic siphon gauge experiences five tips during a two-hour rainfall. Calculate the total rainfall in millimeters.
- The Fortin's barometer shows a reading of 29.92 inches of Hg. Calculate atmospheric pressure at the place.
(Given: density of mercury = 13.6 g/cc).
- What are advantages of a barograph over a Fortin's barometer?
- What is wind vane?
- What are the advantages of an anemograph over an anemometer?
- Define relative humidity.

Q.3 Write short notes on any two of the following. 08

- Write a note on the "Mercury barometer."
- Write a short note on the ordinary wind vane.
- Describe the construction and working of thermopile.

Q.4 Answer any two of the following. 08

- With neat diagram explain construction and working of automatic siphon gauge.
- Draw neat labelled diagram of Aneroid barometer and describe its construction and working.
- With neat diagram explain construction and working of cup anemometer.

Q.5 Answer any one of the following 08

- Discuss different temperature scales.
- With neat diagram explain construction and working of Crooke's radiometer.
For a Fe-Cu thermocouple, the inversion temperature is 500 °C. Calculate its neutral temperature.

Seat No.	

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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
GEO-CHEMISTRY (Paper - IV)
Chemistry of the Earth (22221442)**

Day & Date: Thursday, 16-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams and give equations wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic table and calculator is allowed.

(At. Wts.: H=1, C=12, O=16, N=14, Na=23, Cl=35.5)

Q.1 Fill in the blanks with correct answer from given option. 08

- 1) The swelling and shrinkage properties of soil are due to _____.
a) Kaolinite
b) Halloysite
c) Montmorillonite
d) None of these
- 2) Smoke, fumes, ash, dust, nitric oxide and sulphur dioxide are the main sources of _____.
a) Primary Pollutants
b) Secondary pollutants
c) Bio-Degradable Pollutants
d) None of the above
- 3) The upper crust of the earth mainly consist of _____.
a) Sandstone
b) Shale
c) Limestone
d) Igneous and metamorphic rocks
- 4) In geochemical classification of sediments, which of the following is evaporates?
a) $\text{Fe}(\text{OH})_2$
b) CaCO_3
c) NaCl
d) SiO_2
- 5) _____ is the reaction of rock minerals with oxygen, thus changing the mineral composition of rock.
a) Hydration
b) Hydrolysis
c) Oxidation
d) Reduction
- 6) Which of the following method is used for dating relatively recent geological event?
a) K - Ar method
b) U - Pb method
c) Carbon - 14 method
d) Rb - Sr method

- 7)** Two or more substances that have the same or closely similar chemical formulas but different crystal structures are known as _____.
a) Isomorphism b) Polymorphism
c) Pseudomorphism d) None of the above
- 8)** Long -term changes in the geochemical cycle are known as _____.
a) Periodic changes b) Permanent changes
c) Secular changes d) Perennial changes

Q.2 Answer any four of the following.

08

- a) List the types of silicate structures.
- b) Give two examples of polymorphism.
- c) Give the factors affecting the rate of formation of soil are:
- d) Which type of clay structure has one tetrahedral layer linked with one octahedral layer.
- e) Name any two stable isotopes.
- f) Define Chondrites.

Q.3 Write short notes on any two of the following.

08

- a) Geochronology
- b) Isomorphism and polymorphism
- c) Chemical composition of Igneous rocks.

Q.4 Answer any two of the following.

08

- Explain the geochemical cycle with neat labeled diagram.
- Discuss the compatible and incompatible trace elements.
- Describe in brief the radioactive decay.

Q.5 Answer any one of the following.

08

- Explain in brief the Geochemical classification of elements.
- Discuss in brief composition of meteorites.

Seat No.	

- 8) ZIFT is an acronym for _____.
a) Zygote intra fallopian transfer
b) Zygote inter fallopian transfer
c) Zygote intra fallopian traction
d) Zygote inter fallopian traction

Q.2 Answer any four of the following. 08

- a) Write structure and functions of connective tissue.
- b) Draw a well labelled diagram of T.S. of Pancreas.
- c) Write the functions of blood.
- d) Explain Testosterone hormone.
- e) Write any two diseases of Hyperthyroidism.
- f) Explain IUD.

Q.3 Attempt any two of the following. 08

- a) With the help of suitable diagram describe Ultra structure of skeletal muscle.
- b) Write in detail parturition and lactation.
- c) Explain resting membrane potential.

Q.4 Answer any two of the following. 08

- a) Explain in detail ART (Assisted Reproductive Techniques) and GIFT (Gamete Intrafallopian Transfer).
- b) Write location and structure of pituitary gland and explain any two hormones secreted by Adenohypophysis.
- c) Explain in detail the ultra structure of neuron.

Q.5 Answer any one of the following. 08

- a) Write Histology, hormonal secretions, their functions and disorders of Thyroid gland.
- b) Write location, structure, types and functions of Epithelial tissues.

Set	P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
MATHEMATICS (Paper – VII)
Differential Equations (22221423)**

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Choose the correct alternative for each of the following **08**

- 1) The solution of the differential equation $y z dx + x z dy + x y dz = 0$ is _____.
a) $x + y + z = c$
c) $xyz = c$

b) $x - y + z = c$
d) $3xyz = c$
- 2) The one solution of $\frac{dx}{xz} = \frac{dy}{yz} = \frac{dz}{(x+y)^2}$ is _____.
a) $xy = G$
c) $x - y = G$

b) $\frac{x}{y} = G$
d) $(x + y)^2 = G$
- 3) P.I. $= \frac{e^{-z}}{(D-1)^2(D+1)} =$ _____.
a) $\frac{Z}{2} e^{-z}$
c) $\frac{Z^2}{4} e^{-z}$

b) $\frac{Z}{4} e^{z}$
d) $\frac{Z}{4} e^{-z}$
- 4) The know solution of the equation $x \frac{d^2 y}{dx^2} - (2x - 1) \frac{dy}{dx} + (x - 1)y = 0$ is _____.
a) $y = e^x$
c) $y = x$

b) $y = e^{-x}$
d) $y = x^{-1}$
- 5) The general solution of the differential equation $\sqrt{y - px} = p$ is _____.
a) $\sqrt{y - cx} = c$
c) $y = cx + c$

b) $y = cx - c$
d) $y = px + p$

- 6) If $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$ is a linear second order differential equation with $2 + 2Px + Qx^2 = 0$ then the part of C.F = _____.
 a) e^x b) e^{-x}
 c) x d) x^2
- 7) The differential equation of the form $y^2 = pxy + f\left(\frac{py}{x}\right)$, reduces to Clairaut's form by substitution.
 a) $x^2 = u, y^2 = v$ b) $x^2 = u, y = v$
 c) $x = u, y = v$ d) $x = u^2, y = v$
- 8) The solution of differential equation $\frac{dx}{a} = \frac{dy}{a} = \frac{dz}{1}$ is _____.
 a) $x + y = G, y + az = c_2$
 b) $x - y = G, y - az = c_2$
 c) $ax + y = G, ay + z = c_2$
 d) $x + y = G, y + z = c_2$

Q.2 Answer the following. (Any Four)**08**

- a) Solve $x = \frac{y}{2p} - \frac{yp}{2}$
- b) Solve $\frac{d^2y}{dx^2} - \left(1 + \frac{2}{x}\right)\frac{dy}{dx} + \left(\frac{1}{x} + \frac{2}{x^2}\right)y = 0, u = x$ is a part of C.F.
- c) Solve $x^2 \frac{d^2y}{dx^2} + 2x \frac{dy}{dx} - 20y = 0$
- d) Solve $\frac{dx}{y} = \frac{dy}{x} = \frac{dz}{xyz^2(x^2 - y^2)}$
- e) Solve $x dy - y dx - 2x^2 z dz = 0$
- f) Solve $(p - y)(p + x + y) = 0$

Q.3 Attempt the following. (Any Two)**08**

- a) Solve $(2x + 1)^2 \frac{d^2y}{dx^2} - 6(2x + 1) \frac{dy}{dx} + 16y = 8(2x + 1)^2$
- b) Explain the necessary condition for the inerrability of the differential equation $Pdx + Qdy + Rdz = 0$, where P, Q, R are functions of x, y and z .
- c) Solve $\frac{dx}{x(y^2 - z^2)} = \frac{dy}{y(z^2 - x^2)} = \frac{dz}{z(x^2 - y^2)}$

Q.4 Answer the following. (Any Two)**08**

- a) Solve $xp^2 - 2yp + ax = 0$
- b) Solve $x^2 \frac{d^2y}{dx^2} - (x^2 + 2x) \frac{dy}{dx} + (x + 2)y = x^3 e^x$
- c) Solve $3x^2 + 3y^2 dy - (x^3 + y^3 + e^{2z}) dz = 0$

Q.5 Answer the following. (Any One)**08**

- a) Explain the method of solving linear differential equation of second order $\frac{d^2y}{dx^2} + P \frac{dy}{dx} + Qy = R$, where P, Q, R are functions of x only by changing dependent variable y to v by removal of first order derivative. (i.e. Normal form)
- b) Explain how to solve $x^n \frac{d^n y}{dx^n} + a_1 x^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \dots + a_{n-1} \frac{dy}{dx} + a_n y = x$ can be transformed to linear differential equation with constant coefficient's by changing the independent variable x for by substitution $z = \log x$

Seat No.	

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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April– 2026
BOTANY (Paper – VII)
Plant Physiology (22221402)**

Day & Date: Friday, 17-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat & well labelled diagram wherever necessary.
4) Use of logarithmic table and calculator is allowed.

Q.1 Multiple choice questions.**08**

- 1) NADP⁺ is reduced to NADPH in.
 - a) Photorespiration
 - b) Cyclic photophosphorylation
 - c) Calvin cycle
 - d) noncyclic photophosphorylation
- 2) From the following _____ is a short day plant.
 - a) *Zea mays*
 - b) *Cucumis sativus*
 - c) *Helianthus annuus*
 - d) *Oryza Sativa*
- 3) Maximum absorption of _____ colour light occurs during photosynthesis.
 - a) White
 - b) Blue
 - c) Violet
 - d) Yellow
- 4) During glycolysis the first irreversible step of phosphorylation of glucose is regulated by _____ enzyme.
 - a) Aldolase
 - b) Isomerase
 - c) Hexokinase
 - d) Dehydrogenase
- 5) Photoperiodic stimulus is perceived by _____.
 - a) Leaves
 - b) Stem
 - c) Roots
 - d) Apical bud
- 6) The substrate for photorespiration is _____.
 - a) phosphoglyceric acid
 - b) glycolate
 - c) Serine
 - d) glycine
- 7) Which of the following hormones can replace vernalisation?
 - a) auxin
 - b) cytokinin
 - c) gibberellins
 - d) ethylene
- 8) The first carbon dioxide acceptor in C₄-plants is _____.
 - a) phosphoenol-pyruvate
 - b) ribulose 1, 5-diphosphate
 - c) oxalo-acetic acid
 - d) phosphoglyceric acid

- Q.2 Answer the following. (Any Four) 08**
- a) What are phytochromes?
 - b) What are short day plants?
 - c) What is phloem loading?
 - d) What is cyclic photophosphorylation?
 - e) What is apoplast?
- Q.3 Write short notes. (Any Two) 08**
- a) Non cyclic photophosphorylation.
 - b) Electron transport system.
 - c) Significance of vernalization.
- Q.4 Answer the following. (Any Two) 08**
- a) Explain the symplastic mode of transport.
 - b) Define photorespiration and write its significance.
 - c) Explain the concept of photoperiodism.
- Q.5 Answer the following. (Any One) 08**
- a) Explain mass flow hypothesis with suitable diagram.
 - b) Explain the process of glycolysis with flow diagram.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April - 2026
MATHEMATICS (Paper - VIII)
Abstract Algebra - I (22221424)

Day & Date: Saturday, 18-04-2026
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 Choose the correct alternative of the following.**08**

- 1) Which of the following is not group?
 - a) $\langle \mathbb{Z}, + \rangle$
 - b) $\langle \mathbb{R}, + \rangle$
 - c) $\langle \mathbb{N}, + \rangle$
 - d) $\langle \mathbb{C}, + \rangle$
- 2) Let $f: G \rightarrow G'$ be homomorphism then $\ker f = \underline{\hspace{2cm}}$.
 - a) $\{x \in G / f(x) = e'\}$
 - b) $\{x \in G / f(x) = e\}$
 - c) $\{x \in G' / f(x) = e'\}$
 - d) $\{x \in G' / f(x) = x\}$
- 3) A cycle of length $\underline{\hspace{2cm}}$ is called transposition.
 - a) 0
 - b) 1
 - c) 2
 - d) 3
- 4) A relation ' $\sim$ ' on the set S defined by $p \sim q \Rightarrow q \sim p \forall p, q \in S$ is called $\underline{\hspace{2cm}}$.
 - a) Reflexive
 - b) Transitive
 - c) Symmetric
 - d) None of these
- 5) The value $[2] \oplus [4]$ in $\mathbb{Z}_5$ is $\underline{\hspace{2cm}}$.
 - a) 2
 - b) 4
 - c) 5
 - d) 1
- 6) Statement A : All cyclic group are abelian.
 Statement B : The order of cyclic group is same as order of its generator.
 - a) (A) and (B) are false
 - b) (A) is true (B) is false
 - c) (B) is true (A) is false
 - d) (A) and (B) both are true
- 7) The number of subgroups of $\mathbb{Z}_{12}$ are $\underline{\hspace{2cm}}$.
 - a) 1
 - b) 2
 - c) 12
 - d) 6
- 8) The Euler ϕ function $\phi(11) = \underline{\hspace{2cm}}$.
 - a) 11
 - b) 10
 - c) 9
 - d) 1

Q.2 Attempt any Four of the following. 08

- Show that the identity element in a group G is unique.
- If $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 4 & 3 & 2 \end{pmatrix}$ $\beta = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 1 & 4 & 2 \end{pmatrix}$ find $\alpha \circ \beta$ and $\beta \circ \alpha$
- Solve the equation $x(1\ 3\ 2) = (1\ 3)$ in S_3 .
- Show that every cyclic group is abelian group.
- If R is additive group of real numbers and R_+ is multiplicative group of positive real numbers the $f: R \rightarrow R_+$ defined by $f(x) = e^x$ show that f is homomorphism.
- Find all generators of Z_{12}

Q.3 Attempt any Two of the following. 08

- Find order of element of group $\{1, -1, 2^\circ, -2^\circ\}$ under the complex multiplication.
- State and prove Lagrange's theorem.
- Determine the right coset of $\langle [3] \rangle$ in Z_{12}

Q.4 Attempt any Two of the following. 08

- Show that intersection of any two normal subgroup is normal subgroup.
- Show that $(G, +_6)$ is abelian group where $G = \{0, 1, 2, 3, 4, 5\}$ and $+_6$ is addition modulo 6 is binary operation.
- For permutation $X = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 1 & 4 & 5 & 6 & 2 \end{pmatrix}$ $Y = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 4 & 1 & 3 & 6 & 5 \end{pmatrix}$
Find X^2Y and XY^2

Q.5 Attempt any One of the following 08

- State and prove Cayley's theorem.
- Find g.c.d 616 and 427 and express $(616, 427) = 616X + 427Y$

Set P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
BOTANY (Paper - VIII)
Embryology of Angiosperms (22221403)**

Day & Date: Saturday, 18-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Multiple choice questions.

08

- 1) Angiosperms Shows presence of _____ pollen sacs.
a) 1
b) 2
c) 3
d) 4
- 2) Pollination with help of birds is called _____.
a) Anemophily
b) Entomophily
c) Hydrophily
d) Ornithophily
- 3) In self-pollination, pollen is transferred _____.
a) Between flowers of different plants
b) From the anther to the stigma of the same flower
c) By insects only
d) From one plant to another by wind
- 4) Double fertilization in plants results in the formation of _____.
a) Two embryos
b) One embryo and endosperm
c) Two endosperms
d) One seed coat and one embryo
- 5) After fertilization, the ovary develops into _____.
a) Seed
b) Fruit
c) Root
d) Pollen
- 6) During embryo development in monocots, the shoot meristem develops into _____.
a) Root
b) Cotyledon
c) Plumule
d) Endosperm
- 7) Entry of pollentube through integuments is called as _____.
a) Mesogamy
b) Chalazogamy
c) Porogamy
d) Syngamy

- 8) _____ among the following part of the dicot embryo gives rise to the stem and leaves.
- | | |
|-------------|--------------|
| a) Radicle | b) Hypocotyl |
| c) Epicotyl | d) Cotyledon |

Q.2 Answer any four of the following. 08

- a) Define pollination.
- b) Draw a well labelled diagram of typical ovule.
- c) Define double fertilization.
- d) Draw a well labelled diagram of T.S. of anther.
- e) Draw a well labelled diagram of dicot embryo.
- f) Define hydrophily & give one suitable example.

Q.3 Attempt any two of the following. 08

- a) Describe pollination mechanism in *Calotropis*.
- b) Describe anther wall.
- c) Describe polygonum type of embryo sac.

Q.4 Answer any two of the following. 08

- a) Describe development of embryo in monocot with suitable diagram.
- b) Write a note on contrivances to achieve self & cross pollination.
- c) Write a note on seed dispersal mechanism.

Q.5 Answer any one of the following 08

- a) Describe in detail development of microsporogenesis.
- b) Describe in detail development of endosperm.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
GEOGRAPHY (Paper - VII)
Economic Geography (22221435)**

Day & Date: Monday, 20-04-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat & well labelled diagram wherever necessary.
4) Use of maps stencil is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. 08

- 1) _____ is practiced in plantations and natural stands.
 - a) Fishing
 - b) Gathering
 - c) Forestry
 - d) All of these
- 2) Economic geography is the branch of _____ Geography.
 - a) Natural
 - b) Human
 - c) Geomorphology
 - d) Oceanography
- 3) According to _____ "Any economic activity involving the production, distribution, and consumption of commodities, depending on the level of generality."
 - a) Raich
 - b) Hetner
 - c) Alexandar
 - d) O'Connor
- 4) _____ is the father of economic geography.
 - a) Weber
 - b) Hetner
 - c) Alexandar
 - d) Chisholm
- 5) In Quinary Sector _____ coloured workers are observed.
 - a) Blue
 - b) Gold
 - c) Pink
 - d) Red
- 6) _____ farming the only aim is to fulfil the needs of the farmer and his family.
 - a) Subsistence
 - b) Intensive
 - c) Commercial
 - d) Mixed
- 7) _____ formulated a theory of industrial location in which an industry is located where the transportation costs of raw materials and final product is a minimum.
 - a) Alfred Weber
 - b) Vonthunen
 - c) Strabo
 - d) Ritter

- 8) Example of primary activities is _____.
a) Agriculture b) Hunting
c) Mining d) All of these**

Q.2 Answer the following. (Any Four) **08**

- Which is the largest IT park in Pune?
- In which state the sugar industry is located in India?
- Define the hunting.
- Write down the example of Primary activity.
- Definition of Commercial agriculture.
- Define the IT.

Q.3 Write short notes. (Any Two) **08**

- a) Mining
- b) Tertiary activity
- c) Subsistence agriculture

Q.4 Answer the following. (Any Two) **08**

- a) Define the Primary activity and explain its characteristics.
- b) Define the Economic geography and explain its branches.
- c) Describe the concept of cotton industry and explain its distribution.

Q.5 Answer the following. (Any One) 08

- a) Describe the industrial location theory by Weber with critic.
- b) Explain the nature and scope of economic geography.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
Electronics (Paper - VII)
Operational Amplifier and Applications (22221426)**

Day & Date: Monday, 20-04-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagram and give equations wherever necessary.

Q.1 Multiple choice questions.**08**

- 1) Which equation is used to calculate input bias current of OpAmp?
 - a) $|I_{b1} + I_{b2}|$
 - b) $(|I_{b1} - I_{b2}|)/2$
 - c) $I_{b1} - I_{b2}$
 - d) $(|I_{b1} + I_{b2}|)/2$
- 2) What is the purpose of current mirror circuit for emitter coupled differential amplifier?
 - a) To stable collector current of Q1
 - b) To stable collector current of Q2
 - c) To stable tail current
 - d) All of these
- 3) Which of the following is not application of differential amplifier using OpAmp?
 - a) voltage comparator
 - b) differentiator
 - c) voltage subtractor
 - d) All of these
- 4) The Voltage to Current converter using OpAmp is also called _____ amplifier.
 - a) buffer
 - b) transresistance
 - c) conductance
 - d) transconductance
- 5) To construct voltage follower circuit using OpAmp _____ type of configuration is needed.
 - a) closed loop non-inverting
 - b) open loop non-inverting
 - c) open loop inverting
 - d) closed loop inverting
- 6) What type of coupling is used for OpAmp?
 - a) differential amplifier coupled
 - b) direct coupled
 - c) differential coupled
 - d) gain coupled

- 7) The capacitor is connected _____ path, to construct the OpAmp as an integrator.
- a) in designer chosen
 - b) at the inverting terminal
 - c) at the non-inverting terminal
 - d) in feedback
- 8) The two inputs, 125 mV and 75 mV, for unity gain OpAmp adder in inverting configuration then the output voltage of adder is _____.
- a) - 200 mV
 - b) + 200 mV
 - c) - 50 mV
 - d) + 50 mV

Q.2 Answer the following. (Any Four) 08

- a) Mention any four ideal characteristics of OpAmp.
- b) In case of OpAmp, define input bias current and slew rate?
- c) Mention the types of transistor differential amplifier.
- d) Sketch, OpAmp IC741 pin configuration with neat labelled.
- e) What are linear applications of circuits deploying OpAmp?
- f) The differential mode gain and common mode gain are 35000 and 0.70 respectively, then find the CMRR in dB?

Q.3 Answer the following. (Any Two) 08

- a) Write a note on differentiator circuit using OpAmp.
- b) Construct & explain triangular wave generator using OpAmp.
- c) Write a note on transistorized emitter coupled differential amplifier.

Q.4 Answer the following. (Any Two) 08

- a) Construct & explain Current to Voltage converter circuit using OpAmp 741.
- b) Write a note on zero crossing detector using OpAmp.
- c) Construct & explain adder circuit using OpAmp configuration.

Q.5 Answer the following. (Any One) 08

- a) Mention various configurations of OpAmp. State the reasons, why closed loop configuration needed? Derive the gain relation for the closed loop inverting configuration.
- b) Construct & explain.
 - i) Current mirror bias circuit
 - ii) Astable multivibrator using OpAmp

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
GEOLOGY - VII
Sedimentary and Metamorphic Petrology (22221414)**

Day & Date: Monday, 20-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat & well labelled diagram wherever necessary.

Q.1 Multiple choice questions.**08**

- 1) Spherical aggregations of CaCO_3 are present in _____ structure.
 - a) Pisolitic
 - b) Oolitic
 - c) Porphyritic
 - d) Ophitic
- 2) Which of the following rock is formed by thermal metamorphism of Limestone?
 - a) Slate
 - b) Quartzite
 - c) Schist
 - d) Marble
- 3) Omphacite is dominant mineral in _____ facies.
 - a) Eclogite
 - b) Granulite
 - c) Green schist
 - d) Blue schist
- 4) Breccia constitutes of _____ grains.
 - a) Angular
 - b) Sub-angular
 - c) Both a & b
 - d) Rounded
- 5) Laterite is _____ Sedimentary rock.
 - a) rudaceous
 - b) arenaceous
 - c) residual
 - d) argillaceous
- 6) Stress minerals are present in _____.
 - a) Schist
 - b) Phyllite
 - c) Both a & b
 - d) Quartzite
- 7) Which of the following structures represent shallow water environment?
 - a) Stalactites
 - b) Ripple marks
 - c) Both a & b
 - d) Graded bedding
- 8) Evaporation and/ or precipitation from natural solutions are involved in formation of sedimentary _____ deposits.
 - a) Chemical
 - b) Rudaceous
 - c) Argillaceous
 - d) Residual

- Q.2 Answer the following. (Any Four) 08**
- a) Give any two names of minerals of Granulite facies.
 - b) Define metamorphic facies.
 - c) Give names of sediments of different shapes with diagrams.
 - d) Draw labelled diagram of Cross bedding structure.
 - e) Define Stress minerals.
- Q.3 Write short notes. (Any Two) 08**
- a) Retrograde Metamorphism
 - b) Marble
 - c) Bauxite
- Q.4 Answer the following. (Any Two) 08**
- a) Describe Ripple mark structure.
 - b) Explain Greenschist facies.
 - c) Explain Thermal metamorphism.
- Q.5 Answer the following. (Any One) 08**
- a) Define Sedimentary rocks. Describe Conglomerate and Breccia.
 - b) Define Metamorphic rocks. Describe Granulose and Schistose structure.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
MICROBIOLOGY (Paper – VII)
Immunology & Medical Microbiology (22221420)**

Day & Date: Monday, 20-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat & well labelled diagram wherever necessary.

Q.1 Choose the correct alternative and rewrite the sentence again. **08**

- 1) Study of immunity among Negroid and Mongoloid is example of _____ immunity.

a) individual	b) species
c) racial	d) pandemic
- 2) Anti-Snake Venom (ASV) is example of _____ immunity.

a) natural active	b) natural passive
c) artificial active	d) artificial passive
- 3) Incomplete antigen or partial antigen is also known as _____.

a) Epitope	b) Paratope
c) Hapten	d) Antigenic determinant
- 4) Blood group antigens are examples of _____.

a) Autoantigen	b) Isoantigen
c) MHC antigen	d) Microbial antigen
- 5) Predominant antibody of the primary immune response having 5 days half-life and pentamer in nature is _____.

a) IgM	b) IgG
c) IgE	d) IgA
- 6) Blood group determination test is an example of _____.

a) Slide precipitation test	b) Tube precipitation test
c) Slide agglutination test	d) Tube flocculation test
- 7) Enteric fever is caused by _____.

a) <i>Salmonella paratyphi A</i>	b) <i>Salmonella paratyphi B</i>
c) <i>Salmonella typhi</i>	d) All of these
- 8) Candidiasis is caused by _____.

a) Yeast	b) Mold
c) Bacteria	d) Virus

- Q.2 Answer the following. (Any Four) 08**
- a) What is inflammation?
 - b) What is phagocytosis?
 - c) What is epitope?
 - d) What is paratope?
 - e) What is titer?
 - f) What is pathogenesis?
- Q.3 Write short notes. (Any Two) 08**
- a) Basic structure of antibody
 - b) Precipitation
 - c) Types of acquired immunity
- Q.4 Answer the following. (Any Two) 08**
- a) Explain in short innate immunity.
 - b) Describe in brief characteristics and functions of IgA.
 - c) Write in brief on agglutination reactions used in diagnosis of disease.
- Q.5 Answer the following. (Any One) 08**
- a) Write in detail on types of antigens with examples.
 - b) Discuss in detail Enteric fever 'Typhoid'.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
Geography (Paper – VIII)
Environmental Geography (22221436)**

Day & Date: Tuesday, 21-04-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Choose and write a correct from given four alternatives. 08

- 1) _____ is a one of the importance of Environmental Geography.
 - a) Equilibrium of Environmental
 - b) Disparities of Environment
 - c) Unbalanced Environment
 - d) All the Above
- 2) _____ is the sum of all living and non-living things that surround us.
 - a) Lithosphere
 - b) Environment
 - c) Atmosphere
 - d) Biosphere
- 3) _____ is a Characteristics of desert biome.
 - a) Low precipitation
 - b) High precipitation
 - c) Dense vegetation
 - d) Low evaporation
- 4) _____ has first given the term of acid rain.
 - a) Christ Ralph
 - b) Elmer Joseph Clark
 - c) Ernest Flower
 - d) Robert Angus Smith
- 5) The term Ecosystem was firstly used by _____.
 - a) Tansley
 - b) Wegner
 - c) Anderson
 - d) Huggett
- 6) _____ is a largest ecosystem on the Earth.
 - a) Desert
 - b) Forest
 - c) Grassland
 - d) Oceans
- 7) Intensity of noise is measured in _____.
 - a) Centimeter
 - b) Decimeter
 - c) Decibel
 - d) Kilometer
- 8) The Ozone layer lies in _____.
 - a) Troposphere
 - b) Stratosphere
 - c) Ionosphere
 - d) Mesosphere

- Q.2 Answer any Four of the following. 08**
- a) Define the concept of Environmental Geography.
 - b) Define the concept of Biome.
 - c) Define the concept of Food chain.
 - d) Define the concept of Ozone depletion.
 - e) Define the concept of water pollution.
 - f) Define the concept of Acid rain.
- Q.3 Write short notes on any Two of the following. 08**
- a) Function of Ecosystem
 - b) Noise pollution
 - c) Effect of global warming
- Q.4 Answer any Two of the following. 08**
- a) Explain the Importance of Environmental Geography.
 - b) Explain the causes of desertification.
 - c) Explain the different types of ecosystem.
- Q.5 Answer any One of the following. 08**
- a) Explain the Nature of Environmental Geography.
 - b) Explain major Biomes of the world.

Set P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
ELECTRONICS (Paper - VIII)
Digital Techniques and Microprocessor (22221427)**

Day & Date: Tuesday, 21-04-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams and give equations wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of Logarithmic table and scientific calculator is allowed.

Q.1 Multiple choice questions.

08

- 1) If a memory chip has a 11-bit address bus, its data storage capacity is _____.
a) 4 KB b) 8 KB
c) 6 KB d) 2 KB
- 2) _____ ADC has fastest conversion speed.
a) Flash b) SAR type
c) Dual Slope d) Single Slope
- 3) In the 8085 processor _____ is used store the address of memory from which data is accessed.
a) DE pair b) HL pair
c) BC pair d) PSW
- 4) In the flow chart, the decision is symbolized by the _____ shape.
a) oval b) rectangle
c) diamond d) parallelogram
- 5) The multiplexed address/data bus is demultiplexed by using _____.
a) IC 74244 b) IC 74245
c) IC 74138 d) IC 74373
- 6) _____ is a non-volatile memory.
a) Flash memory b) DRAM
c) SRAM d) Cache RAM
- 7) The suitable clock frequency of the 8085 microprocessors is _____.
a) 6 MHz b) 3 MHz
c) 12 MHz d) 9 MHz
- 8) _____ is a two-byte instruction.
a) JZ 16-bit address b) LDA 16-bit address
c) OUT 8-bit address d) LXI R_p, 16-bit address

- Q.2 Answer any Four of the following. 08**
- a) Compare SRAM with DRAM.
 - b) Define Accuracy and settling time for DAC.
 - c) Give the roll of program counter.
 - d) State any four single byte instructions of 8085 processor.
 - e) Define an absolute and a linear address decoding technique.
 - f) Enlist interrupt related pins of 8085 processor.
- Q.3 Attempt any Two of the following. 08**
- a) Explain in Brief Flash ADC.
 - b) Write the functions of:
 - i) ALE
 - ii) $\overline{IO/\overline{M}}$
 - iii) $\overline{RD}$
 - iv) $\overline{WR}$ pins of 8085
 - c) What is instruction? Classify instruction set according to the word size of instructions with suitable examples.
- Q.4 Answer any Two of the following. 08**
- a) Calculate the analog O/P voltage for R-2R DAC if digital data is 1111, For logic 1 = 5 Volt and for logic 0 = 0 volts.
 - b) Explain the generation of $\overline{MEMR}$, $\overline{MEMW}$, $\overline{IOR}$ and $\overline{IOW}$ control signals by using decoder IC 74138.
 - c) Write assembly language program to transfer the block of 10-memory location.
- Q.5 Answer any One of the following. 08**
- a) What is addressing mode? Explain different types of addressing modes supported by 8085 processor with suitable examples.
 - b) State the salient features of 8085 processor. Explain ALU, and Flag register of 8085 processor.

Set P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April – 2026
GEOLOGY (Paper - VIII)
Stratigraphy (22221415)**

Day & Date: Tuesday, 21-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Multiple choice questions.

08

- 1)** Intertrappean beds belongs to _____.
a) Dharwar b) Vindhyan
c) Siwaliksd d) Deccan trap
- 2)** In Geological Time Scale, Phanerozoic Eon is classified in _____ Era.
a) Paleozoic b) Mesozoic
c) Cenozoic d) All of above
- 3)** Eastern and western Dharwarcratons are separated by _____ shear zone.
a) Sargur b) Gorur
c) Bababudan d) Chitradurg
- 4)** Lower most formation of Gondwana system is _____.
a) Domodar b) Talchier
c) Rewa d) Panchet
- 5)** Asbestos and Baryte deposits occur in _____ system rocks.
a) Dharwar b) Siwalik
c) Gondwana d) Cuddapah
- 6)** "Purana" basins are now called as _____ basins.
a) Proterozoic b) Intra-continental
c) Epi-cratonic d) All of these
- 7)** Crescent shaped Cuddapah basin is trending _____.
a) N-S b) E-W
c) SSW-SSE d) None of these
- 8)** Himalayan mountains were formed due to _____ activity.
a) Earthquake b) Volcanic
c) Tectonic d) None of these

- Q.2 Answer the following. (Any Four) 08**
- a) Name the two major groups in WDC.
 - b) Give the economic importance of Dharwar Supergroup.
 - c) What is infra-tappean beds?
 - d) What is age of Deccan trap?
 - e) What is the age of Haimanta group?
- Q.3 Answer the following. (Any Two) 08**
- a) Explain in brief Delhi supergroup.
 - b) Describe the classification of Triassic of spiti.
 - c) Explain Cretaceous of Tiruchirapalli.
- Q.4 Answer the following. (Any Two) 08**
- a) Explain stratigraphy of Cuddapah Supergroup.
 - b) Describe Barakar formation of Gondwana Supergroup
 - c) Describe Geological time scale.
- Q.5 Answer the following. (Any One) 08**
- a) Describe lithology, distribution, age and economic importance of Vindhyan Supergroup.
 - b) Explain physiographic divisions of India.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April - 2026
MICROBIOLOGY (Paper - VIII)
Introduction to Industrial Microbiology (22221421)**

Day & Date: Tuesday, 21-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw Neat diagrams wherever necessary.
3) Figures to right indicate full marks.

Q.1 Rewrite the following sentences choosing by selecting correct Answer from given alternatives. 08

- 1) Industrial cultures are maintained by _____.
a) Sterilization b) Incubation
c) Lyophilization d) Pasteurization
- 2) Alcohol fermentation is carried out by using _____.
a) *Saccharomyces cerevisiae* b) *E. Coli*
c) *Pen. Chrysogenum* d) *Aspergillus Oryzae*
- 3) Natural source for screening of industrially important strains is _____.
a) Air b) soil
c) Water d) Sewage
- 4) For strain improvement _____ rays are used.
a) Cathode b) Infra-Red
c) Cosmic d) Ultraviolet
- 5) Molasses is waste from _____ industry used as raw material for designing of fermentation media.
a) Sugar b) Dairy
c) Paper and pulp d) Starch
- 6) Higher concentration of Nucleic acid is major disadvantage to use _____ as SCP.
a) Fungi b) Protozoa
c) Bacteria d) Algae
- 7) Example of Dual fermentation is _____ production.
a) Vinegar b) Citric Acid
c) Ethanol d) Penicillin
- 8) Lab scale fermenters are used for _____ purpose.
a) Production b) Recovery
c) Preservation d) Research

- Q.2 Answer any Four of the following. 08**
- a) What is precursor?
 - b) Define primary screening.
 - c) What is whey?
 - d) Define synthetic media.
 - e) What is function of spargers?
 - f) Give two examples of antifoam agents.
- Q.3 Write short note on any Two of the following. 08**
- a) Penicillin fermentation
 - b) Dual and multiple fermentation
 - c) Use of waste as fermentation media
- Q.4 Answer any Two of the following. 08**
- a) Primary screening of antibiotic producers
 - b) Strain improvement methods
 - c) Inoculum and production media
- Q.5 Answer any One of the following. 08**
- a) With diagram explain parts and function of fermenter.
 - b) Describe in detail Alcohol fermentation.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026
English (Compulsory)
Literary Mindscapes – I (22221500)**

Day & Date: Tuesday, 28-04-2026
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Rewrite the following sentences choosing the correct alternative. 08

- 1) According to A.P.J Abdul Kalam _____ is the soul of India?

a) Economy	b) Youth
c) Technology	d) Culture
- 2) _____ is the central character in "The Homecoming"?

a) Phatik Chakravorty	b) Makhan
c) Giribala	d) Nilkanta
- 3) _____ stage of life does Shakespeare describe in his poem?

a) Five	b) Six
c) Seven	d) Eight
- 4) _____ is the Queen's rival in the poem?

a) A warrior	b) A daughter
c) A poet	d) A beggar
- 5) _____ quality is the best describe in the poem schoolmaster?

a) Fearful	b) Kind
c) Stern	d) Lazy
- 6) _____ is criticized mostly in the poem 'Money Madness'?

a) Poverty	b) Love
c) Greed for money	d) Education
- 7) Change the following sentence into passive voice: "She writes a letter."

a) A letter was written by her	b) A letter is written by her
c) A letter has written by her	d) A letter is writting by her
- 8) Choose the correct phrasal verb to complete the sentence:
He finally _____ smoking.

a) Gave in	b) Gave up
c) Gave out	d) Gave off

- Q.2 Answer the following questions. (Any Four) 12**
- a)** Explain the idea of life in the poem “All the world is a stage”.
 - b)** Describe the charm and power of the dancer as shown in the poem by Sarojini Naidu?
 - c)** Describe the personality of the village schoolmaster.
 - d)** How does money affect human relationships according to the poem?
 - e)** What is the first vision of India according to Dr. A.P.J Abdul Kalam?
 - f)** What is the significance of the title “The Homecoming”?
- Q.3 Answer the following question. (Any One) 10**
- a)** Discuss the 4 Cs of Learning skills.
- OR**
- b)** Write in detail the types of 21st century skills.
- Q.4 Write a detailed note on 21st Century skills. 10**

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
PHYSICS (Special Paper - IX)
Mathematical Physics & Statistical Physics (22221509)**

Day & Date: Wednesday, 29-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.
4) Use of a logarithmic table and calculator is allowed.

Q.1 A) Multiple choice questions. 10

- 1) The length ds of line element in terms of cylindrical coordinates is _____.
 a) $ds^2 = dr^2 + r^2 d\theta^2 + dz^2$ b) $ds^2 = dr^2 + r^2 + dz^2$
 c) $ds^2 = dr^2 + r^2 d\theta^2 + d\phi^2$ d) $ds^2 = dr^2 + r^2 d\theta^2$
- 2) The _____ of differential equation is highest power of the highest order differential coefficient occurring in it.
 a) order b) degree
 c) linearity d) homogeneity
- 3) The condition for most probable distribution is _____.
 a) $\delta \ln k = 0$ b) $W = 0$
 c) $\ln W = 0$ d) $\delta \ln W = 0$
- 4) The three coordinates of spherical polar coordinate system are _____.
 a) (x, y, z) b) (r, θ, ϕ)
 c) (r, θ, z) d) (x, r, θ)
- 5) Phase space is _____.
 a) only position space
 b) only momentum space
 c) position and momentum space
 d) three dimensional space
- 6) Ratio of most probable speed and average speed of gas molecule is _____.
 a) 1 b) $\frac{\sqrt{\pi}}{2}$
 c) $\frac{\sqrt{\pi}}{4}$ d) $\frac{2}{\sqrt{\pi}}$

- 7) Maxwell- Boltzmann law of most probable distribution of molecule is based on the following conditions, for a system _____.
 a) Total number of molecules is constant
 b) Total energy of the assembly is constant
 c) Temperature of the system is constant
 d) Total number of molecules and total energy of the assembly is constant
- 8) Bose Einstein distribution law is _____.
 a) $n_i = \frac{g_i}{e^\alpha e^{\frac{u_i}{kT}} + 1}$ b) $n_i = \frac{g_i}{e^\alpha e^{\frac{u_i}{kT}} - 1}$
 c) $n_i = \frac{g_i}{e^\alpha e^{\frac{u_i}{kT}}}$ d) $n_i = \frac{g_i}{e^\alpha e^{\frac{1}{kT}} + 1}$
- 9) Pauli's exclusion principles apply to _____.
 a) M-B statistics b) F-D Statistics
 c) B-E Statistics d) None of these
- 10) Which of the following is Stefans law?
 a) $E = \sigma T^4$ b) $E = \sigma T$
 c) $E = \sigma T^2$ d) $E = \sigma T^5$

B) Fill in the blanks:**06**

- 1) Stoke's theorem gives the relation between line integral with _____.
- 2) In orthogonal curvilinear coordinates, the coefficients h_1, h_2, h_3 are called _____.
- 3) Thermodynamics cannot be applicable to _____ ensemble.
- 4) M-B Statistics applicable to _____.
- 5) Rest mass of photon is _____.
- 6) Three particles are distributed in four energy levels, the possible ways of this distribution when particles are fermions _____.

Q.2 Solve Any Eight of the following.**16**

- a) State Legendre's and Bessel's differential equations.
- b) Define order of differential equation with example.
- c) State Laplacian Operator.
- d) Define ensemble. Give its types.
- e) Define accessible microstates.
- f) State various thermodynamic functions.
- g) Deduce Wien's formula from Planck's radiation formula.
- h) Define Fermi energy.
- i) Write any two conclusions of Lummer and Pringsheim experiment.
- j) Write postulates of Fermi-Dirac statistics.

Q.3 A) Attempt Any Two of the following.**10**

- 1) Extend expressions from orthogonal curvilinear coordinates to cartesian coordinate system.
- 2) Define thermodynamic probability. Obtain an expression for thermodynamic probability.

3) Derive Maxwell-Boltzmann distribution law.

B) Obtain an expression for divergence of vector in orthogonal curvilinear coordinates. **06**

Q.4 A) Attempt Any Two of the following. **08**

- 1) Explain concept of orthogonal curvilinear coordinates.
- 2) Deduce Rayleigh's Jeans Law from Planck's Radiation formula.
- 3) Compare M-B, B-E and F-D statistics.

B) State and Prove Gauss's divergence theorem. **08**

Q.5 Attempt Any Two of the following. **16**

- a)** Define most probable distribution. Show that in most probable distribution, $n_i = \text{average density} \times \text{area of cell}$
- b)** Using Maxwells law of distribution of speeds of molecules in a gas, obtain expressions for most probable speed and average speed.
- c)** Derive Planck's radiation formula in terms of frequency and wavelength.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026**

**CHEMISTRY (Special Paper - IX)
Physical Chemistry (22221505)**

Day & Date: Wednesday, 29-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.
4) Use of a log table and calculator is allowed.

Q.1 A) Multiple choice questions.**10**

- 1) Which of the following electrode can be used as a reference electrode?
 - a) Calomel
 - b) Glass
 - c) Quinhydrone
 - d) Platinum
- 2) When the cell reaction is reached equilibrium, the E° value _____.
 - a) increases
 - b) equals to zero
 - c) decreases
 - d) None of these
- 3) The de Broglie wavelength depends upon _____.
 - a) mass of a particle
 - b) velocity of a particle
 - c) both a and b
 - d) Planck's constant
- 4) When a beam of light of sufficiently high frequency is allowed to strike a metal surface, electrons are ejected from the metal surface. This effect is known as _____.
 - a) Compton effect
 - b) Raman effect
 - c) Photoelectric effect
 - d) Einstein effect
- 5) The wave particle duality hypothesis was given by _____.
 - a) Werner Heisenberg
 - b) de Broglie
 - c) Max Planck
 - d) Arthur Compton
- 6) The activity of pure metal has the value of _____.
 - a) infinity
 - b) zero
 - c) unity
 - d) can't say
- 7) The mathematical expression for reduced phase rule is given as _____.
 - a) $F = C - P + 1$
 - b) $F = C - P - 2$
 - c) $F = C + P - 2$
 - d) $F = C - P$

- 8) The equation $I_t = I_0 10^{-\epsilon ct}$ represents _____ law.
- a) Lambert's b) Beer's
c) Grotthus d) Einstein's
- 9) Which of the following process is non-radiative in nature?
- a) Fluorescence b) Phosphorescence
c) Delayed fluorescence d) Inter system crossing
- 10) Which of the following acts as a sensitizer in photosynthesis process?
- a) water b) heat
c) chlorophyll d) carbon dioxide

B) Fill in the blank/definitions/one sentence answer/one word answer/Give name/predict the product. 06

- 1) Write the expression for Compton shift.
- 2) What is chemiluminescence?
- 3) The free energy change and the emf of a cell are related as _____.
- 4) State Wein's displacement law.
- 5) What is the spin multiplicity of a triplet states?
- 6) What is triple point in phase diagram?

Q.2 Solve Any Eight of the following. 16

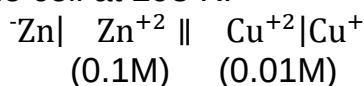
- a) What is electrochemical series?
- b) Write the expression for the de Broglie wavelength.
- c) State Compton effect.
- d) State Gibbs' phase rule.
- e) State Stefan-Boltzmann fourth power law.
- f) What is standard electrode potential of Cu/Cu^{2+} electrode?
- g) Give the typical life times of fluorescence and phosphorescence.
- h) What is polymorphism?
- i) State Stark-Einstein law of photochemical equivalence.
- j) Define perfect black body.

Q.3 A) Attempt Any Two of the following. 10

- 1) Explain how EMF measurement helps in the determination of pH of a solution.
- 2) With the help of neat labelled Jablonski diagram, explain various radiative photophysical pathways.
- 3) Give the statement of photoelectric effect. Explain quantum mechanical approach of photoelectric effect.

B) Short note/ Solve: **06**

Calculate the emf of the cell at 298 K.



Given : $E_{Zn}^0 = -0.76V$, $E_{Cu}^0 = 0.34 V$

- Q.4 A) Attempt Any Two of the following. 08**
- 1) Write the expression for Schrodinger wave equation. Give the physical significance of wave function.
 - 2) Write differences between photochemical and thermal reactions.
 - 3) Construct and explain the phase diagram for water.
- B) Describe/Explain/Solve. 08**
- Define quantum efficiency? What are the reasons for low, high and unit quantum efficiency.
- Q.5 Attempt Any Two of the following. 16**
- a) Explain how the emf measurements may be employed to determine
 - i) ΔG
 - ii) ΔH
 - iii) ΔS
 - b) Derive an expression for emf of a chemical cell without transference.
 - c) With the help of neat labelled phase diagram, discuss lead-silver system.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026
BOTANY (Special Paper - IX)
Plant Systematics (22221501)**

Day & Date: Wednesday, 29-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labeled diagrams whenever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Rewrite the following sentence by choosing the correct alternative. 10

- 1) A floral formula does not tell about _____.
 a) ovary position b) whorls of floral parts
 c) number of floral parts d) placentation and aestivation
- 2) The axis of the flower is condensed to form _____.
 a) ovary b) thalamus
 c) buds d) bract
- 3) _____ is the placentation in the unilocular ovary with a single ovule.
 a) Axile b) Free central
 c) Basal d) Marginal
- 4) Majority of the present-day phylogenists consider angiosperms to have first developed in the _____.
 a) moist tropics b) montane tropical forests
 c) open grasslands d) open scrub jungles
- 5) Complete fusion of the ovarian wall with the hypanthium results into the _____ condition.
 a) perigynous b) epigynous
 c) monogynous d) androgynous
- 6) A plant living and completing its life cycle in one growing season is called _____.
 a) annual b) biennial
 c) perennial d) seasonals
- 7) APG III system is based on the sound phylogenetic principle of constructing taxa on the basis of established _____.
 a) monophyly b) clades
 c) unplaced families d) ANITA

- 8) _____ is one of salient feature of family Rubiaceae.
- a) Ovary superior b) Interpetiolar stipules
c) Fruit a follicle d) Seed with a tuft of hairs
- 9) _____ is one of the salient features of Polygonaceae.
- a) Insectivorous plants
b) Stipules forming ochrea at nodes
c) Stipules usually small
d) Seeds large dispersed explosively
- 10) Stems represent the main axes of plants, being distinguished into _____.
- a) nodes and internodes b) bearing leaves and axillary buds
c) both a & b d) None of these

B) Fill in the blanks.

06

- 1) *Abelmoschus esculentus* (Bhendi) belongs to family _____
- 2) Rutaceae belongs to order _____
- 3) Polygoniaceae belongs to class _____
- 4) *Zea mays* belongs to family _____
- 5) Smallest unit of classification is _____
- 6) Rubiaceae belongs to sub-class _____

Q.2 Solve Any Eight of the following.

16

- a) APG stands on (full form of APG).
- b) Define inflorescence.
- c) Enlist types of cymose inflorescence.
- d) What is stipule?
- e) What are tetramerous flowers?
- f) Enlist plants of economic importance in family Malvaceae.
- g) Write down characters of subclass Gamopetalae.
- h) Write down characters of class dicotyledon.
- i) Enlist types of simple fruits.
- j) What is mean by phyllotaxy?

Q.3 A) Write a short note on any two of the following:

10

- 1) Characters of primitive flowers in angiosperms
- 2) Storage root
- 3) Economic importance of Poaceae

B) Explain in brief cymose type of inflorescence.

06

Q.4 A) Answer Any Two of the following.

08

- 1) Comment upon general evolutionary trends in phyllotaxy.
- 2) Explain in brief hypanthodium type of inflorescence.
- 3) Mentions the demerits of Englar & Prantl system of classification.

B) Explain in brief aggregate fruits.

08

Q.5 Attempt Any Two of the following.

16

- a)** Explain in detail general evolutionary trends in fruits.
- b)** Explain in detail APG III system of classification.
- c)** Write down systematic position, vegetative characters, reproductive characters, plant of economic importance (any two) of Rubiaceae.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
ZOOLOGY (Special Paper - IX)
Molecular Biology (22221513)**

Day & Date: Wednesday, 29-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Multiple choice questions. 10

- 1) Which of the following is true about the Watson and Crick model of DNA?
 - a) DNA is a single-stranded molecule
 - b) DNA forms a triple helix
 - c) The two strands are anti-parallel
 - d) Both strands are parallel
- 2) What is the function of RNA primase in DNA replication?
 - a) Unwinds the DNA
 - b) Synthesizes RNA primer
 - c) Adds nucleotides to the new strand
 - d) Ligates Okazaki fragments
- 3) In prokaryotes, the initiation of transcription begins at the _____.
 - a) Shine-Dalgarno sequence b) TATA box
 - c) Promoter region d) Enhancer sequence
- 4) What is the role of tRNA during translation?
 - a) It carries amino acids to the ribosome
 - b) It catalyzes the formation of peptide bonds
 - c) It synthesizes the mRNA
 - d) It provides energy for translation
- 5) Which of the following is true about the genetic code?
 - a) The genetic code is degenerate
 - b) Each codon codes for multiple amino acids
 - c) There is no redundancy in the codons
 - d) The genetic code is read in a non-overlapping manner
- 6) The enzyme responsible for joining Okazaki fragments is _____.
 - a) DNA polymerase I b) DNA ligase
 - c) RNA polymerase d) Topoisomerase

- 7) Which of the following is NOT involved in gene regulation in prokaryotes?
 - a) Repressors
 - b) Activators
 - c) Enhancers
 - d) Operators
- 8) In eukaryotes, splicing of mRNA _____.
 - a) Removes exons and joins introns
 - b) Adds a 5' cap
 - c) Removes introns and joins exons
 - d) Adds a poly-A tail
- 9) Which type of RNA is involved in RNA interference?
 - a) mRNA
 - b) tRNA
 - c) rRNA
 - d) siRNA
- 10) What is the primary function of the ribosome?
 - a) To synthesize RNA
 - b) To replicate DNA
 - c) To synthesize proteins
 - d) To transcribe genes

B) One-line/Fill in the blanks/Definition.**06**

- 1) Define "operon" in the context of gene regulation.
- 2) Write the function of the enzyme helicase in DNA replication.
- 3) What is meant by "degeneracy" in the genetic code?
- 4) Define the term "post-transcriptional modification."
- 5) What is the function of the poly-A tail in eukaryotic mRNA?
- 6) What is RNA splicing?

Q.2 Solve Any Eight of the following.**16**

- a) Explain the structure and function of RNA.
- b) Describe the semi-conservative model of DNA replication.
- c) Explain the process of transcription in prokaryotes.
- d) Write a short note on the lac operon model of gene regulation.
- e) What is the Wobble Hypothesis?
- f) Discuss the differences between prokaryotic and eukaryotic transcription.
- g) Explain the process of polyadenylation in mRNA.
- h) What are the applications of recombinant DNA technology?
- i) Discuss the mechanism of translation initiation in prokaryotes.
- j) Explain the function of siRNA in gene regulation.

Q.3 A) Attempt Any Two of the following.**10**

- a) Describe the process of translation in eukaryotes.
- b) Explain the mechanism of mismatch repair in DNA.
- c) Write a detailed note on the different types of RNA and their functions.

B) Write a short note on RNA polymerase and its role in transcription.**06**

- Q.4 A) Attempt Any Two of the following. 08**
- 1) Explain the process of transcription in eukaryotic cells.
 - 2) Describe the process of capping, splicing, and polyadenylation in mRNA processing.
 - 3) Explain the structure of a ribosome and its role in translation.
- B) Describe the mechanism of DNA replication in prokaryotes. 08**
- Q.5 Attempt Any Two of the following. 16**
- a) Discuss the process of gene regulation in prokaryotes using the lac operon model.
 - b) Describe the process of post-transcriptional modification in eukaryotic cells.
 - c) Explain the mechanism of RNA interference (siRNA and miRNA).

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
MATHEMATICS (Special Paper - IX)
Algebra - II (22221517)**

Day & Date: Wednesday, 29-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of calculator is not allowed.

Q.1 A) Multiple choice questions.**10**

- Consider the following statement.
 - The empty set is linearly independent
 - The span $(Q) = \{0\}$ than
 - Only (i) is true
 - Only (ii) is true
 - Both (i) & (ii) are true
 - Both (i) & (ii) are false
- The no. of zero divisors of Z_6 are _____.
 - 1
 - 2
 - 3
 - 5
- The no. of units in the ring Z_8 are _____.
 - 4
 - 7
 - 2
 - 1
- The no. of ideas of Z_{40} are _____.
 - 1
 - 20
 - 40
 - 8
- Let V be an inner product space vectors x & y in V are orthogonal if _____.
 - $\langle x, y \rangle = 0$
 - $\|x\| \neq 0$
 - $\|x\| = 1$
 - $\|x\|^2 = 1$
- Let $T: R^2 \rightarrow R^3$ be liner transformation defined by $T(a_1, a_2) = (a_1 + 3a_2, 0, 2a_1, -4a_2)$ than $[T]^v =$ _____.
 - $\begin{bmatrix} 1 & 3 \\ 0 & 0 \\ 2 & -4 \end{bmatrix}$
 - $\begin{bmatrix} 1 & 3 \\ 2 & -4 \\ 0 & 0 \end{bmatrix}$
 - $\begin{bmatrix} 3 & 1 \\ -4 & 0 \\ 0 & 2 \end{bmatrix}$
 - $\begin{bmatrix} 3 & 1 \\ 0 & 0 \\ -4 & 2 \end{bmatrix}$

- 7) Let $T: R^3 \rightarrow R^2$ be the linear transformation defined by $T(a_1, a_2, a_3) = (a_1 - a_2, 2a_3)$ then $R(T) =$ _____.
 a) R b) R^2
 c) R^3 d) $\{0\}$
- 8) The dimension of $P_4(F)$ is _____.
 a) 4 b) 5
 c) 16 d) 0
- 9) Which of the following is true?
 a) Every integral domain is field.
 b) Every commutative ring with unity is integral domain.
 c) Every finite integral domain is field.
 d) Every ring is integral domain.
- 10) The dimension of $\mathbb{C}(\mathbb{C})$ _____.
 a) 1 b) 2
 c) 0 d) ∞

B) Fill in the blank / Definition / One sentence answer / One word answer / Give the name. 06

- 1) Define maximal idea.
- 2) Define Kernel of the ring homomorphism.
- 3) If two vectors are linearly dependent then show that one of them is scalar multiple of other.
- 4) If x, y, z are L.I. over the field $\mathbb{C}$ then show that $x + y, y + z, z + x$ are also L.I. over $\mathbb{C}$.
- 5) Define inner product space.
- 6) Let V be a vector space over F then V is isomorphic to F^4 iff _____.

Q.2 Solve Any Eight of the following. 16

- a) Show that the vectors $\{(1,0,0), (0,1,0), (0,0,1)\}$ are linearly independent.
- b) Let $f: R \rightarrow S$ be a ring homomorphism prove that $\ker f$ is an ideal of R .
- c) Prove that intersection of two sub rings is a subring.
- d) If F is field then show that F has no ideals other than F & $\{0\}$.
- e) Prove that $\|x + y\|^2 + \|x - y\|^2 = 2(\|x\|^2 + \|y\|^2)$
- f) Let $T: R^2 \rightarrow R^2$ define by $T(a_1, a_2) = (2a_1 + a_2, a_1)$ show that T is linear.
- g) Let $T: P(R) \rightarrow P(R)$ defined by $T(f(x)) = f'(x)$ prove that T is onto.
- h) Let $T: R^2 \rightarrow R^3$ define by $T(a_1, a_2) = (a_1 + a_2, 0, 2a_1 - a_2)$ find $N(T)$.
- i) Define quotient ring.
- j) Prove that skew field has no zero divisor.

Q.3 A) Attempt Any Two of the following. 10

- a) Let R is commutative ring with unity, prove that P is prime ideal iff R/P is an integral domain.
- b) Show that $\{(1,0,-1), (2,5,1), (0,-4,3)\}$ is linearly independent subset of R^3 and it spans R^3 .

- c) Let V and W are vector spaces over F and suppose that $\{v_1, v_2, \dots, v_n\}$ is a basis for V , for $w_1, w_2, w_3, \dots, w_n$ in W , show that there exist exactly one linear transformation $T: V \rightarrow W$ such that $T(v_i) = w_i$ for $i = 1, 2, \dots, n$

B) Prove that every finite integral domain is field. **06**

Q.4 A) Attempt Any Two of the following. **08**

- a) State and prove Cauchy-Schwarz inequality for the vector space V .
- b) Let T be an invertible linear transformation from V to W then prove that V is finite dimensional if and only if W is finite dimensional and $\dim(V) = \dim(W)$.
- c) If D is an integral domain of characteristic 0, then prove that D contains a subring isomorphic to $\mathbb{Z}$.

B) State and prove Rank-Nullity theorem. **08**

Q.5 Attempt Any Two of the following. **16**

- a) State and prove fundamental homomorphism theorem for rings.
- b) State and prove replacement theorem.
- c) Let R is commutative ring with unity, prove that an ideal M of R is maximal ideal of R if and only if R/M is field.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026
STATISTICS (Special Paper - IX)
Statistical Inference – I (22221520)

Day & Date: Wednesday, 29-04-2026
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Use of log table and calculator is allowed.

Q.1 A) Multiple choice questions. 10

- 1) Unbiasedness is invariant under the following transformation _____.
 - a) Linear
 - b) Continuous
 - c) One to one
 - d) One to one and on to
- 2) Pitman-Koopman form of probability distribution is used to determine _____ estimator of the parameter.
 - a) Sufficiency
 - b) Consistency
 - c) Unbiased
 - d) Efficiency
- 3) Cramer-Rao inequality gives _____.
 - a) Lower bound of the variance of the estimator
 - b) Upper bound of the variance of the estimator
 - c) Asymptotic variance of the estimator
 - d) None of the above
- 4) If $X_1, X_2, \dots, X_n$ is a random sample from $U(0, \theta)$ then the sufficient estimator of θ is _____.
 - a) $\bar{X}$
 - b) $\sum X_i$
 - c) $X_{(n)}$
 - d) $X_{(1)}$
- 5) If X is a single observation from Poisson distribution with parameter λ then $X(X - 1)$ is an Unbiased estimator of _____.
 - a) λ^2
 - b) λ
 - c) $\lambda^2 + \lambda$
 - d) $\lambda^2 - \lambda$
- 6) M.L.E. is same as moment estimator if the distribution _____.
 - a) belongs to exponential family
 - b) hold regularity conditions
 - c) has support free from parameter of estimation
 - d) has unique M.L.E.

- 7) The types of estimates are _____.
 a) Point estimate
 b) Interval estimate
 c) Estimation of confidence region
 d) All the above
- 8) For an estimator to be consistent, the unbiasedness of estimator is _____.
 a) Necessary
 b) Sufficient
 c) Necessary as well as Sufficient
 d) Neither Necessary nor Sufficient
- 9) If the variance of an estimator attains the Crammer-Rao lower bound, the estimator is _____.
 a) Most efficient
 b) Sufficient
 c) Consistent
 d) Admissible
- 10) If T_1 and T_2 are two unbiased estimator of θ , then relative efficiency of T_1 with respect to T_2 is given by _____.
 a) $\frac{Var(T1)}{Var(T2)}$
 b) $\frac{Var(T2)}{Var(T1)}$
 c) $\sqrt{\frac{Var(T1)}{Var(T2)}}$
 d) $\sqrt{\frac{Var(T2)}{Var(T1)}}$

B) Fill in the blank.**06**

- 1) An estimator T is said to be unbiased for a parameter θ _____.
- 2) The maximum likelihood estimator (MLE) is the value of the parameter that maximizes the _____ function.
- 3) If statistic T is unbiased estimator of parameter θ then unbiased estimator of $7\theta + 4$ is _____.
- 4) Let 5, 8, 3, 6, 8 are observations from Poisson (λ) then unbiased estimate of λ is _____.
- 5) A statistic is a function of _____.
- 6) Factorization theorem for sufficiency is known as _____.

Q.2 Solve Any Eight of the following.**16**

- a) What are the requirements of good estimator?
- b) Define sampling distribution of an estimator.
- c) Define sufficient estimator.
- d) State Neyman - factorization theorem.
- e) Define a sample and a population.
- f) Define a biased estimator and unbiased estimator.
- g) Define a Parameter and give one example.
- h) Define likelihood function of a random variable $X_1, X_2, \dots, X_n$ from Poisson distribution with parameter θ .
- i) Define information function $I(\theta)$ of parameter θ .
- j) State any two properties of Maximum Likelihood Estimator (MLE).

Q.3 A) Attempt Any Two of the following. 10

- 1) Let $X_1, X_2, \dots, X_n$ be a random sample from $N(\mu, \sigma^2)$. Show that sample Mean Square s^2 is a biased estimator of σ^2
- 2) Obtain the MLE of the parameter θ based on a r.s. of size n from Poisson Distribution.
- 3) Let $X_1, X_2, \dots, X_n$ be a r.s. from $N(\mu, \sigma^2)$ distribution. Find the estimators of μ and σ^2 by the Method of moments.

B) Let $X_1, X_2, \dots, X_n$ be a random sample of size n from a distribution with pdf 06

$$f(x, \theta) = \begin{cases} \theta x^{\theta-1} & ; 0 < x < 1 \\ 0 & ; \text{otherwise.} \end{cases}$$

obtain a sufficient statistic for θ .

Q.4 A) Attempt Any Two of the following. 08

- 1) Obtain the likelihood function of Normal Distribution.
- 2) Let $X_1, X_2, \dots, X_n$ be a random sample from $N(\mu, \sigma^2)$. Show that sample variance S^2 is a consistent estimator of σ^2 .
- 3) Prove that two distinct unbiased estimators of $\phi(\theta)$ give rise to infinitely many Unbiased Estimators of $\phi(\theta)$.

B) If X has $N(\mu, \sigma^2)$ find the Fisher information function. 08

- 1) $I(\mu)$ when σ^2 is known
- 2) $I(\sigma^2)$ when μ is known

Q.5 Attempt Any Two of the following. 16

a) State and prove Crammer - Rao Inequality.

b) Let X_1, X_2 and X_3 is a r.s. from $P(\theta)$ distribution.

Let
$$T_1 = \frac{x_1 + x_2 + x_2}{3} \quad T_2 = \frac{x_1 + 2x_2 + x_3}{4}$$

Show that T_1 and T_2 are unbiased estimator of θ and also find the efficiency of T_1 in relative to T_2 .

c) State and prove Uniqueness theorem for UMVUE.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026
GEOLOGY (Special Paper - IX)
Economic Geology (22221525)**

Day & Date: Wednesday, 29-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Multiple choice questions. 10

- 1) Hydrothermal deposits, which are formed at great depths, near the intrusive and within the temperature range of 300°C to 500°C is called _____.
 a) Hypothermal deposits b) Mesothermal deposits
 c) Epithermal deposits d) Syngenetic deposits
- 2) In the Supergene Sulphide Enrichment, lower unaffected part of the ore body is _____.
 a) Leached zone b) Oxidized zone
 c) Supergene sulphide zone d) Primary zone
- 3) The bulging or dilation of schistose rocks due to pressure transmitted by mineralising solution, which type of vein deposit is _____.
 a) Sheeted vein b) Chambered vein
 c) Lenticular vein d) Fissure vein
- 4) Gossan or cap rocks are good indicator of _____.
 a) Hydrothermal deposits b) Placer deposits
 c) Residual deposits d) Secondary sulphide deposits
- 5) Sulphur is a typical example of _____.
 a) Hydrothermal deposits b) Evaporatic deposits
 c) Fumarolic deposits d) Magmatic deposits
- 6) Cavity filling deposit in which mass of rock body is intercalated by a network of small closely spaced ore bearing veinlets is known as _____.
 a) Stockwork b) Ladder vein
 c) Box work d) Saddle reef

- 7) The process responsible for the formation of placer deposits is _____.
a) Mechanical b) Residual
c) Magmatic d) Chemical
- 8) Which is the most common ore of Zinc?
a) Sphalerite b) Galena
c) Chromite d) Bauxite
- 9) Which of these rocks could be an important source of Diamonds?
a) Komatiite b) Gabbro
c) Eclogite d) Kimberlite
- 10) Syngenetic ore deposits are formed _____.
a) Before the host rock formation
b) Same time as the host rock
c) Later than the host rock formation
d) No relation with host rock

B) Fill in the blanks/Definition/One sentence answer.

06

- 1) Ruby is gem variety of _____.
- 2) The Tenor value of Iron is always _____.
- 3) Pyrolusite is a mineral of _____.
- 4) Hutti Gold Mines are located in _____ state of India.
- 5) Which type of Coal shows brown colour _____.
- 6) Definition of Ferrous minerals.

Q.2 Solve Any Eight of the following.

16

- a) Define Economic Geology.
- b) Define Country rock.
- c) What is Grade?
- d) Anthracite Coal found in which state of India.
- e) What is Simple ore mineral?
- f) Give example of Sulphur ore.
- g) Write down Rank of Coal.
- h) What is Metasomatism?
- i) Define Early Magmatic deposit.
- j) What is Xenothermal deposits?

Q.3 A) Attempt Any Two of the following.

10

- 1) Describe Residual deposit.
- 2) Write a note on Aeolian placer deposit with example.
- 3) Describe the occurrences and distribution of Copper ore deposits.

B) Short note on classification of Hydrothermal ore deposit.

06

- Q.4 A) Attempt Any Two of the following. 08**
- 1) Explain Early Magmatic ore deposits and its types with suitable examples.
 - 2) Explain Cavity filling deposits.
 - 3) Describe the occurrence and distribution of Manganese ore deposits.
- B) Write note on Pegmatite ore deposits. 08**
- Q.5 Attempt Any Two of the following. 16**
- a) Describe process of Coal formation and distribution of India.
 - b) Explain Shear Zone deposits and Gash vein deposits.
 - c) Explain Contact Metasomatic deposit.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026
MICROBIOLOGY (Special Paper - IX)
Virology (22221529)**

Day & Date: Wednesday, 29-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Rewrite the following choosing correct alternative. 10

- 1) Genome of _____ virus is segmented.
 - a) TMV
 - b) Influenza
 - c) Adeno
 - d) Mammary Tumor
- 2) The name of the scientists who discovered the first virus is _____.
 - a) Ivanoski
 - b) Louis Pasteur
 - c) Edward Jenner
 - d) Cowinner
- 3) Embryological egg is used in the _____ of virus.
 - a) Attenuation
 - b) Cultivation
 - c) Isolation
 - d) Both b & c
- 4) Cancer that involves the connective tissue is known as _____.
 - a) Sarcomas
 - b) Liphomas
 - c) Lucamia
 - d) Maligal
- 5) Polystyrene latex is used for enumeration of viruses in sample by _____.
 - a) Hemagglutination assay
 - b) Pock Method
 - c) Direct microscopic count
 - d) Acid end point method
- 6) _____ is the virus used as biopesticide.
 - a) Herpesvirus
 - b) Baculovirus
 - c) Papillomavirus
 - d) TMV
- 7) The most largest virus is _____.
 - a) Porcine circovirus
 - b) F&M virus
 - c) Pox virus
 - d) TMV
- 8) Ebola virus gain entry to the human host through _____.
 - a) the fecal-oral route
 - b) mucous membranes
 - c) abrasions in the skin
 - d) Both b and c

- 9) Which of these are symptoms of rabies are seen in dogs _____.
 a) Sudden behaviour change
 b) Mouth open and drooling or foaming
 c) Change in sound of bark
 d) All of the above
- 10) Which of these is considered an opportunistic infection in someone with advanced HIV (AIDS)?
 a) A common cold
 b) Tuberculosis
 c) A skin rash
 d) Headaches

B) Answer in one line.**06**

- 1) Define Virioids.
- 2) What is generalised Lysogeny?
- 3) What is the long form of CaMV?
- 4) Define Prions.
- 5) What is a prophage?
- 6) What is an eclipse period in virus?

Q.2 Solve Any Eight of the following.**16**

- a) Give methods of purification of virus.
- b) Draw the structure of HIV virus.
- c) Write about spread of Ebola virus.
- d) Give the types of cancer depending on its origin and spread.
- e) Write on Tobacco Mosaic Virus.
- f) Write on Baltimore classification scheme.
- g) What are temperate phages?
- h) How does Influenza virus get transmitted?
- i) Give any two indirect enumeration method for viruses.
- j) Write in short on replication of Adenoviruses.

Q.3 A) Attempt Any Two of the following.**10**

- 1) Write an account on viral classification on the basis of LHT system of classification.
- 2) Explain isolation and cultivation of animal viruses.
- 3) Describe the details of Rabies disease.

- B)** Explain about Swine Flu with its etiological agent, mode of transmission pathogenesis, symptoms, laboratory diagnosis and treatment.

06**Q.4 A) Attempt Any Two of the following.****08**

- 1) Write a note on one step growth experiment.
- 2) Explain characteristics of cancerous cells.
- 3) Write an account on prevention and control of plant viral diseases.

- B)** Describe the details of lytic cycle of T4 phages.

08

Q.5 Attempt Any Two of the following.

16

- a)** Explain various hypothesis of cancer like somatic mutation, viral gene, defective immunity.
- b)** Describe virus as bio pesticides and give the details of its production and application.
- c)** What is lysogeny? Explain specific lambda lysogeny.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
ELECTRONICS (Special Paper - IX)
Linear Integrated Circuits and Applications (22221537)**

Day & Date: Wednesday, 29-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat labelled diagrams whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of log table and calculator is allowed.
- 5) Use of Mobile is strictly prohibited.

Q.1 A) Select the correct alternative. 10

- The process of forming a thin single-crystal layer on a substrate is called _____.
 - Oxidation
 - Diffusion
 - Epitaxy
 - Metallization
- In constant source diffusion, the impurity concentration is kept _____.
 - Increasing
 - Decreasing
 - Constant
 - Variable
- _____ IC regulator provides a positive fixed voltage.
 - 79XX
 - LM317
 - 78XX
 - LM337
- A precision rectifier is mainly used for _____.
 - High frequency signals
 - Low voltage signals
 - High power supply
 - Noise elimination
- An all-pass filter changes _____.
 - Amplitude
 - Phase only
 - Both amplitude & phase
 - Frequency
- In photolithography, the coating material is _____.
 - Silicon dioxide
 - Photoresist
 - Metal
 - Germanium
- Lock range of PLL means _____.
 - Minimum input frequency
 - Maximum VCO frequency
 - Frequency range over which PLL remains locked
 - Capture bandwidth

- 8) _____ IC is used for FSK demodulation.
 - a) LM741
 - b) IC565
 - c) 78XX
 - d) LM331
- 9) Chebyshev filters are characterized by _____.
 - a) Flat response
 - b) Ripple in passband
 - c) No ripple
 - d) Linear phase
- 10) The thermal shutdown in regulators protects against _____.
 - a) High voltage
 - b) High temperature
 - c) Low current
 - d) Reverse bias

B) Answer in one sentence.

06

- 1) Define epitaxy.
- 2) State one application of a sample and hold circuit.
- 3) What is an all-pass filter?
- 4) Write the use of LM337.
- 5) State one application of PLL.
- 6) What is oxidation in IC fabrication?

Q.2 Solve Any Eight of the following.

16

- a) Advantages of ICs.
- b) Limited source diffusion process.
- c) Draw circuit of precision full-wave rectifier.
- d) Define clipping circuit.
- e) Difference between passive and active filters.
- f) Write features of IC 565.
- g) What is over-current protection in regulators?
- h) Applications of V to F converter.
- i) Give difference between Butterworth and Chebyshev filter.
- j) What is LM317 adjustable regulator?

Q.3 A) Attempt Any Two of the following.

10

- 1) Explain fabrication steps of an NPN transistor.
- 2) Derive transfer characteristics of PLL.
- 3) Design a regulated 5V supply using IC 7805.

B) Explain Photolithography process.

06

Q.4 A) Attempt Any Two of the following.

08

- 1) Draw and explain active peak detector.
- 2) Explain second-order Butterworth LPF.
- 3) Explain Protection circuits in IC regulators.

B) Explain diffusion process with neat diagram.

08

Q.5 Attempt Any Two of the following.

16

- Explain epitaxial process with neat diagram.
- Explain block diagram, principle and applications of PLL IC 565.
- Discuss active filters: classification, advantages, and comparison.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026**

**COMPUTER SCIENCE (Special Paper - IX)
Data Communication and Networking (22221533)**

Day & Date: Wednesday, 29-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labeled diagrams wherever necessary.

Q.1 A) Multiple choice questions.**10**

- 1) DNS is the abbreviation of _____.
 a) Dynamic Name System b) Dynamic Network System
 c) Domain Name System d) Domain Network Service
- 2) How many layers are in the TCP/IP model?
 a) 4 layers b) 5 layers
 c) 6 layers d) 7 layers
- 3) Which one of the following is not a function of network layer?
 a) congestion control b) error control
 c) routing d) inter-networking
- 4) What does each packet contain in a virtual circuit network?
 a) only source address
 b) only destination address
 c) full source and destination address
 d) a short VC number
- 5) Which of the following is the network layer protocol for the internet?
 a) Domain Name System b) File Transfer Protocol
 c) Ethernet d) Internet Protocol
- 6) Application layer protocol defines _____.
 a) types of messages exchanged
 b) message format, syntax and semantics
 c) rules for when and how processes send and respond to messages
 d) All of the mentioned
- 7) To achieve reliable transport in TCP, _____ is used to check the safe and sound arrival of data.
 a) Packet b) Buffer
 c) Segment d) Acknowledgment

- 8) Which layer is responsible for process to process delivery in a general network model?
- a) session layer b) data link layer
c) transport layer d) network layer
- 9) Which of the following allows you to connect and login to a remote computer?
- a) SMTP b) HTTP
c) FTP d) Telnet
- 10) Which of the following can't be a feature of hub?
- a) Filtering the data b) Half duplex transmission
c) No software association d) Star topology architecture

B) Fill in the blank.**06**

- 1) The _____ is the protocol used to make hypertext document readable on WWW.
- 2) A _____ is a device that forwards packets between networks by processing the routing information included in the packet.
- 3) _____ is the process of efficiently selecting a path in a network along which data packets will travel to their destination.
- 4) All computers connected to the internet and wanting to use it for sending/receiving data must follow a common set of rules for communication called _____.
- 5) RARP stands for _____.
- 6) In long distance data transmission system, the most preferable mode of communication is _____.

Q.2 Solve Any Eight of the following.**16**

- a) Define Protocols & Standards.
- b) Define Period, Frequency.
- c) Define Error and its types.
- d) Long form of CSMA/CD and HTTP.
- e) Define Data Flow.
- f) Long form of SNMP and SMTP.
- g) Define Amplitude, Bandwidth.
- h) Define Modulation. What are different types of modulation?
- i) Define Framing.
- j) Define switch and hub.

Q.3 A) Attempt Any Two of the following.**10**

- 1) Explain Fiber Optic Cable.
- 2) Explain Stop and Wait ARQ in detail.
- 3) Explain Shortest Path Routing.

B) Explain IP and RTP.**06**

Q.4 A) Attempt Any Two of the following. 08

- 1) Explain Packet Switching.
- 2) Explain ALOHA.
- 3) Differentiate between Bridges and Router.

B) Explain ISO-OSI reference model in detail. 08

Q.5 Attempt Any Two of the following. 16

- a) Explain Parallel and Serial Transmission.
- b) Explain Cyclic Redundancy Check with example.
- c) Differentiate between TCP and UDP.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
PHYSICS (Special Paper - X)
Solid State Physics (22221510)**

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labeled diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Select correct alternative from the following: 10

- 1) The number of lattice points in primitive cell is _____.
a) 2
b) $3/2$
c) 1
d) $1/2$
- 2) Bravais lattice in three dimensions is classified in _____.
a) Three groups
b) seven groups
c) five groups
d) fourteen groups
- 3) The electrical conductivity of the metal is _____.
a) independent of electron density
b) independent of proton density
c) depend upon proton density
d) dependent on electron density
- 4) Bragg's law of X-ray diffraction is _____.
a) $2d \sin \theta = n\lambda$
b) $d \sin \theta = n\lambda$
c) $d^2 \sin \theta = n\lambda$
d) $4d \sin \theta = n\lambda$
- 5) Magnitude of reciprocal lattice vector is equal to _____.
a) d_{hkl}
b) $1/d_{hkl}$
c) $1/*d_{hkl}$
d) d^2_{hkl}
- 6) Superconductor is also called as a _____.
a) bad conductor
b) hole conductor
c) perfect conductor
d) Semiconductor
- 7) Diamagnetic material has _____ magnetic susceptibility.
a) Negative
b) Positive
c) Infinity
d) Zero

- 8) The temperature above which a ferromagnetic material behaves like a paramagnetic material is called _____.
a) Neel point b) Curie point
c) transition point d) cooling point
- 9) The normal conductor become superconductor when _____.
a) its resistance becomes zero
b) its conductivity becomes zero
c) it melts
d) its resistance becomes high
- 10) If $T > 0$ and $E = E_F$ then $F(E) = \underline{\hspace{2cm}}$.
a) 20 % b) 30 %
c) 40 % d) 50 %

B) Give the correct answer and rewrite the following: **06**

- 1) First superconductor was invented at _____ temperature.
- 2) In simple cubic crystal structure total number of lattice points per unit cell is _____.
- 3) Who invented X-ray?
- 4) The relation of Fermi energy (E_f) = _____.
- 5) What is the general relation of magnetic susceptibility?
- 6) In which class of solid material conduction band is completely empty?

Q.2 Solve any eight of the following. 16

- a) What is mean by packing fraction in crystallography?
- b) Draw the neat diagram of BCC structure.
- c) Define free or valance electron of metal?
- d) Write any two properties of paramagnetic materials.
- e) Define reciprocal lattice.
- f) What is forbidden energy gap?
- g) Write any two properties of ferromagnetic materials.
- h) What are the types of ferrites?
- i) What is critical temperature in superconductor?
- j) What are the types of superconductor?

Q.3 A) Attempt the following. (Any Two) 10

- 1) Explain Miller indices. How they are determined?
- 2) Distinguish between insulator, metal and semiconductors
- 3) Define Fermi energy and derive its expression at absolute zero temperature.

B) What is Hall effect? Obtain an expression for Hall voltage. **06**

Q.4 A) Attempt the following. (Any Two) 08

- 1) Explain FCC crystal structure.
- 2) Explain Fermi-Dirac distribution of electron in metal.

- 3) Show that every reciprocal lattice vector is normal to the lattice plane of the crystal lattice.

B) What is ferromagnetic material? Explain hysteresis in ferromagnetic material. **08**

Q.5 Attempt the following. (Any Two) **16**

- a)** Explain powder method of X-ray diffraction for crystal structure.
- b)** What are the types of crystal structure? Explain hexagonal close packed structure.
- c)** What is superconductor? Explain the effect of magnetic field on superconductor.

Seat No.	

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**B.Sc. (Plain) (Semester - V) (New) (CBSC) Examination:
March/April – 2026
CHEMISTRY (Special Paper – X)
Inorganic Chemistry (22221506)**

Day & Date: Thursday, 30-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculator is allowed.

Q.1 A) Select the most correct alternative. 10

- 1) Increase in CFSE _____ the stability of complexes.
 - a) Increases
 - b) Decreases
 - c) first increases then decreases
 - d) Keep same
- 2) According to MOT, in octahedral complex _____ orbitals are non-bonding MOs.

a) a_{1g}	b) t_{1u}
c) t_{2g}	d) e_g
- 3) In nuclear reactor graphite is used as _____.

a) Catalyst	b) Moderator
c) Fuel	d) Coolant
- 4) Nuclear fusion reactions are also called _____ reactions

a) Homonuclear	b) Thermogravimetric
c) Thermoplastic	d) Thermonuclear
- 5) The function of myoglobin is to _____.

a) transport O_2	b) Transport CO_2
c) store O_2	d) store CO_2
- 6) _____ is essential for biological processes.

a) Co	b) Ca
c) Ni	d) Cr
- 7) The substance which increases the efficiency of catalyst is called _____.

a) auto catalyst	b) Poison
c) Promoter	d) Inhibitor

- 8) In the manufacture of ammonia _____ catalyst is used.
- a) V_2O_5 b) Al_2O_3
- c) Pt d) Fe + Mo
- 9) The element ____ is important component of chlorophyll in plants and imparts dark green colour to leaves.
- a) Zn b) Mg
- c) S d) B
- 10) The fertilizers which are directly absorbed by the plant from soil are called _____ fertilizers.
- a) complete b) incomplete
- c) Direct d) indirect

B) Fill in the Blanks:

06

- 1) $^{239}\text{Pu}_{94} + {}^4\text{H}_2 \rightarrow {}^1\text{n}_0 + \underline{\hspace{2cm}}$.
- 2) According to CFT, bonding between metal and ligand is in nature.
- 3) Haemoglobin contains heme units.
- 4) The elements which are absolutely necessary for life processes are elements.
- 5) In of vegetable oil nickel is used as positive catalyst.
- 6) is the most important synthetic organic nitrogenous fertilizer.

Q.2 Solve the following. (Any Eight)

16

- a) What is induced catalysis? Explain with example.
- b) What are limitations of MOT?
- c) Draw the shapes of d- orbitals.
- d) What is the function of calcium in living being?
- e) What is projectile capture - particle emission reaction?
- f) What is induced radioactivity?
- g) Give the advantages of complex fertilizers.
- h) What are qualities of ideal fertilizers?
- i) What are the properties of urea?
- j) Explain esterification using tracer technique.

Q.3 A) Attempt the following. (Any Two)

10

- 1) What is catalysis? Give different types of catalysis.
- 2) Describe the nature of oxygen binding curves for hemoglobin and myoglobin.
- 3) What is crystal field splitting? Explain the splitting in tetrahedral complexes with suitable example.

B) What is a catalyst? Explain the mechanism of catalysis on the basis of adsorption theory.

06

- Q.4 A) Attempt the following. (Any Two) 08**
- 1) Discuss the process of manufacture of ammonium sulphate. Give its advantages and disadvantages.
 - 2) Discuss the factors affecting crystal field splitting.
 - 3) State and explain Jahn - Teller Distortion Theorem with example.
- B) What is nuclear fission? Explain in detail uncontrolled chain reaction with example. 08**
- Q.5 Attempt the following. (Any Two) 16**
- a) Explain the function, structure and working of haemoglobin.
 - b) What is nuclear reaction? Discuss the nuclear fusion reaction in detail.
 - c) What are assumptions of MOT? With the help of MO diagram explain magnetic character and colour of complex ion $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
BOTANY (Special Paper - X)
Genetics (22221502)**

Day & Date: Thursday, 30-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Multiple choice questions: 10

- 1) Mendel worked on ____ plant.
 - a) Maize
 - b) Sunflower
 - c) Pea
 - d) Hibiscus
- 2) When F1 hybrid is crossed back only with double recessive parent is called _____.
 - a) Back cross
 - b) Dominant cross
 - c) Test cross
 - d) Hybrid cross
- 3) When the linked genes inherit in same linkage groups for two or more generations are called _____.
 - a) Incomplete linkage
 - b) Complete linkage
 - c) Mutation
 - d) Crossing over
- 4) The distance between two linked genes is measured in _____.
 - a) Mm
 - b) Cm
 - c) Map unit
 - d) Meters
- 5) Holandric *genes* are present only in _____.
 - a) Males
 - b) Females
 - c) Both a & b
 - d) None of these
- 6) Crossing over in diploid organisms is responsible for _____.
 - a) Dominance of genes
 - b) Linkage between genes
 - c) segregation of allele
 - d) Recombination of linked genes
- 7) Polygenes are also called as _____.
 - a) Multiple genes
 - b) Multiple factors
 - c) Cumulative genes
 - d) All of these
- 8) When two or more nonallelic gene pairs affect the same character in the same way, it is called _____.
 - a) Pleiotropy
 - b) Polygenic inheritance
 - c) Additive expressivity
 - d) Total penetrance

- 9) Extranuclear inheritance is supposed to be controlled by genes present in Cytoplasmic organelles like ____.
- a) Chloroplast b) Mitochondria
- c) Both a & b d) None of these
- 10) When a plant is germinated in dark, plastids remain ____.
- a) Colourless b) Yellow coloured
- c) Green coloured d) None of these

B) Answer the following questions.

06

- 1) Define Back Cross.
- 2) Define coupling and repulsion.
- 3) Define allosomes.
- 4) What is meant by maternal inheritance?
- 5) What is meant by sex chromosomes?
- 6) Enlist the qualitative characters.

Q.2 Solve the following. (Any Eight)

16

- a) Define autosomes.
- b) Define synapsis.
- c) Define complete linkage.
- d) Give the example of cytoplasmic inheritance.
- e) Define Holandric genes.
- f) Enlist the quantitative characters.
- g) Who is considered as Father of Modern Genetics?
- h) Define Law of Independent Assortment.
- i) Which plastid is responsible for green colour development in plants.
- j) Define heterogametic sex.

Q.3 A) Attempt the following. (Any Two)

10

- 1) Describe the balance concept of sex determination in drosophila.
- 2) Describe the process of linkage.
- 3) Describe sex-linked inheritance in man.

B) What are complementary genes? Explain with suitable example.

06

Q.4 A) Attempt the following. (Any Two)

08

- 1) Describe Inheritance of chloroplast genes in *Mirabilis jalapa* with suitable example.
- 2) What is crossing over? Explain mechanism of crossing over.
- 3) What is epistasis? Explain dominant epistasis with suitable example.

B) Write significance of linkage and crossing over.

08

Q.5 Attempt the following. (Any Two)

16

- Write on interaction between cytoplasmic and nuclear genes.
- What are inhibitory genes? Explain with suitable example.
- Describe haemophilia with suitable example.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester – V) (New) (CBSC) Examination:
March/April - 2026
ZOOLOGY (Special Paper - X)
Principles of Genetics (22221514)**

Day & Date: Thursday, 30-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculator is allowed.

Q.1 A) Multiple choice questions. 10

- 1) Genetics is a branch which deals with the study of _____.
a) Relation between plant and environment
b) inheritance and variation
c) cell structure
d) thermal structure
- 2) The geometrical device that helps to find out all the possible combinations of male and female gametes is known as _____.
a) Bateson Square b) Mendel Square
c) Punnett Square d) Mendel's Cube
- 3) When a gene exists in more than one form, the different forms are called _____.
a) Heterozygous b) complementary genes
c) Genotypes d) Allels
- 4) The smallest unit of genetic material which produces a phenotypic effect on mutation is _____.
a) Muton b) Gene
c) Recon d) Nucleic acid
- 5) _____ is known as the "Father of Genetics".
a) Morgan b) Mendel
c) Watson d) Bateson
- 6) Recessive gene can be expressed in _____ condition.
a) Heterozygous b) Homozygous
c) Both the above d) None of these
- 7) A cross between two pairs of alleles is called _____.
a) Linkage b) Dihybrid cross
c) Crossing over d) Monohybrid cross

- 8) _____ enzymes are used to cut the recipient DNA?
 a) endonuclease b) exonuclease
 c) Ligase d) polymerase
- 9) Genetic identity of human male is determined by _____.
 a) cell organelles b) autosome
 c) nucleolus d) sex chromosome
- 10) _____ is the fundamental unit of heredity.
 a) Nucleus b) Gene
 c) Cell d) Golgi complex

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) The _____ plant was used by Mendel for his experiments.
- 2) The transfer of genes from one cell to another by a bacteriophage is known as _____.
- 3) Crossing over is advantageous because it brings about _____.
- 4) Traits controlled by three or more genes are called as _____.
- 5) A chromosome with centromere near the end is called _____.
- 6) A female child in human will have _____ chromosomes.

Q.2 Solve the following. (Any Eight) 16

- a) Down's syndrome.
- b) Define Mendelian law of Inheritance.
- c) Define Mutation.
- d) Give any examples of chemical mutagens.
- e) Give 2 contrasting characters of pea plant.
- f) Define linkage.
- g) What is a Bar body.
- h) Codominance.
- i) Transformation.
- j) Sex determination.

Q.3 A) Attempt any Two of the following. 10

- 1) Describe frame shift mutation.
- 2) Describe mechanism of sex determination in human.
- 3) Describe mechanism of crossing over.

B) Describe mechanism symptoms and treatment of Down's syndrome. 06

Q.4 A) Attempt any Two of the following. 08

- 1) Describe Somatic cell Hybridization.
- 2) Discuss Mendelian Laws of inheritance.
- 3) Process of conjugation in Bacteria.

B) Describe/Explain/Solve 08

Describe inheritance of Blood group.

Q.5 Attempt any Two of the following.

16

- a)** Describe Erythroblastosis foetalis.
- b)** Discuss on transposons in bacteria.
- c)** Describe different types of Chromosomes.

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85	1
86	1
87	1
88	1
89	1
90	1
91	1
92	1
93	1
94	1
95	1
96	1
97	1
98	1
99	1
100	1

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
MATHEMATICS (Special Paper - X)
Complex Analysis (22221518)**

Day & Date: Thursday, 30-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative for each of the following. 10

- 1) $\int_L |dz|$ where L is any rectifiable arc joining the point $z = a$ and $z = b$ is equal to _____.

- a) $|b - a|$ b) $b - a$
c) arc length of L d) $|a + b|$

- 2) If L is a circle $|z| = 1$ then $\int_L \bar{z} dz = \underline{\hspace{2cm}}$
- a) πi b) $2\pi i$
c) $-\pi i$ d) $-2\pi i$

- 3) When $0 < |z| < 4$ the expansion of $\frac{i}{4z-z^2}$ is _____.

- $$\begin{array}{ll} \text{a)} & \sum_{n=0}^{\infty} \frac{z^{n-1}}{4^{n+1}} \\ \text{b)} & \sum_{n=0}^{\infty} \frac{z^{n+1}}{4^{n+1}} \\ \text{c)} & \sum_{n=0}^{\infty} (-1)^n \frac{z^{n-1}}{4^{n+1}} \\ \text{d)} & \sum_{n=0}^{\infty} (-1)^n \frac{z^{n+1}}{4^{n+1}} \end{array}$$

- 4) Which of the following not correct for analytic function $f(z)$ and $g(z)$ in a region G ?

- a) $f(z) + g(z)$ is analytic in G
b) $f(z) - g(z)$ is analytic in G
c) $f(z) \cdot g(z)$ is analytic in G
d) $f(z)/g(z)$ is analytic in G

- 5) If $u = x^3 - 3xy^2$, find the analytic function is _____.

- a) $f(z) = z^4 + c$ b) $f(z) = \overline{z^2 + c}$
c) $f(z) = z^3 + c$ d) $f(z) = \frac{z^3}{3} + c$

- 6) A conjugate function $u(x, y) = e^x \sin y$ is _____.
 a) $-e^x \cos y$ b) $e^x \cos y$
 c) $e^y \cos x$ d) $-e^y \cos x$
- 7) The residue of $\frac{z^3}{(z-1)(z-2)(z-3)}$ at $z = 2$ is _____.
 a) 8 b) 6
 c) -8 d) -6
- 8) The residue of function $\frac{1}{(z^2+1)^3}$ at $z = i$ is _____.
 a) $-\frac{3}{16i}$ b) $\frac{3}{16i}$
 c) $\frac{3i}{16}$ d) $\frac{3}{16}$
- 9) The residue of a function $f(z)$ at $z = \infty$ is given by _____.
 a) $\lim_{z \rightarrow 0} z f(z)$ b) $\lim_{z \rightarrow \infty} z f(z)$
 c) $\lim_{z \rightarrow 0} (-z + (z))$ d) $\lim_{z \rightarrow \infty} (-z + (z))$
- 10) If $f(z) = \frac{e^z}{z^2(z^9+9)}$ Res. $f(z)$ at $z = -3i$ is _____.
 a) $\frac{e^{-3i}}{54i}$ b) $-\frac{e^{-3i}}{54i}$
 c) $\frac{e^{3i}}{54i}$ d) $-\frac{e^{3i}}{54i}$

B) Fill in the blanks.**06**

- 1) The function $f(z) = \frac{1}{\sin(\pi/z)}$ has _____ singularity at $z = 0$
- 2) A curve $z(t) = x(t) + y(t)i$, $\alpha \leq t \leq \beta$, is called Jordan arc if $t_1 \neq t_2 \Rightarrow$ _____.
- 3) If $f(z) = u + iv$ be an analytic function of $z = x + iy$, then the families of curve $u = \text{constant}$, $v = \text{constant}$ are _____ to each other.
- 4) An analytic function with constant modulus is _____.
- 5) Residue $\frac{z^2}{(z^2+1)^2}$ at $z = i$ is _____.
- 6) The principle part of a Laurent's expansion of $f(z)$ contains only in terms so that $f(z) = \sum_{n=0}^{\infty} a_n(z-a)^n + \sum_{n=1}^{\infty} b_n(z-a)^{-n}$, where $b_n =$ _____.

Q.2 Attempt the following. (Any Eight)**16**

- a) If $w = f(z) = u + iv$ analytic, region in R then prove that $\frac{\partial w}{\partial x} = -i \frac{\partial w}{\partial y}$
- b) Construct the analytic function $f(z) = u + iv$, where $u = \sin x \cdot \cosh y$
- c) If $f(z)$ and $g(z)$ are analytic function in a domain D then prove that $\frac{d}{dz}(f(z) \cdot g(z)) = f(z) \cdot \frac{d}{dz} g(z) + g(z) \cdot \frac{d}{dz} f(z)$
- d) Find the residue of $\frac{z+1}{z^2(z-3)}$ at $z = 0$
- e) Find the residue of $\operatorname{cosec} z$
- f) Evaluate Residue of $\frac{z^3}{(z-1)(z-2)(z-3)}$ at $z = \infty$
- g) Evaluate $\int_L \frac{dz}{(z-a)}$ where L represent a circle $|z-a| = r$
- h) Evaluate the integral $\int_0^{1+i} (x-y+ix^2) dz$
- i) Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in region $1 < |z| < 3$
- j) What kind of singularity $\sin z - \cos z$ at $z = \infty$

Q.3 A) Attempt the following. (Any Two)**10**

- a) If $u + v = \frac{2 \sin 2x}{e^{2y} + e^{-2y} - 2 \cos 2x}$ is an analytic function. Find $f(z)$ in terms of z .
- b) Evaluate $\int_0^\pi \frac{d\theta}{a + b \cos \theta}$ if $a > b > 0$
- c) Evaluate $\int_{(0,1)}^{(2,5)} (3x+y)dx + (2y-x)dy$ along the curve
- $y = x^2 + 1$
 - Straight line joining $(0,1)$ to $(2,5)$

B) Prove that Polar form of Cauchy-Riemann equation.**06****Q.4 A) Attempt the following. (Any Two)****08**

- a) Obtain the Taylor's and Laurent's series for the function $\frac{(z^2-1)}{(z+2)(z+3)}$ valid for
- $|z| < 2$
 - $2 < |z| < 3$
- b) Evaluate $\int_c \frac{e^z}{z(z-1)^2} dz$ where c is circle $|z| = 2$
- c) Show that the function $f(z)$ is not regular at origin but C.R. equations are satisfied at the point $f(z) = \sqrt{|xy|}$

B) State and prove Cauchy's Residue theorem.**08**

Q.5 Attempt the following. (Any Two)

- a) Expand $\frac{1}{z(z^2-3z+2)}$ for the region
- i) $0 < |z| < 1$
 - ii) $1 < |z| < 2$
 - iii) $|z| > 2$
- b) Prove that necessary and sufficient condition that, $w = f(z) = u + iv$ be analytic in region R is that C.R. equations $u_x = v_y$, $u_y = -v_x$ are sufficient in R where suppose that the derivative continuous in R .
- c) Prove that $\cosh\left(z + \frac{1}{z}\right) = a_0 + \sum_{n=1}^{\infty} a_n \left(z^n + \frac{1}{z^n}\right)$ where
- $$a_n = \frac{1}{2\pi} \int_0^{2\pi} \cosh(2 \cos \theta) \cdot \cos n\theta \, d\theta$$

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
STATISTICS (Special Paper - X)
Probability Distributions (22221521)**

Day & Date: Thursday, 30-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions.

10

- Multiple choice questions:
- Let (X, Y) is $BN(0, 0, \sigma_1^2, \sigma_2^2, \rho)$ and suppose $U = \frac{X}{Y}$ and $V = Y$ then the marginal distribution of U is _____.
 - Cauchy
 - Normal
 - Lognormal
 - Laplace
 - If $X \rightarrow \text{Laplace}(\mu, \lambda)$ with p.d.f. $f(x) = \frac{1}{2\lambda} e^{-\frac{1}{\lambda}|x-\mu|}$ $\lambda > 0, |\mu|, |x|$; mean = _____.
 - λ
 - μ
 - λ^2
 - None of these
 - If X is a Pareto (α, β) r.v., then the its c.d.f. is _____.
 - $1 + \left(\frac{\beta}{x}\right)^\alpha$
 - $1 - \left(\frac{\beta}{x}\right)^\alpha$
 - $1 + \left(\frac{\beta}{x}\right)$
 - $1 - \left(\frac{\beta}{x}\right)$
 - If $X \sim B(1, P)$, Suppose X is truncated at $X = 0$ then $V(X) =$ _____.
 - 1
 - 0
 - pq
 - None of these
 - Let (X, Y) is $BN(3, 2, 4, 9, 0.5)$ then $Cov(X, Y) =$ _____.
 - 0
 - 1
 - 2
 - 3
 - Median of logistic distribution with parameter μ, σ^2 is _____.
 - μ
 - σ^2
 - $\mu + \sigma^2$
 - None of these
 - Mean of truncated Poisson distribution truncated at $X = 0$ is _____.
 - 0
 - $1 - e^{-\lambda}$
 - λ
 - $\frac{1}{1 - e^{-\lambda}}$

- 8) If X, Y are iid exp (λ) random variables then $Z = X - Y$ has _____ distribution.
- a) Exponential b) Laplace
c) Lognormal d) Cauchy
- 9) If X is a Pareto α, β random variables then, then $E(X) =$ _____
- a) $\frac{\alpha\beta}{\beta-1}$ b) $\frac{\alpha\beta}{\beta+1}$
c) $\frac{\alpha\beta}{\alpha-1}$ d) $\frac{\alpha\beta}{\beta+1}$
- 10) If X is Cauchy (μ, λ) then its quartile deviation is = _____.
- a) μ b) λ
c) $\mu + \lambda$ d) $\mu - \lambda$

B) Fill in the blank.

06

- 1) The Median of Cauchy distribution is _____.
- 2) If $X \sim W(1,1)$ then the distribution function is _____.
- 3) The nature of Pareto distribution is _____.
- 4) If $X \sim N(\mu, \sigma^2)$ then e^x has _____.
- 5) The distribution function of truncated exponential distribution is _____.
- 6) If $X \sim W(\alpha, \beta)$ then $\frac{X}{\alpha} \sim$ _____.

Q.2 Solve any eight of the following.

16

- State p. d. f. of normal distribution truncated to the right above ' b '.
- State p. d. f. of Weibull distribution with parameters (α, β) .
- If X is Cauchy (μ, λ) write expressions for Q_1 and Q_3 .
- Write the coefficient of skewness and kurtosis of Laplace distribution.
- Write the first four raw moments of Log - Normal distribution
- State the p. m. f. of truncated exponential distribution truncated at $x = 0$
- What is the p. d. f. of Pareto distribution, When $\alpha = \beta = 1$?
- Sketch Probability curve of Laplace distribution with proper notations.
- State the p. d. f. of Logistic distribution with parameters (μ, σ) .
- State p. m. f. of truncated Poisson distribution at $X = 0$

Q.3 A) Attempt any Two of the following.

10

- Explain the Relationship Between Cauchy distribution and Uniform distribution.
- Find Distribution function of Pareto Distribution.
- Derive the p. m. f. of truncated Binomial distribution to truncated at $x = 0$.

B) Let $Y = X_1 - X_2/2$ where, X_1 and X_2 are i.i.d. χ^2 variate with two degrees of freedom. Show that Y has double exponential distribution.

06

Q.4 A) Attempt any Two of the following. 08

- a) Find means of Bivariate normal distribution.
- b) If $X \sim N(\mu, \sigma^2)$ then show that e^x has Log - Normal distribution.
- c) Derive p. d. f. of truncated Normal distribution truncated to the both sides.

B) Let $X \sim Lap(\mu, \lambda)$ then find its mean and variance. 08

Q.5 Attempt any Two of the following. 16

- a) Find mean and variance of logistic distribution.
- b) Derive p. d. f. of truncated normal distribution to the left below 'a'. Also find mean of truncated normal distribution to the left below 'a'.
- c) If X and Y are independent random variable each following $N(0, 2)$, Then prove that $Z = \frac{X}{Y}$ follows Cauchy Distribution.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
GEOLOGY (Special Paper - X)
Hydrogeology (22221526)**

Day & Date: Thursday, 30-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Multiple Choice Question.**10**

- 1) The capacity of rocks to transmit water is called?
 - a) Porosity
 - b) Permeability
 - c) Specific yield
 - d) Transmissivity
- 2) Which type of aquifer is bounded above and below by impermeable layers?
 - a) Unconfined
 - b) Confined
 - c) Perched
 - d) Leaky
- 3) The zone in which all the pores are completely filled with water is called?
 - a) Zone of aeration
 - b) Zone of saturation
 - c) Capillary zone
 - d) Vadose zone
- 4) Darcy's law relates discharge to _____.
 - a) Porosity
 - b) Hydraulic gradient
 - c) Specific retention
 - d) Evapotranspiration
- 5) Which geophysical method is most widely used to locate groundwater?
 - a) Gravity survey
 - b) Magnetic survey
 - c) Resistivity survey
 - d) Seismic survey
- 6) Vesicles in Basalt act as _____.
 - a) Secondary porosity
 - b) Primary porosity
 - c) Porosity
 - d) Inter granular spaces
- 7) Infiltration capacity depends mainly on _____.
 - a) Soil type
 - b) Slope of land
 - c) Wind speed
 - d) Temperature
- 8) Shear zone in sandstone act as _____.
 - a) Secondary porosity
 - b) Primary porosity
 - c) Porosity
 - d) Fault

- 9) Rock formation below the water table is said to be ____.
- a) Dry b) Aquifer
- c) Saturated with water d) Aquitard
- 10) An impermeable formation that may contain water but it is incapable of transmitting it in significant quantities is described as ____.
- a) Confined aquifer b) Aquiclude
- c) Aquitard d) Aquifuge

B) Answer the following questions in a one sentence / Fill in the blanks. 06

- 1) What is meteoric water?
- 2) Define permeability?
- 3) Define hydrogeology?
- 4) The percentage of a rock's total volume that is taken up by pore space is called ____.
- 5) A local water table positioned above the regional water table is ____.
- 6) Which of the following methods is commonly used for determining the hydraulic conductivity of an aquifer in the field?

Q.2 Solve of the following. (Any Eight) 16

- a) What is juvenile water? Give an example.
- b) Define piezometric surface.
- c) What is a hot spring? Give an example.
- d) Define groundwater basin?
- e) What is Aquifer? What type of rock is a good aquifer?
- f) What is confined aquifer?
- g) What is Intrinsic permeability?
- h) Define Specific retention.
- i) How to control ground water depletion?
- j) What is the full form of TDS in hydrogeology?

Q.3 A) Attempt of the following. (Any Two) 10

- 1) Describe the Leaky aquifer with draw labelled diagram.
- 2) Describe rock properties affecting on groundwater.
- 3) What is porosity and its types of porosity?

B) Write a note on Specific retention and Specific yield? **06**

Q.4 A) Attempt of the following. (Any Two) 08

- 1) Describe any two methods of ground water recharge.
- 2) Describe the role of slope and vegetation in ground water.
- 3) Define spring and describe types of spring with diagram?

B) Write a note on vertical distribution of ground water. 08

Q.5 Attempt of the following. (Any Two)**16**

- a)** What are the different types of rocks that can be identified on the aerial photographs and the satellite imageries? Explain how to use them for the groundwater explorations.
- b)** What are the geophysical methods for groundwater exploration?
- c)** Define watershed. Explain geological aspects of watershed development and management.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
MICROBIOLOGY (Special Paper - X)
Agricultural Microbiology (22221530)**

Day & Date: Thursday, 30-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.
4) Use of log tables and calculators are allowed.

Q.1 A) Choose the correct alternative and rewrite the sentence again. 10

- 1) _____ is the major component of the Bordeaux mixture.

a) Sodium chloride	b) Copper sulphate
c) Calcium chloride	d) Magnesium sulphate
- 2) The crystal proteins are _____ which require proteolytic conversion into smaller toxic peptides in the midgut of insects produced by *Bacillus thuringiensis*.

a) α toxin	b) γ toxin
c) β toxin	d) δ toxin
- 3) The root nodules of legumes contain a pink colored pigment which have more affinity to oxygen is called as _____.

a) Haemoglobin	b) Leghaemoglobin
c) Bilirubin	d) Nodhaemoglobin
- 4) _____ is the main process of soil formation.

a) Weathering of rocks	b) Photosynthesis
c) Combustion	d) Animal activity
- 5) The Minerals are abundant in the _____ of soil.

a) Horizon C	b) Horizon A
c) Horizon D	d) Horizon B
- 6) *Ustilago scitaminae* is the causative agent of _____ disease.

a) Citrus canker	b) Bacterial blight
c) Whip smut of sugar cane	d) Soft rot of potato
- 7) _____ is a green manure crop.

a) Sesbania	b) Rice
c) Oat	d) Maize

- 8) The Species of *Thiobacillus* and *Beggiatoa* play an important role in the ____ cycle.
- | | |
|---------------|-------------|
| a) Carbon | b) Nitrogen |
| c) Phosphorus | d) Sulfur |
- 9) The transformation of nitrates to gaseous nitrogen is accomplished by microorganisms in a series of biochemical reactions is known as ____.
- | | |
|----------------------|--------------------|
| a) Nitrification | b) Denitrification |
| c) Nitrogen fixation | d) Ammonification |
- 10) ____ an enzyme plays an active role in lignin breakdown.
- | | |
|--------------|------------------|
| a) Laccase | b) Pectinase |
| c) Cellulase | d) Hemicellulase |

B) Write True or False:**06**

- 1) Phosphorus is often a limiting nutrient in aquatic ecosystems.
- 2) Microorganisms produce cellulose enzymes to dissolve the middle lamella, which acts as the "glue" between plant cells, leading to tissue softening or rot.
- 3) All microorganisms present in the soil are beneficial & nonpathogenic.
- 4) The density of microorganism is higher at phyllosphere than rhizosphere.
- 5) The Xylanases, mannanases, and arabinosidases play vital role in degrading hemicellulose.
- 6) Human activities like burning fossil fuels significantly impact the sulphur cycle by releasing sulphur dioxide into the atmosphere.

Q.2 Solve any eight of the following.**16**

- a) What is PSB? Enlist any two names.
- b) Define FYM.
- c) What are the symptoms of whip smut of sugarcane?
- d) Enlist types of soil.
- e) What is DDT?
- f) Enlist any two names of non-symbiotic nitrogen fixers.
- g) Define soil as a ecosystem.
- h) Define compost.
- i) What is humus?
- j) Enlist applications of *Trichoderma viridae*.

Q.3 A) Write any Two of the following.**10**

- 1) Explain in detail causative agent, symptoms and control of oily spots of pomegranate.
- 2) Describe in detail degradation of lignin.
- 3) What are genetically modified crops? Explain in brief any two examples.

B) Give a detailed account on vermicomposting. Add a note on its applications.**06**

Q.4 A) Attempt any Two of the following. 08

- 1) Discuss in detail *Bacillus thuriengensis* as a bio insecticide.
- 2) Write a note on composition, production & significance of green manure.
- 3) Describe in detail role of microorganisms in carbon cycle.

B) Explain in short structure and properties of soil. 08

Q.5 Attempt any Two of the following. 16

- a) Describe in detail microbial degradation of cellulose.
- b) Explain in detail mechanism and steps involved in nitrogen fixation by *Rhizobium*.
- c) Describe in detail chemical and biological control measures used in controlling plant disease.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
ELECTRONICS (Special Paper - X)
Fundamentals of Microcontroller (22221538)**

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculator is allowed.

Q.1 A) Chose correct *alternative* and rewrite the sentence **10**

- 1) On chip RAM capacity of 8051 micro-controller is _____.
a) 512 bytes b) 256 bytes
c) 1024 bytes d) 128 bytes
- 2) For accessing data from external memory _____ is used as a memory pointer.
a) DPTR b) PC
c) R1 and R2 d) SP
- 3) The 8051 microcontroller contains _____.
a) Two 8-bit timer/counter b) Two 16-bit timer/counter
c) One 8-bit timer/counter d) One 16-bit timer/counter
- 4) _____ SFR is used for receive and sends the serial data.
a) ACC b) TCON
c) SBUF d) SCON
- 5) _____ of the microcontroller 8051 can be used as lower order address/data bus.
a) Port-2 b) Port-1
c) Port-3 d) Port-0
- 6) MOV @R₀, A is an example of _____ addressing mode.
a) Indirect b) Direct
c) Immediate d) Branch
- 7) The width of stack pointer is _____ bit.
a) 16 b) 8
c) 10 d) 12
- 8) The timer/counter is configuring in various mode by using _____ SFR.
a) PCON b) TCON
c) TMOD d) SCOD

- 9) AJMP is a _____ byte instruction.
- a) One b) Three
- c) Four d) Two
- 10) Upon reset all ports are configured as _____.
- a) input ports b) output ports
- c) input and output ports d) all of these

B) Answer in one word

06

- 1) Full form of TMOD.
- 2) The SFR address of Port- 1 is.
- 3) The width of DPTR SFR is.
- 4) The on-chip ROM capacity of 8051 controller is.
- 5) The addressing mode of MOV A, R₃ instruction is.
- 6) The standard clock frequency for 8051-controller is.

Q.2 Solve any eight of the following.

16

- a) Compare micro-controller and micro-processor (any two points).
- b) Give the result of XORing of 0F H and 3C H data.
- c) Give the roll of ALE pin of 8051-controller.
- d) Give the significance of $\overline{EA}$ pin.
- e) State any four instruction of an indirect addressing mode of 8051-controller.
- f) Enlists the SFR essential for serial communication in 8051 controllers.
- g) What is the difference between 8051 and 8052 microcontrollers?
- h) State any four-bit wise or Boolean instruction of 8051-controller.
- i) Draw the structure of TMOD register of 8051 controllers.
- j) State the function of RS₀ and RS₁ bits of PSW SFR of 8051.

Q.3 A) Attempt any Two of the following.

10

- 1) Write a note on flag structure of the 8051-controller.
- 2) Explain TCON SFR of 8051-controller.
- 3) List any four short jump instructions and explain any one of them.

B) Explain on chip RAM organization of 8051-microcontroller.

06

Q.4 A) Attempt any Two of the following.

08

- What is an instruction? Explain any three logical group of instructions.
- State salient feature of 8051 -microcontroller.
- Explain alternative functions of port-3.

B) With suitable flow-chart write ALP to transfer the block of 10 location from internal memory to external memory.

08

Q.5 Attempt any Two of the following.

16

- a)** What is the addressing mode? Explain addressing modes of 8051 microcontroller with its examples.
- b)** Write ALP to transmit word "EXAM" serially with baud rate 9600 continuously.
- c)** Draw the functional block diagram of 8051. Explain TMOD SFR.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
COMPUTER SCIENCE (Special Paper - X)
Advanced Java (22221534)

Day & Date: Thursday, 30-04-2026
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculator is allowed.

Q.1 A) Multiple Choice Question. 10

- 1) Which interface helps in navigating and reading database records?
 - a) ResultSet
 - b) Statement
 - c) Connection
 - d) DriverManager
- 2) Which of the following is not a type of JDBC driver?
 - a) JDBC-ODBC Bridge
 - b) Native-API Driver
 - c) Network Protocol Driver
 - d) XML Driver
- 3) Which method is used to initialize servlet?
 - a) init()
 - b) start()
 - c) initServlet()
 - d) run()
- 4) What is the role of RequestDispatcher?
 - a) Connects to database
 - b) Handles sessions
 - c) Forwards request to another resource
 - d) Reads cookies
- 5) Which method is used to write output in JSP?
 - a) out.print()
 - b) response.write()
 - c) page.write()
 - d) writer.print()
- 6) Which is a valid JSP directive?
 - a) <%@ page %>
 - b) <%@ import %>
 - c) <%@ taglib %>
 - d) All of the above
- 7) Which annotation is used for Hibernate Entity?
 - a) @Table
 - b) @Entity
 - c) @Column
 - d) @Bean
- 8) What does Spring ORM support?
 - b) JDBC
 - c) JPA
 - b) Hibernate
 - d) All of the above

- 9) In Spring, which class is used for JdbcTemplate?
 - a) JdbcHandler
 - b) JdbcTemplate
 - c) SimpleJdbc
 - d) TemplateJDBC
- 10) Which annotation is used for constructor injection?
 - a) @Autowired
 - b) @Inject
 - c) @Constructor
 - d) @Component

B) Fill in the blanks.

06

- 1) _____ the package for servlet API.
- 2) _____ Servlet method that handles both GET and POST.
- 3) _____ JSP tag for Java declaration.
- 4) _____ Statement used for parameterized queries.
- 5) _____ Hibernate file to define mappings.
- 6) _____ Spring module for database operations.

Q.2 Solve the following (Any Eight)

16

- a) Explain JDBC driver types with advantages and disadvantages.
- b) Describe steps to connect Java application with database using JDBC.
- c) Explain servlet request and response process.
- d) Describe difference between GenericServlet and HttpServlet.
- e) Explain session tracking using Hidden Form Fields.
- f) What is a Java Bean? How is it used in JSP?
- g) Explain architecture of JSP.
- h) Describe Hibernate annotations with example.
- i) Explain constructor injection with example.
- j) Explain Spring JDBC with JdbcTemplate example.

Q.3 A) Attempt the following (Any Two)

10

- 1) Explain cookies with their advantages and disadvantages.
- 2) Describe JSP implicit objects with examples.
- 3) Explain Hibernate application development steps.

B) Write a short note on Spring MVC.

06

Q.4 A) Attempt the following (Any Two)

08

- 1) Describe different JDBC statements and their uses.
- 2) Explain JSP tag elements with examples.
- 3) Explain Spring ORM and how it integrates with Hibernate.

B) Explain Spring annotations with examples and advantages.

08

Q.5 Attempt the following (Any Two)

16

- Create a JDBC application using PreparedStatement.
- Write a JSP page using JSTL SQL tag to retrieve database records.
- Create a simple CRUD application using Hibernate and Spring Boot.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
PHYSICS (Special Paper - XI)
Classical Mechanics (22221511)

Day & Date: Saturday, 02-05-2026
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Use of logarithmic table and calculators is allowed.
 4) Draw neat diagrams wherever necessary.

Q.1 A) Multiple choice questions. 10

- 1) Any rigid body having large number of particles has _____ degrees of freedom.

a) 2	b) 3
c) 5	d) 6
- 2) In conservative force field _____ remains constant.

a) Linear momentum	b) angular momentum
c) energy	d) Both (a) and (b)
- 3) In northern hemisphere, due to Coriolis force, cyclone deflects towards _____.

a) North	b) South
c) East	d) West
- 4) In absence of resistance; the range of projectile is _____.

a) $2uv/g$	b) uv/g
c) $uv/2g$	d) $2v/g$
- 5) In the symmetric mode of oscillations, the particles are always _____.

a) In phase	b) out of phase
c) with constant phase	d) in opposite phase
- 6) In rigid body motion, the quantities I_{XY} , I_{YZ} , I_{ZX} are called _____.

a) Moment of inertia	b) Product of inertia
c) measured inertia	d) tensor
- 7) The energy transfer from an oscillator to its coupled partner is periodic and takes place with the period _____.

a) $T = \frac{2\pi}{\omega_1 - \omega_2}$	b) $T = \frac{3\pi}{\omega_1 - \omega_2}$
c) $T = \frac{5\pi}{\omega_1 - \omega_2}$	d) $T = \frac{4\pi}{\omega_1 - \omega_2}$

- 8) If a particle is at rest in a rotating frame of reference, the Coriolis force acting on it is _____.
 - a) Zero
 - b) minimum
 - c) maximum
 - d) infinity
- 9) A rigid body in motion can be completely specified if it's _____.
 - a) Position and orientations are given
 - b) Only positions is given
 - c) Only orientations are given
 - d) All of the above
- 10) When two particles are in motion in a plane then it will have _____ degrees of freedom.
 - a) 1
 - b) 2
 - c) 3
 - d) 4

B) Fill in the blanks:

06

- 1) When torque acting on a system of particles is constant, its _____ is conserved.
- 2) Lagrangian function is given by $L = \text{_____}$.
- 3) Along the equator, the effect of Coriolis force is _____.
- 4) Motion of a simple pendulum is an example of _____ constraint.
- 5) The shortest distance between any two points in space is _____.
- 6) If force acting on a particle is zero, its _____ remains constant.

Q.2 Answer the following. (Any Eight)

16

- a) Define pseudo force and give its one example.
- b) State and prove conservation theorem for linear momentum of a particle
- c) What is inertial frame of reference? Give one example of it.
- d) State Hamilton's principle.
- e) What are degrees of freedom?
- f) What is Centripetal force?
- g) What is a rigid body?
- h) State principle of virtual work.
- i) State Euler's theorem
- j) Define centre of mass of a system of particles.

Q.3 A) Answer the following. (Any Two)

10

- 1) State and prove Brachistochrone problem.
- 2) Show that the total angular momentum of a system of particles is equal to the sum of angular momentum of centre of mass about origin and angular momentum of any other particle about centre of mass.
- 3) Obtain angular momentum of a rigid body.

B) Write a note on normal modes and normal coordinates of coupled oscillatory system.

06

- Q.4 A) Answer the following. (Any Two) 08**
- 1) Obtain an expression for kinetic energy of a rigid body in component form.
 - 2) Explain the energy transfer mechanism in coupled oscillatory system.
 - 3) Explain the concept of minimum surface of revolution is catenary.
- B) Show that the angular acceleration of a particle is same in fixed and rotating coordinate system 08**
- Q.5 Answer the following. (Any Two) 16**
- a) State and explain D'Alembert's principle and obtain Lagrange's equations from it.
 - b) What is projectile motion? Derive an expression for time of flight of a projectile in resistive and non-resistive medium.
 - c) What is Coriolis force? Explain the effect of Coriolis force on a body falling freely under the action of gravity.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026**

**CHEMISTRY (Special Paper - XI)
Organic Chemistry (22221507)**

Day & Date: Saturday, 02-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Chart of spectroscopic data supplied by university is allowed.

Q.1 A) Multiple choice questions: 10

- Mass spectroscopy is a _____.
a) Low pressure technique b) Low temperature technique
c) High pressure technique d) All of these
- The complex formed in Reformatsky reaction is _____.
a) organozinc compound b) organomagnesium compound
c) organolithium compound d) organoborane compound
- In NMR spectroscopy _____ radiations are used.
a) UV b) IR
c) radiofrequency d) visible
- The number of fundamental modes of vibrations for a non-linear molecule is calculated by formula _____.
a) $3N-6$ b) $3N-5$
c) $3N-4$ d) $3N$
- Tautomerism is shown by _____.
a) chloroform b) ethyl acetoacetate
c) acetic acid d) Grignard reagent
- _____ is highly stable isomer.
a) cyclopropane b) cyclobutene
c) cyclopentane d) cyclohexane
- The ratio of signifying a doublet is, _____.
a) 1:1 b) 1:2
c) 1:3 d) 1:4
- In Oppenauer oxidation reaction, alcohol is converted into _____.
a) acid b) ketone
c) amine d) alkene

- 9) Condensation of EAA with urea in presence of phosphoryl chloride gives _____.
a) antipyrine _____ b) crotonic acid
c) cinnamic acid d) 4-methyl uracil
- 10) The number of signals given by compound $\text{CH}_3\text{-CH}_2\text{-Cl}$ in NMR spectrum is _____.
a) 1 b) 2
c) 3 d) 4

B) Fill in the blank.

06

- 1) In _____ spectroscopy, gaseous organic molecule is bombarded with high energy electrons.
- 2) According to Sachse-Mohr theory, strainless ring acquires _____ structure.
- 3) Vibrational frequency of a band can be calculated by using _____ law.
- 4) The m/e of methanol is observed at _____.
- 5) Baeyer's strain theory is based on the assumption that cycloalkanes have _____ structure.
- 6) Ethyl aceto acetate at equilibrium exists as _____ form.

Q.2 Solve any eight of the following.

16

- a)** How will you distinguish the following compounds by using IR spectroscopy
- i) $\text{CH}_3\text{-CH}_2\text{-NH}_2$
 - ii) $\text{CH}_3\text{-CH}_2\text{-CN}$
- b)** Write the reagents for the following conversion and name the reaction.



- c) Give reaction of hydroxyl amine with ethyl aceto acetate.
- d) Define equivalent and non-equivalent protons with suitable example
- e) Draw boat conformation of cyclohexane and label the hydrogen.
- f) Define Molecular ion peak with example.
- g) What is meant by ring flipping or ring inversion in case of cyclohexane?
- h) Define stereo specific and stereo selective reactions.
- i) Assign the structure of following compound by using IR data
Mol. formula: C_3H_6O
IR: 1700 cm^{-1}
- j) Define coupling constant with suitable example.

Q.3 A) Attempt any Two of the following.

10

- 1) Explain MPV reduction with mechanism.
- 2) Explain the term locking of conformation with suitable example.
- 3) Discuss the applications of Mass spectroscopy

B) Write a note on Stobbe condensation reaction and give its application. **06**

Q.4 A) Attempt any Two of the following. **08**

- 1) Discuss stability of conformations of cyclohexane with energy profile diagram.
- 2) Assign the structure for the following compound using spectral data:
 Molecular formula: $C_9H_{10}O_2$
 IR: 1740, 1240, 750, 695 cm^{-1}
 PMR: 1.96 δ (3H, s), 5.1 δ (2H, s), 7.10 δ (5H, s)
- 3) How will you prepare the following from Diethyl malonate
 - i) Alanine (α -amino acid)
 - ii) Barbituric acid

B) Write a note on Baeyer's strain theory **08**

Q.5 Attempt any Two of the following. **16**

- a)** What is reactive methylene group? How will you prepare the following from EAA?
 - i) Ethyl-2-ethyl acetoacetate
 - ii) Crotonic acid
 - iii) 4-Methyl uracil
- b)** Highly branched primary alkyl halide A [$C_5H_{11}Br$] on alkaline hydrolysis in the presence of AgOH forms tertiary alcohol B [$C_5H_{12}O$]. It does not form expected primary alcohol C [$C_5H_{12}O$]. Identify A, B and C. Write the reaction and name it.
- c)** Assign the structure of following compounds by using spectral data:
 - i) Molecular formula: C_4H_8O ,
 $m/e = 72$, IR = 1720 cm^{-1} ,
 PMR – δ 1.05 (triplet, 3H), δ 1.10 (single, 3H), δ 2.50 (quarter, 2H)
 - ii) Molecular formula: C_7H_8O ;
 PMR: 3.7 δ (1H, s, broad), 4.4 δ (2H, s), 7.27 δ (5H, s)

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026**

**BOTANY (Special Paper - XI)
Molecular Biology (22221503)**

Day & Date: Saturday, 02-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) All questions carry equal marks.
3) Draw neat labelled diagrams whenever necessary.
4) Figures to the right indicate full marks.

Q.1 A) Rewrite the following sentences by choosing correct alternative. 10

- 1) _____ type of sugar attach to the DNA helix in with the phosphorus.
 - a) Mannose
 - b) Pentose
 - c) Ribose
 - d) Glucose
- 2) Reconstruction of DNA at low temperature is called _____ DNA.
 - a) Renaturation
 - b) Melting
 - c) Replication
 - d) Denaturation
- 3) _____ enzyme play important role in the winding strand of the DNA unwind.
 - a) Topo-I
 - b) Pol-I
 - c) Exonuclease
 - d) Helicase
- 4) The _____ type of DNA present in E.Coli bacterium.
 - a) Circular
 - b) Leptate
 - c) Double Helix
 - d) None of these
- 5) The sequence of structural genes in the lac Operon is _____.
 - a) lac---A lac---Z lac lac—Y
 - b) lac---Z lac---Y lac---A
 - c) lac—Z lac---A lac---Y
 - d) Lac—A Lac—Y lac---Z
- 6) Which ribosomal subunit is commonly associated with the initiation of protein synthesis in prokaryotes?
 - a) 70 S ribosome
 - b) 50 S ribosome
 - c) 30 S ribosome
 - d) 28 S ribosome
- 7) _____ is the main enzyme of transcription.
 - a) DNA dependent DNA Polymerase
 - b) DNA dependent RNA polymerase
 - c) RNA dependent RNA polymerase
 - d) RNA dependent DNA polymerase

- 8) The energy required for charging of t RNA IS _____.
 - a) GTP
 - b) ATP
 - c) AMP
 - d) ADP
- 9) Post translation modification of protein occur primarily in which _____ cellular compartment.
 - a) Endoplasmic reticulum
 - b) Nucleus
 - c) Cytoplasm
 - d) Golgi apparatus
- 10) Acetylation is a post translation modification _____ involves the addition of an acetyl group to specific amino acid in proteins.
 - a) Serine
 - b) Lysine
 - c) Tyrosine
 - d) Threonine

B) Answer the following Questions in one sentence.

06

- 1) What is mean by DNA?
- 2) What is the Z-form of DNA?
- 3) Enlist the types of RNA.
- 4) Define translation.
- 5) Define Denaturation of DNA.
- 6) What is function of enzyme helicase?

Q.2 Solve any eight of the following.

16

- a) What are the different forms of DNA.
- b) Define Denaturation and Renaturation of DNA.
- c) Give the name of any two transcription factors.
- d) What is function of Ribosome?
- e) What is function of m- RNA?
- f) What is charging of t-RNA.
- g) What is difference between DNA & RNA?
- h) What is difference between prokaryotic & eukaryotic cell.
- i) State any one principle of transcription.
- j) What is mean by steroid hormones?

Q.3 A) Attempt any Two of the following.

10

- 1) Write the note on DNA denaturation process.
- 2) Explain the structure of t-RNA you have studied with figure.
- 3) Write the note on DNA as genetic carrier material.

B) Write the short note on following question.

06

Structure of Ribosome.

Q.4 A) Attempt any Two of the following.

10

- 1) Enzyme involved in DNA replication
- 2) Write notes on types of RNA.
- 3) Write the note on transcription of prokaryotic.

B) Write the short note on following question. 06

Explain the principles of transcriptional regulation in prokaryotic & Eukaryotic.

Q.5 Attempt any Two of the following. 16

- a)** Describe the lac-operon concept.
- b)** Describe the DNA Structure with chemical components.
- c)** Describe the steps involved in protein synthesis.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
ZOOLOGY (Special Paper - XI)
Endocrinology (22221515)**

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculator is allowed.

10

- 1) Endocrinology is the study of _____.
 - a) Hormone
 - b) Chemicals
 - c) Animals
 - d) Environment
- 2) I'slets of Langerhans secretes _____ hormone
 - a) Epinephrine
 - b) Insulin
 - c) Progesterone
 - d) Adrenalin
- 3) Endocrine glands are _____.
 - a) Ductus
 - b) Cytoplasmic
 - c) Ductless
 - d) Plasma
- 4) Hormone exit the cell of origin through the process of _____.
 - a) Endocytosis
 - b) Hypostatic
 - c) Epistasis
 - d) Exocytosis
- 5) The immune cells are _____.
 - a) Lymphocytes
 - b) Eosinophil
 - c) Nucleus
 - d) Thrombocytes
- 6) Neurosecretory cells are primarily located in _____.
 - a) Muscle
 - b) Nervous system
 - c) Digestive gland
 - d) Salivary gland
- 7) Which of the following is primary site of Neuro hormone?
 - a) Cerebellum
 - b) optic lobes
 - c) Hypothalamus
 - d) Spinal cord
- 8) _____ is Neurohormone.
 - a) LH
 - b) STH
 - c) ACTH
 - d) Oxytocin

- 9) The Pineal gland is known as _____.
 a) Epiphysis cerebri b) Hypophysis
 c) Hypothalamus d) Infundibulum
- 10) Melatonin hormone secretes by _____.
 a) Adrenal gland b) Pineal gland
 c) Thymus gland d) Thyroid gland

B) Fill in the blanks/Definition/one sentence answer/one word answer/predict the product etc. 06

- 1) What is Hypothalamus?
- 2) Which hormone produce in hypothalamus?
- 3) How many endocrine glands present in human body?
- 4) Which endocrine gland is called as Master gland?
- 5) Which hormone secrets by ovary?
- 6) Who controls the working of endocrine glands?

Q.2 Solve any eight of the following. 16

- a) Neurohormone
- b) Disorders of Ovary
- c) Pituitary gland
- d) Feedback Mechanism
- e) Hormone Action
- f) Epiphysis
- g) Hormones of Pineal gland
- h) Hormones of Tesis
- i) Neurosecretions
- j) Hypothalamus

Q.3 A) Attempt any Two of the following. 10

- 1) What are the Neurohormones?
- 2) Give the Classification of endocrine hormones.
- 3) Explain hormonal action of cellular level.

B) Short note/ Solve: 06

Describe Role of secretion of Pineal gland in Biological Rhythm.

OR

Write in brief Hypophysial Portal System.

Q.4 A) Attempt any Two of the following. 08

- 1) Describe Genetic Control of Hormone Action.
- 2) Describe on Hormone Receptors.
- 3) Describe Endocrine function of ovary.

B) Describe/Explain/Solve: 08

Write in detail Disorders of Pituitary gland.

OR

Describe on Endocrine structure and functions of Placenta.

Q.5 Attempt any Two of the following.

16

- a)** Describe on Hypothalamic Nuclei and their functions.
- b)** Explain on Hypophysial Axis.
- c)** Give an account of characteristics and Transport of Hormones.

**Seat
No.**

Max. Marks: 80

10

- Page 1 of 3

- 8) If $f: A \rightarrow B$ and $x \in A, y \in A$ then $f(x \cup y) = \underline{\hspace{2cm}}$.
- a) $f(x) \cap f(y)$ b) $f(x) \cup f(y)$
- c) $f^{-1}(x) \cap f^{-1}(y)$ d) $f^{-1}(x) \cup f^{-1}(y)$
- 9) If $f(x) = x^2$ ($-\infty < x < \infty$) then $f^{-1}(7)$ is $\underline{\hspace{2cm}}$.
- a) $\{\sqrt{7}\}$ b) $\{-\sqrt{7}\}$
- c) $\{\sqrt{7}, -\sqrt{7}\}$ d) 0
- 10) The series $\sum_{n=1}^{\infty} \frac{1}{n}$ is $\underline{\hspace{2cm}}$.
- a) Convergent b) Divergent
- c) Conditionally convergent d) Absolute convergent

B) Fill in the blanks.

06

- 1) The series $1 + r + r^2 + r^3 + \dots$ is oscillatory if $r = \underline{\hspace{2cm}}$.
- 2) If χ is then characteristics function on the set A and B then $\chi_{A \cup B} = \underline{\hspace{2cm}}$.
- 3) If $S_n = (-1)^n$ then $\liminf_{n \rightarrow \infty} s_n = \underline{\hspace{2cm}}$.
- 4) If $\sum_{n=1}^{\infty} a_n$ is convergent then $\lim_{n \rightarrow \infty} a_n = \underline{\hspace{2cm}}$.
- 5) If $\lim_{n \rightarrow \infty} (1 + \frac{2}{n})^n = \underline{\hspace{2cm}}$.
- 6) If $0 < x < 1$ then $\sum_{n=0}^{\infty} x^n$ converges to $\underline{\hspace{2cm}}$.

Q.2 Attempt the following. (Any Eight)

16

- Prove that set of all integer are countable.
- Define convergence and conditional convergence of series.
- Discuss the convergence of the series $\sum_{n=1}^{\infty} \frac{n+1}{n+2}$
- State the root test for absolute convergence.
- Define oscillatory sequence.
- Write the formula for the sequence $0, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \dots$
- If $\lim_{n \rightarrow \infty} s_n = L$ and $\lim_{n \rightarrow \infty} t_n = M$ then prove that $\lim_{n \rightarrow \infty} (s_n + t_n) = L + M$
- Define cartesian product of A and B .
- Prove that every convergent sequence converges to unique limit.
- If $f(x) = \log x$ for $x \in (0, \infty)$ if $A = [0,1]$ find $f^{-1}(A)$.

Q.3 A) Attempt the following. (Any Two) **10**

- a) If $\lim_{n \rightarrow \infty} |a_n|^{1/n} = A$ then the series of real number $\sum_{n=1}^{\infty} a_n$
- Converges absolutely if $A < 1$
 - Diverges if $A > 1$
- b) If $0 < x < 1$ then prove that $\sum_{n=1}^{\infty} x^n$ converges to $\frac{1}{1-x}$
- c) If $\{s_n\}_{n=1}^{\infty}$ and $\{t_n\}_{n=1}^{\infty}$ are sequence of real number if $\lim_{n \rightarrow \infty} s_n = L$ and $\lim_{n \rightarrow \infty} t_n = M$ then $\lim_{n \rightarrow \infty} s_n \cdot t_n = L \cdot M$.

B) Prove that the sequence $\left\{\left(1 + \frac{1}{n}\right)^n\right\}_{n=1}^{\infty}$ is convergent. **06**

Q.4 A) Attempt the following. (Any Two) **08**

- a) If $f: A \rightarrow B$ and $y \subset A, Y \subset A$ then
 $f(x \cup y) = f(x) \cup f(y)$
- b) If $\{S_n\}_{n=1}^{\infty}$ is sequence of real number such that $\lim_{n \rightarrow \infty} S_n = L$ and $\lim_{n \rightarrow \infty} S_n = M$ then prove that $L = M$
- c) For any $a, b \in R$ such that $||a| - |b|| \leq |a - b|$ then prove that $\{|S_n|\}_{n=1}^{\infty}$ converges to $|L|$ if $\{S_n\}_{n=1}^{\infty}$ converges to L

B) If A and B are subset of s then **08**

- $(A \cup B)' = A' \cap B'$
- $(A \cap B)' = A' \cup B'$

Q.5 Attempt the following. (Any Two) **16**

- a) An infinite subset of a countable is countable.
- b) If $\sum_{n=1}^{\infty} a_n$ is a series of non-negative number with
 $s_n = a_1 + a_2 + \dots + a_n (n \in I)$ then
- $\sum_{n=1}^{\infty} a_n$ Converges if the sequence $\{s_n\}_{n=1}^{\infty}$ is bounded
 - $\sum_{n=1}^{\infty} a_n$ diverges if $\{s_n\}_{n=1}^{\infty}$ is not bounded
- c) If $\{S_n\}_{n=1}^{\infty}$ is Convergent sequence of real number then
 $\lim_{n \rightarrow \infty} \sup S_n = \lim_{n \rightarrow \infty} S_n$

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
STATISTICS (Special Paper - XI)
Sampling Techniques (22221522)**

Day & Date: Saturday, 02-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of log table and calculator is allowed.
- 4) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple Choice Questions.

10

- 1) The advantage of sampling over census is _____.
 - a) Less cost
 - b) Greater accuracy
 - c) Quick results
 - d) All of these
- 2) The list of all sampling units is called _____.
 - a) Frame
 - b) Stratum
 - c) Cluster
 - d) Population
- 3) In SRSWOR, each unit has _____.
 - a) Equal chance of selection
 - b) Different chance
 - c) No chance
 - d) Unknown chance
- 4) Sample proportion p is an unbiased estimator of _____.
 - a) Population mean
 - b) Population proportion
 - c) Population variance
 - d) None
- 5) Standard error of p depends on _____.
 - a) Sample size
 - b) Population size
 - c) Both
 - d) None
- 6) The total sample size for given margin of error depends on _____.
 - a) Confidence level
 - b) Population mean
 - c) Correlation
 - d) None
- 7) Non-sampling error includes _____.
 - a) Recording mistakes
 - b) Interviewer bias
 - c) Non-response
 - d) All of these
- 8) A good questionnaire should be _____.
 - a) Long
 - b) Biased
 - c) Simple and clear
 - d) Complex

- 9) If $P = 0.5$, the variance of p is _____.
 a) Maximum b) Minimum
 c) Zero d) Cannot say
- 10) Handling of non-response is usually done by _____.
 a) Substitution b) Call-backs
 c) Weighting d) All of these

B) Fill in the blanks:**06**

- 1) Sampling units are selected from _____.
- 2) In sampling for attributes, data is usually _____.
- 3) Estimator of total number of units possessing attribute is _____.
- 4) Sample size increases when margin of error is made _____.
- 5) Standard error decreases as sample size _____.
- 6) The method where every unit has equal chance is _____.

Q.2 Solve the following. (Any Eight)**16**

- a) Explain distinguishable elementary units, sampling units, and sampling frame.
- b) Write advantages of sampling method over census method.
- c) State objectives of a sample survey.
- d) Discuss characteristics of a good questionnaire.
- e) Explain sampling and non-sampling errors.
- f) Explain non-response and its handling methods.
- g) Define simple random sampling. State its types.
- h) Derive expectation of sample proportion.
- i) Derive standard error of estimator of population total in SRSWOR.
- j) Explain determination of sample size for given margin of error.

Q.3 A) Attempt the following. (Any Two)**10**

- 1) Explain stratified sampling with real life example.
- 2) Comparison of systematic sampling with SRSWOR.
- 3) Prove that Systematic sampling as a particular case of cluster sampling.

B) Short note/Solve.**06**

Write short note on Non-sampling errors.

Q.4 A) Attempt the following. (Any Two)**08**

- 1) Discuss estimation of total number of units possessing attribute.
- 2) Explain margin of error and confidence coefficient in sample size determination.
- 3) Explain standard error of sample proportion.

B) Describe/Explain/Solve.**08**

Explain objectives of a sample survey with examples.

Q.5 Attempt the following. (Any Two)**16**

- a)** Prove that $N\bar{y}_n$ is an unbiased estimator of population total.
- b)** Discuss methods of handling non-response.
- c)** Explain determination of sample size with coefficient of variation method.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
GEOLOGY (Special Paper - XI)
Applied Geology - Engineering Geology (22221527)

Day & Date: Saturday, 02-05-2026
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.

Q.1 A) Multiple Choice Questions. 10

- 1) The resistance offered by a stone against rubbing action is called _____.
 a) Rubbing resistance b) Abrasive resistance
 c) Shear resistance d) All of above
- 2) The basic igneous rock which is extensively used as road materials is _____.
 a) Granite b) Gabbro
 c) Basalt d) Syenite
- 3) The test which is conducted by an indirect method usually is _____.
 a) Compressive strength b) Shear strength
 c) Tensile strength d) None
- 4) The underground passages driven through the ground are called _____.
 a) Bridges b) Passages
 c) Tunnels d) Sub-routes
- 5) Selection of excavation method depends on _____.
 a) Type of rocks b) Nature of rocks and ground
 c) Weather condition d) None
- 6) Which type of rocks requires double lining?
 a) Hard rocks b) Crystalline rocks
 c) Soft rocks d) Non-crystalline rock
- 7) In synclinal bends, dams placed on which part would run risk of leaking?
 a) Upstream limb b) Downstream limb
 c) Core d) Sloping side
- 8) Which of the following is not a method of control of mass movement?
 a) Afforestation b) Retaining wall
 c) Chemical treatment d) Deforestation

- 9) In which type of flowage, failure is easily visible?
 - a) Rapid failure
 - b) Quick failure
 - c) Slow failure
 - d) Moderate failure
- 10) What is the character of the surface of shear in loose, inherently weak rocks?
 - a) Curved
 - b) Planar
 - c) Circular
 - d) Undulated

B) Answer the following questions in a one sentence/Fill in the blanks. 06

- 1) What is full form of RQD?
- 2) If RMR index is between 41 and 60 _____.
- 3) Define permeability.
- 4) What is a tunnel crown?
- 5) What is Adit in tunnel?
- 6) What are the types of dams?

Q.2 Solve any eight of the following. 16

- a) What are the six parameters of RMR?
- b) What is Saprolite?
- c) What is mean by Well graded soil?
- d) What is formula of Liquidity Index?
- e) Define Tunnel.
- f) What is Sluice way?
- g) Define Soil.
- h) What is Subsidence?
- i) Which rock possesses very low Compressive Strength?
- j) What is role of water table in Tunnel?

Q.3 A) Attempt any two of the following. 10

- 1) Explain objectives for the Construction of Dam.
- 2) Explain Gravity and Arch dam with suitable diagram.
- 3) Explain Durability of building stone.

B) Write a note on Causes of Dam failure. 06

Q.4 A) Attempt any two of the following. 08

- 1) Describe Elasticity of rocks.
- 2) Describe Relative density.
- 3) What is SMR? Explain advantages of SMR.

B) Explain Siltation problem and how to control siltation problem. 08

Q.5 Attempt any two of the following. 16

- Describe suitable and unsuitable conditions for construction of Tunnel.
- Describe Index properties of Soil.
- Describe Causes, Prevention and Mitigation of landslide

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026
MICROBIOLOGY (Special Paper - XI)
Immunology (22221531)**

Day & Date: Saturday, 02-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks
3) Draw neat labeled diagrams wherever necessary
4) Use of log tables and calculators are allowed

Q.1 A) Rewrite the following sentences choosing correct alternative. 10

- 1) The maturation of B- lymphocytes occur in _____.
a) Bone marrow b) Thymus
c) Lymph nodes d) Spleen
- 2) Natural killer (NK) belongs to _____ type of immunity.
a) adaptive immunity b) innate immunity
c) active immunity d) all of the above
- 3) Humoral immunity is mediated by _____.
a) T helper cells
b) Cytotoxic T cells
c) B lymphocytes and antibodies
d) NK cells
- 4) In cell mediated immunity, cytotoxic T cells recognize antigens via _____.
a) MHC I b) MHC II
c) Complement receptors d) Antibodies
- 5) The difference between primary and secondary immune response is mainly due to _____.
a) Antigen presenting cells b) Memory B and T cells
c) NK cells d) Complement activation
- 6) A person with blood group AB can receive blood from _____.
a) Only group AB
b) Only group O
c) All groups (universal recipient)
d) Only A and B

- 7) The classical complement pathway is activated by: _____.
 - a) Antigen-antibody complexes
 - b) Bacterial endotoxin
 - c) Properdin
 - d) Mannose binding lectin
- 8) The alternate complement pathway is activated by: _____.
 - a) Antibody binding
 - b) Antigen presenting cells
 - c) Pathogen surfaces (LPS, endotoxin)
 - d) MHC molecules
- 9) The Arthus reaction is an example of: _____.
 - a) Type I hypersensitivity b) Type II hypersensitivity
 - b) Type III hypersensitivity c) Type IV hypersensitivity
- 10) The most important immune cells in graft rejection are: _____.
 - a) B lymphocytes b) Cytotoxic T cells
 - c) NK cells d) Macrophages

B) Answer the following in one sentence.

06

- 1) Define hypersensitivity.
- 2) Define autoimmune disease.
- 3) What is a complement?
- 4) What is Rh blood group?
- 5) Define secondary immune response.
- 6) What is the role of macrophages?

Q.2 Solve the following (Any Eight)

16

- a) Enlist the types of lymphoid cells.
- b) Enlist the two differences between plasma cell and memory cell.
- c) What is the role of cytokines?
- d) Define properdin.
- e) Define delayed type of hypersensitivity.
- f) Enlist the type of autoimmune diseases.
- g) What is Isograft?
- h) What is MALT?
- i) Draw a labelled diagram of spleen.
- j) What is HLA typing?

Q.3 A) Attempt the following (Any Two)

10

- 1) Write an account SLE.
- 2) Explain in detail contact dermatitis.
- 3) Describe the properties of complement.

B) Write an essay on Anaphylaxis.

06

- Q.4 A) Attempt the following (Any Two) 08**
- 1) Write an account on Type III hypersensitivity.
 - 2) Explain in short graves autoimmune disease.
 - 3) Differentiate between primary and secondary immune response.
- B) What are the different types of grafts? Write the mechanism of graft rejection. 08**
- Q.5 Attempt the following (Any Two) 16**
- a) Explain in detail the ABO blood group system.
 - b) Describe the structure and function of thymus.
 - c) Write an account on classical pathway of complement.

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
ELECTRONICS (Special Paper - XI)
Sensors and Transducers (22221539)**

Max. Marks: 80

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams and give equations wherever necessary.
- 3) Figures to right indicate full marks.
- 4) Use of log table and calculators is allowed.
- 5) Use of Mobile is strictly prohibited.

- The device which converts non-electrical quantity into electrical form is called _____.
 - Amplifier
 - Transducer
 - Oscillator
 - Rectifier
- _____ of the following is an active transducer.
 - Thermocouple
 - Strain gauge
 - RTD
 - Potentiometer
- LVDT is used to measure _____.
 - Temperature
 - Displacement
 - Pressure
 - Flow
- _____ of the following is a resistive transducer.
 - Strain gauge
 - LVDT
 - Thermocouple
 - Photodiode
- The static characteristics of measurement system include _____.
 - Accuracy
 - Bandwidth
 - Response time
 - Frequency response
- Thermistors are mainly used for _____.
 - High pressure measurement
 - Temperature measurement
 - Light intensity measurement
 - Flow measurement
- _____ of the following is a photoelectric transducer.
 - LDR
 - Potentiometer
 - Strain gauge
 - RTD

- 8) The principle of operation of piezoelectric transducer is _____.
 - a) Change in resistance
 - b) Change in inductance
 - c) Change in capacitance
 - d) Generation of voltage due to mechanical stress
- 9) _____ sensor is used for human motion detection.
 - a) LM35
 - b) PIR sensor
 - b) RTD
 - c) Thermistor
- 10) An opto-coupler is used for _____.
 - a) Isolation
 - b) Amplification
 - c) Rectification
 - d) Oscillation

B) One sentence answer.

06

- 1) Define sensor.
- 2) Write full form of LVDT.
- 3) State one application of strain gauge.
- 4) Define static characteristics of transducer.
- 5) Write example of smart temperature sensor.
- 6) Name one actuator used in switching circuits.

Q.2 Solve the following (Any Eight)

16

- a) Differentiate between sensor and transducer.
- b) Write two applications of RTD.
- c) State working principle of LDR.
- d) What is calibration of measurement system?
- e) Draw block diagram of measurement system.
- f) Mention two types of dynamic characteristics.
- g) Define active and passive sensor with example.
- h) Write two applications of LVDT.
- i) What is the principle of Hall effect transducer?
- j) State two functions of a solenoid.

Q.3 A) Attempt the following (Any Two)

10

- 1) Explain static characteristics of measurement system.
- 2) Explain the working of strain gauge with diagram.
- 3) Explain construction and working of LVDT.

B) Explain the classification of transducers.

06

Q.4 A) Attempt the following (Any Two)

08

- 1) Explain principle and working of RTD.
- 2) Explain photoelectric transducer with example.
- 3) Describe principle of piezoelectric transducer.

B) Explain the construction and working of PIR sensor.

08

Q.5 Attempt the following (Any Two)**16**

- a)** With neat diagram explain block diagram of measurement system.
- b)** Explain LVDT with construction, working and applications.
- c)** Explain various selection criteria for transducer.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
COMPUTER SCIENCE (Special Paper - XI)
Dot Net Core (22221535)**

Day & Date: Saturday, 02-05-2026
Time: 03:00 PM To 06:00 AM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Multiple choice questions:

10

- 1) Which of the following enables runtime polymorphism?
 - a) Method overloading
 - b) Method overriding
 - c) Static constructor
 - d) Sealed class
- 2) Which is NOT a valid serialization format in C#?
 - a) JSON
 - b) Binary
 - c) XML
 - d) HTML
- 3) Which type of thread does not prevent application termination?
 - a) Foreground thread
 - b) Background thread
 - c) Main thread
 - d) Worker thread
- 4) Which LINQ method is used to filter data?
 - a) Select()
 - b) Where()
 - c) Join()
 - d) Count()
- 5) Which keyword is used to declare a class that cannot be inherited?
 - a) static
 - b) sealed
 - b) final
 - d) abstract
- 6) Which method is used for console input?
 - a) Console.Out()
 - b) Console.Write()
 - c) Console.ReadLine()
 - d) Console.Input()
- 7) Events in C# are based on _____.
 - a) Interfaces
 - b) Abstract classes
 - c) Delegates
 - d) Attributes
- 8) Which of the following is a reference type?
 - a) int
 - b) float
 - c) string
 - d) bool

- 9) Which among the following is NOT an exception?
- Stack Overflow
 - Arithmetic Overflow or underflow
 - Incorrect Arithmetic Expression
 - All the mentioned
- 10) The delegate declaration consists of ____.
- return type
 - parameter list
 - delegate keyword
 - all of the above

B) Fill in the blanks.**06**

- Polymorphism enables _____ binding of methods at runtime.
- If a class contains at least one abstract method, the class must be declared as _____.
- _____ root of the .NET type hierarchy.
- Code that targets the Common Language Runtime is known as _____.
- _____ is a common way /method to pause the execution of a thread.
- _____ is the .NET equivalent of Java virtual machine.

Q.2 Solve any Eight of the following.**16**

- What is collection?
- What is exception?
- What is Lambda Expression?
- What is Serialization?
- List out Access specifier used in C#.
- What is polymorphism?
- List out common control in window form application.
- What are different LINQ aggregation method?
- What are the different types of inheritance?
- What is Boxing and unboxing?

Q.3 A) Attempt any Two of the following.**10**

- Explain parameter passing techniques in C#.
- Explain thread life cycle.
- Write a program which can demonstrate method overloading.

B) Explain multicast delegate with example.**06****Q.4 A) Attempt any Two of the following.****08**

- Explain Elvis and NULL coalescing operator with example.
- what is sealed class? Explain with example.
- Explain enumeration with example

B) Write a program which can implement custom exception.**08**

Q.5 Attempt any Two of the following.

16

- a)** What is interface? What is difference between interface and abstract class.
- b)** Write a program which can implement multilevel inheritance.
- c)** Write a program which can implement Dictionary <T> with its properties and method.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026
PHYSICS (Special Paper - XII)
Nuclear Physics (22221512)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculator is allowed.

Q.1 A) Select the correct alternative: 10

- 1) The radius of nucleus is directly proportional to _____ of atomic mass number.

a) square root	b) cube root
c) Cube	d) Square
- 2) If electrical quadrupole moment is greater than zero then charge distribution of nucleus is _____.

a) circular	b) spherical
c) oblate spherical	d) prolate spherical
- 3) Liquid drop model is explained by _____.

a) Rutherford	b) Bohr
c) Sommerfeld	d) Chandwick
- 4) For exothermic nuclear reactions the Q value should be _____.

a) positive	b) negative
c) zero	d) infinity
- 5) Deuteron is made up of _____.

a) proton and neutron	b) proton and electron
b) electron and neutron	d) positron and electron
- 6) In stripping reaction product and target nuclei are _____.

a) isomers	b) isobars
c) isotopes	d) monomers
- 7) An accelerator is used for increasing _____ of a charged particles.

a) potential energy	b) kinetic energy
c) binding energy	d) excitation energy

- 8) In cyclotron time for semicircular path of ion is _____ for every revolution.
- | | |
|--------------|--------------|
| a) increases | b) decreases |
| c) constant | d) zero |
- 9) β particles are _____.

a) positrons	b) electrons
b) protons	c) neutrons
- 10) Leptons are _____.

a) fermions	b) bosons
c) baryons	d) pions

B) Fill in the blanks:**06**

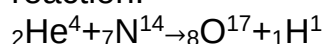
- 1) Shape of nucleus is _____.
- 2) In nuclear reaction the bombarding particle is called _____.
- 3) Cyclotron contains _____ Dees.
- 4) The substance which emits flash of light when high energetic charge particles strikes on it is called _____.
- 5) Neutrino has _____ charge.
- 6) Antiparticle of electron is _____.

Q.2 Solve any Eight of the following.**16**

- a) Define Packing fraction.
- b) Write semi empirical mass formula.
- c) Define Mass defect.
- d) What is stripping reaction?
- e) What is pickup reaction?
- f) What is accelerator?
- g) Define dead time and recovery time.
- h) What is self-quenching mechanism of GM counter?
- i) Define α -disintegration energy.
- j) Give two properties of Photons.

Q.3 A) Attempt any Two of the following.**10**

- 1) Calculate Q- value of the following reaction and indicate type of reaction.



Given: mass of ${}_2\text{He}^4 = 4.0038727$ a.m.u

Mass of ${}_7\text{N}^{14} = 14.003074$ a.m.u.

Mass of ${}_8\text{O}^{17} = 16.999133$ a.m.u.

Mass of ${}_1\text{H}^1 = 1.007825$ a.m.u.

1 a.m.u. = 931 MeV.

- 2) Obtain betatron condition and explain the construction and working of betatron.
- 3) Explain construction and working of scintillation counter

B) Explain liquid drop model of nucleus.**06**

Q.4 A) Attempt any Two of the following. 08

- 1) Explain composition of nucleus and obtain equation of radius of nucleus.
- 2) Explain experimental study of β decay and continuous β ray spectrum.
- 3) Explain different types of interactions.

B) Explain construction and working of cyclotron. What are the limitations of cyclotron? 08

Q.5 Attempt any Two of the following. 16

- a) Explain construction and working of GM counter. Hence explain Geiger plateau region.
- b) What is α particle spectra and Explain fine Structure of α line spectra and long range α particle spectra.
- c) Explain the classification of elementary particles in brief.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026
CHEMISTRY (Special Paper - XII)
Analytical and Industrial Physical Chemistry (22221508-A)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Choose the most correct alternative of the following and rewrite the sentences 10

- _____ analysis is based on the variation of the colour intensity of a system with change in concentration of the component.
 - Colorimetric
 - Potentiometric
 - Conductometric
 - pHmetric
- The equivalent conductance is given by the relation, $\lambda = \frac{\quad}{\quad}$.
 - $\frac{1000 \times k}{M}$
 - $\frac{1000 \times k}{N}$
 - $\frac{100 \times k}{N}$
 - $\frac{100 \times k}{M}$
- According to latest convention, the e.m.f. of a cell may be expressed as _____.
 - $E_{\text{Cell}} = E_{\text{Right}} + E_{\text{Left}}$
 - $E_{\text{Cell}} = E_{\text{Right}} - E_{\text{Left}}$
 - $E_{\text{Cell}} = E_{\text{Right}} \times E_{\text{Left}}$
 - $E_{\text{Cell}} = E_{\text{Left}} - E_{\text{Right}}$
- In photoelectric colorimeters, the response from the photocurrent is measured by means of a _____.
 - voltmeter
 - galvanometer
 - potentiometer
 - conductometer
- Standardization of potentiometer, the standard cell is generally used, having voltage _____.
 - 1.80 volts
 - 1.81 volts
 - 1.018 volts
 - 1.081 volts
- _____ metal is preferred for anodic oxidation.
 - Copper
 - Nickel
 - Aluminium
 - Chromium

- 7) In the process of electroplating _____ plays an important role.
a) electrolysis b) electro-osmosis
b) osmosis d) electrophoresis
- 8) The flame photometry is concerned with the measurement of _____ of emitted light.
a) frequency b) intensity
c) wavelength d) wavelength and intensity
- 9) In flame photometer the temperature of the flame is controlled by _____ factor/s.
a) fuel-oxidant ratio b) type of solvent
b) type of fuel and oxidant c) All of these
- 10) To determine the cell constant generally _____ electrolyte is preferred.
a) KNO₃ b) KCl
c) NH₄Cl d) NaCl

B) Fill in the blanks

06

- 1) Opacity is the reciprocal of _____.
- 2) In potentiometric titrations, the potential of indicator electrode depends on _____.
- 3) Boltzmann distribution equation for the fraction of free atoms that are thermally excited is given as $N^*/N^0 = \text{_____}$.
- 4) In chromium plating generally _____ is used as anode.
- 5) The unit of cell constant is _____.
- 6) The molecular conductance of the solution is given by the relation, $\mu = \text{_____}$.

Q.2 Solve Any Eight of the following.

16

- a) What are the types of photoelectric cells?
- b) Give expressions for cathode and anode efficiency.
- c) Give the advantages of potentiometric titrations.
- d) Give any two limitations of flame photometer.
- e) Draw basic circuit of D. C. Wheatstone bridge.
- f) What are the advantages of glass electrode?
- g) What is mean by throwing and covering power?
- h) Draw block diagram of flame photometer.
- i) Mention various types of conductometric titrations.
- j) Give the Faraday's second law of electrolysis.

Q.3 A) Attempt Any Two of the following.

10

- 1) Discuss oxidation and reduction potentiometric titrations.
- 2) Under what conditions the Beer's law cannot be valid?
- 3) Write note on anodizing.

B) Discuss general principle of flame photometer.

06

Q.4 A) Attempt Any Two of the following. 08

- 1) What is cell constant? How it is determined?
- 2) Write note on Photovoltaic cell.
- 3) State and explain Lambert's law.

B) Explain the various components of flame photometer. 08

Q.5 Attempt Any Two of the following. 16

- a) Give principle of conductometric titrations. Discuss in detail conductometric titrations of strong acid against strong base.
- b) Discuss the construction and working of quinhydrone electrode. How it is used in the determination of pH of a solution?
- c) Describe in detail the various processes of cleaning of articles in electroplating.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
CHEMISTRY (Special Paper - XII)
Methodology and Materials of Industrial Importance (22221508-B)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat, labelled diagrams wherever necessary
3) Figures to the right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Multiple Choice Question.**10**

- 1) Which of the following is a base unit in the SI system?
 - a) Meter
 - b) Liter
 - c) Gram
 - d) All of the above
- 2) _____ is the first step in the scientific method.
 - a) Formulating a hypothesis
 - b) Conducting an experiment
 - c) Analyzing data
 - d) Making observations
- 3) What is the purpose of ANOVA?
 - a) To compare the means of two or more groups
 - b) To analyze the relationship between two variables
 - c) To identify patterns in data
 - d) To predict future values
- 4) Simple linear regression is _____.
 - a) A method for fitting a linear equation to a set of data with one independent variable
 - b) A method for fitting a non-linear equation to a set of data
 - c) A method for analyzing the relationship between two categorical variables
 - d) A method for predicting future values based on past data
- 5) The main purpose of linearizing transformations is _____.
 - a) To fit a non-linear equation to a set of data
 - b) To fit a linear equation to a set of data that is non-linear
 - c) To analyze the relationship between two categorical variables
 - d) To predict future values based on past data

- 6) _____ is the primary goal of waste chemical disposal.
 - a) To minimize environmental impact
 - b) To reduce costs
 - c) To increase efficiency
 - d) To comply with regulations
- 7) What is the role of a stabilizing agent in the synthesis of silver nanoparticles?
 - a) To reduce the silver ions
 - b) To control the size and shape of the nanoparticles
 - c) To increase the reaction rate
 - d) To enhance the optical properties
- 8) Templates are used in the synthesis of one-dimensional nanostructures for _____.
 - a) To control the size and shape of the nanostructures
 - b) To enhance the optical properties of the nanostructures
 - c) To increase the reaction rate
 - d) To reduce the cost of synthesis
- 9) _____ is the major role of the matrix in a composite material.
 - a) To provide reinforcement
 - b) To bind the reinforcement together
 - c) To enhance the optical properties
 - d) To increase the weight
- 10) What is the purpose of reinforcements in composites?
 - a) To reduce the weight
 - b) To enhance the mechanical properties
 - c) To improve the thermal conductivity
 - d) To increase the cost

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) What does SI stand for?
- 2) _____ is the primary consideration for storing chemicals in a laboratory.
- 3) What is weighted linear regression?
- 4) The common method for synthesizing gold nanoparticles is _____.
- 5) What is curve fitting?
- 6) What is an example of a one-dimensional nanostructure?

Q.2 Solve the following. (Any Eight) 16

- a) What is the scientific method?
- b) What is the independent variable in an experiment?
- c) What is chemometrics?
- d) Differentiate between correlation and regression.
- e) What does the correlation coefficient (r) measure?
- f) State the benefit of recovering, recycling, and reusing laboratory chemicals.

- g) Define composites.
- h) Mention common matrix materials used in composites.
- i) What is self-assembly in the context of nanostructures?
- j) Why the careful reading of the Safety Data Sheet (SDS) for a hazardous chemical is important?

Q.3 A) Attempt the following. (Any Two) 10

- 1) Write a short note on bio-nanocomposites.
- 2) What is a common method for synthesizing silver nanoparticles? Explain it in brief.
- 3) Discuss the procedure for working with substances that pose flammable or explosive hazards

B) Write a note on applications of composite materials. 06

Q.4 A) Attempt the following. (Any Two) 08

- 1) What are the potential applications of gold and silver nanoparticles?
- 2) Write a note on SI Units and their use.
- 3) Discuss Environmental effects on composites.

B) Describe the basic aspects of multiple linear regression analysis. 08

Q.5 Attempt the following. (Any Two) 16

- a) Discuss in detail the preparation of gold metallic nanoparticles.
- b) Describe the role of matrix in composites by taking suitable example.
- c) Explain the terms correlation and regression.

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026
BOTANY (Special Paper - XII)
Plant Breeding (22221504-A)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw a neat labelled diagram wherever necessary.

Q.1 A) Multiple choice question:

10

- 1) Copy right protects _____.
a) Invention
b) Names and logos
c) Industrial design
d) Original works of authorship
- 2) International Rice Research Institute (IRRI) headquartered in _____.
a) Dhaka, Bangladesh
b) New Delhi, India
c) Los Banos, Philippines
d) Nairobi, Kenya
- 3) A condition where an organism has more than two complete sets of chromosomes is called _____.
a) Chromosomal mutation
b) Aneuploidy
c) Somatic mutation
d) Polyploidy
- 4) Bagging is usually done _____.
a) Before the flower blooms
b) After fertilization
c) During seed development
d) After harvesting
- 5) The father of Indian green revolution is _____.
a) B.P Pal
b) Borlon
c) Swami Rangnathan
d) Karluter
- 6) _____ is the oldest plant breeding method.
a) Hybridization
b) Selection
c) Mutation breeding
d) Introduction
- 7) Germplasm is also called as _____.
a) world collection
b) Germ collection
c) Gene bank
d) Genetic resources
- 8) Emasculation is concerned with _____.
a) Mass selection
b) Clonal selection
c) Pureline selection
d) Hybridization

- 9) In most of the countries, standard patent generally last for _____.
 a) 5 years
 b) 10 years
 c) 20 years from the filing date
 d) Lifetime of the inventor
- 10) The mutation produced by the activity of man is called _____.
 a) Induced mutation b) Spontaneous mutation
 c) Gene mutation d) Micromutation

B) Answer in one sentence.**06**

- 1) "What is trade secret?
- 2) What is plant breeding?
- 3) Define emasculation.
- 4) What is clone?
- 5) Name one self pollinated crops and one cross pollinated crop.
- 6) What does IPR stands for?

Q.2 Solve any Eight of the following.**16**

- a) What is full form of ICRISAT?
- b) What is mutation?
- c) Enlist the types of IPR.
- d) What is germplasm?
- e) Where is ICAR's headquarter?
- f) What is main objective of plant introduction?
- g) Define interspecific hybridization.
- h) What is the scope of plant breeding?
- i) Who proposed the concept of centres of origin?
- j) Which parent is repeatedly used in back cross method?

Q.3 A) Write a short note on any two of the following.**10**

- 1) Describe role of mutation in plant breeding.
- 2) Write advantages and limitations of mass selection.
- 3) Describe double cross method.

B) Write a note on clonal selection.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Describe role of polyploidy in plant breeding.
- 2) Describe procedure of pure line selection.
- 3) Write on Indian Council of Agricultural Research.

B) Describe activities of National Bureau of plant Genetic resources.**08****Q.5 Attempt any Two of the following.****16**

- a) Describe procedure of hybridization technique.
- b) Describe objectives of plant breeding.
- c) Describe any two forms of IPR.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
BOTANY (Special Paper - XII)
Economic Botany (22221504-B)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat and labeled diagram wherever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Multiple choice question:

10

- The part used as drug of Ashwagandha plant is _____.
 - Rhizome
 - Root
 - Stem
 - Leaf
- Ginger belongs to family _____.
 - Cucurbitaceae
 - Poaceae
 - Zingiberaceae
 - Malvaceae
- Fruit of Emblica is richest natural source of _____.
 - vitamin C
 - vitamin E
 - vitamin D
 - vitamin A
- The _____ are the primary source of a reddish-orange dye of Henna.
 - Leaves
 - Flowers
 - Fruits
 - Roots
- A plant used as edible oil source is _____.
 - Groundnut
 - Ginger
 - Clove
 - Withania
- The red gram is a _____ plant.
 - Legume
 - fibre
 - Spice
 - drug
- Flowers of Saffron yield _____ dye.
 - Green
 - Yellow
 - Blue
 - Purple
- The clove oil is extracted from _____.
 - Santalum wood
 - Floral bud of Syzygium
 - Vetiveria roots
 - Bay leaves

- 9) The natural rubber is obtained from _____.
 a) *Hevea brasiliensis* b) *Manihot glaziovii*
 b) *Achras sapota* c) *Ficus elastica*
- 10) _____ is the natural fibre.
 a) Nylon b) Polyester
 c) Cotton d) Rayon

B) Definition/One sentence answer/ One-word answer. 06

- 1) Which is the insecticidal chemical constituent obtained from Tobacco?
- 2) Which part of cotton gives fiber?
- 3) Write down the source of drug in Ginger.
- 4) Give botanical name of Sesbania.
- 5) What is the botanical name of Chickpea?
- 6) Soybean oil is obtained from seeds of which plant? Give botanical name.

Q.2 Solve any Eight of the following. 16

- a) Write down the botanical name and source of bengal gram.
- b) State any two economic importance of cotton.
- c) Write down the chief constituents of *Tinospora cordifolia*.
- d) State any two uses of Ginger in indigenous system.
- e) State any two economic importance of Lucerne.
- f) Give the name of plants for dyes obtained from roots and wood.
- g) Write down any two importance of custard apple as a pesticide.
- h) Write down any two nutritive value of red gram.
- i) Give source and family of Neem.
- j) Write down any two uses of Groundnut oil.

Q.3 A) Attempt any two of the following. 10

- 1) Give botanical name, source and morphology of Coir.
- 2) Give botanical Name, Source and economic importance of oak.
- 3) Write down the botanical name, source and chief constituents of drug plant Adulsa.

B) Give Botanical name, source and economic importance of Turmeric. 06

Q.4 A) Attempt any Two of the following. 08

- 1) Give an account of extraction method and economic importance of rubber.
- 2) Give morphology of Neem.
- 3) Give brief account of cultural practices of Ground nut.

B) Give Botanical name, source and economic importance of Mehendi. 08

Q.5 Attempt any Two of the following.

16

- a)** State the properties of Rubber.
- b)** Give the botanical name, morphological characters, source and economic importance of custard apple.
- c)** Give brief account of chief constituents and uses in indigenous and allopathic systems of drug plant *Zingiber officinale*.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
ZOOLOGY (Special Paper - XII)
Wildlife Conservation & Management (22221516)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams & give equations wherever necessary.
3) Figures to right indicate full marks.

Q.1 A) Multiple choice question. 10

- 1) _____ of these is the most effective means of Conserving Biodiversity.
 - a) Preserve habitats.
 - b) Get rid of predators
 - c) Census species during the breeding season.
 - d) Vaccinate species against diseases.
- 2) Chipko Movement was strengthened under the leadership of _____.
 - a) Amrita Devi Bishnoi
 - b) Medha Patkar
 - c) A. K. Banerjee
 - d) Sunder Lal Bahuguna
- 3) _____ of the following national parks of India is listed in the Natural World Heritage sites of UNESCO.
 - a) Namdapha National Park
 - b) Dachigam National Park
 - c) Keoladeo Ghana National Park
 - d) Bandipur National Park
- 4) _____ is the hotspot of Biodiversity in India.
 - a) Gangetic plain
 - b) Sunderbans
 - c) Eastern ghats
 - d) Western ghats
- 5) _____ is the correct full form of IUCN.
 - a) International Union for Conservation of Nuts
 - b) International Union for Conservation of Nature
 - c) International Union for Conservation of Natural habitat
 - d) International Union for Conservation of Numbers
- 6) The species whose number of individuals is greatly reduced to a critical level is called _____.
 - a) Indeterminate
 - b) Rare
 - c) Vulnerable
 - d) Endangered

- 7) Nan dan-Kanan Zoo is Popular for Its _____.
 - a) Nilgiri Tahr
 - b) Whale
 - c) White tiger
 - d) Hippo
- 8) In _____ section of The Wildlife Protection Act 1972 deals with the Prohibition of hunting.
 - a) Section 12 of The Wildlife Protection Act 1972
 - b) Section 9 of The Wildlife Protection Act 1972
 - c) Section 14 of The Wildlife Protection Act 1972
 - d) Section 20 of The Wildlife Protection Act 1972
- 9) _____ is defined as the number of species represented in a specific region, landscape or an ecological community.
 - a) Coevolution
 - b) Commensalism
 - b) Species richness
 - c) Population density
- 10) "Gir forest" is located in _____ state.
 - a) Maharashtra
 - b) Rajasthan
 - c) Haryana
 - d) Gujarat

B) Fill in the blank/Definition/One sentence answer/One word answer/ Give the Name/Predict the product etc.

06

- 1) What is Secondary Succession?
- 2) What is Wildlife?
- 3) Define setting back succession.
- 4) Write full form of CITES.
- 5) Define Forage.
- 6) Population Estimation

Q.2 Solve any Eight of the following.

16

- a) Write Importance of conservation.
- b) Explain Habitat analysis.
- c) Define census method.
- d) Define Diversity Indices.
- e) Enlist the National parks in India.
- f) What are the important features of protected areas?
- g) Define Eco tourism.
- h) Define Grazing.
- i) Define climax persistence.
- j) Write Preservation of general genetic diversity.

Q.3 A) Attempt any Two of the following.

10

- 1) Define ecological restoration and write note on restoration of degraded habitat.
- 2) What is Community reserve and what are the important features of protected areas in India?
- 3) Give an account on Biological parameters of wildlife habitat.

B) What is GIS? Comment on its applications in wildlife Management.

06

Q.4 A) Attempt any Two of the following. 08

- 1) Define Values of wild life -and explain positive and negative values.
- 2) Explain Tiger reserves in India & its management challenge.
- 3) Write National: Wildlife Protection Act-1972.

B) Write Application of biostatistics in Biodiversity estimation. 08

Q.5 Attempt any Two of the following. 16

- a) Discuss Methods of population estimation and comment on Sex ratio computation.
- b) Comment on Great Indian Bustard (GIB) Reserve & its management.
- c) Explain Care of injured and diseased animal and write Common diseases of wild animal.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026
MATHEMATICS (Special Paper - XII)
Partial Differential Equations (22221520-A)**

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

10

- 1) The partial differential equation $(x + y - z)p + (3x + 2y)q + 2z = x + y$ is _____.
a) linear b) quasi- linear
c) semi- linear d) non-linear
- 2) The first order partial differential equation $p = P(x, y)$ and $q = Q(x, y)$ are compatible if and only if _____.
a) $\frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x}$ b) $\frac{\partial P}{\partial x} = \frac{\partial Q}{\partial y}$
c) $\frac{\partial P}{\partial y} = -\frac{\partial Q}{\partial x}$ d) $\frac{\partial P}{\partial x} = -\frac{\partial Q}{\partial y}$
- 3) The standard form of non-linear partial differential equation of order one is _____.
a) $z = px + qy + f(p, q)$ b) $z = f(p, q)$
c) $z = px + q^2y + f(p, q)$ d) $z = px - qy - f(p, q)$
- 4) The general solution of $xp = -yq$ is _____.
a) $x^2 + y^2 = \phi(z)$ b) $y^2 + z^2 = \phi(x)$
c) $x^2 + z^2 = \phi(y)$ d) $x^2 - y^2 = \phi(z)$
- 5) The singular integral of $z = px + qy + pq$ is _____.
a) $z = ax + by + ab$ b) $z = ax - by + ab$
c) $z = ax$ d) $z = -xy$
- 6) The complete integral of $pq = k$ is _____.
a) $z = ax - \left(\frac{k}{a}\right)y + c$ b) $z = ax + \left(\frac{k}{a}\right)y + c$
c) $z = ax - \left(\frac{a}{k}\right)y + c$ d) $z = ax + \left(\frac{a}{k}\right)y + c$

- 7) The particular integral of $\frac{1}{D-mD'}f(x, y)$ is _____.
 a) $\int f(x, c + mx)dx$ b) $\int f(y, c - mx)dx$
 c) $\int f(x, c - mx)dx$ d) $\int f(y, c + mx)dy$
- 8) The P.I. of $(D^2 - 6DD' + gD'^2)z = 6x + 2y$ is _____.
 a) $x^2(3x + y)$ b) $\frac{x^2}{2}(3x + y)$
 c) $x(3x + y)$ d) $x^3(3x + y)$
- 9) The C.F. of $(D^2 - 3DD' + 2D'^2)z = \cos(x + 2y)$ is _____.
 a) $\phi_1(y + x) - \phi_2(y + 2x)$ b) $\phi_1(y - x) - \phi_2(y + 2x)$
 c) $\phi_1(y + x) + \phi_2(y + 2x)$ d) $\phi_1(y + x) - \phi_2(y - 2x)$
- 10) The general solution of $(D - D'^2)z = 0$ is _____.
 a) $z = \sum Ae^{kx-y}$ b) $z = \sum Ae^{k^2x+ky}$
 c) $z = Ae^{hx+ky}$ d) $z = Ae^{hx-ky}$

B) Fill in the blanks.**06**

- The particular integral of $(D^2 + D'^2)z = 12(x + y)$ is _____.
- By elimination of arbitrary constants, a and b from $z = (x + a)(y + b)$ we get partial differential equation _____.
- When $f(x, y)$ is of the form $x^m y^n$ if $n < m$ should be expanded in power of _____.
- If $a \neq 0$, then the general solution of the equation $(bD - aD' - c)z = 0$ is _____.
- If $F(D, D')$ be homogenous function of D and D' of degree n then $\frac{1}{F(D, D')} \phi^{(n)}(ax + by) = \text{_____}$.
- The auxiliary equation of $r - 2s + t = \sin(2x + 3y)$ is _____.

Q.2 Attempt Any Eight of the following.**16**

- Eliminate the arbitrary function f from $z = f(x^2 - y^2)$
- Find one solution of $z(x + y)p + z(x - y)q = x^2 + y^2$
- Form the differential equation of eliminating a and b from $z = (x^2 + a)(y^2 + b)$
- Find the complete integral of $q = 3p^2$
- Solve $(D^2 + D'^2 + 2DD')z = 0$
- Solve $(D^3 - 6D^2D' + 11DD'^2 - 6D'^3)z = 0$
- Solve $(D^2 - a^2D'^2 + 2abD + 2a^2bD')z = 0$
- Find the P.I. of $(D - D')(D + D' + 1)z = e^{2x+3y}$
- Find the singular integral of $z = px + qy + \log(pq)$

j) Solve $\left(\frac{y^2 z}{x}\right)P + xzq = y^2$

Q.3 A) Attempt Any Two of the following. 10

- Find the equation of integral surface of the differential equation $2y(z-3)p + (2x-z)q = y(2x-3)$ which pass through circle $z=0, x^2 + y^2 = 2x$.
- Derive the partial differential equation by eliminating arbitrary function ϕ from the function $\phi(u, v) = 0$ where u, v are functions of x, y, z
- Solve $(D^3 - 3DD'^2 - 2D'^3)z = \cos(x + 2y)$

B) Explain the method of finding complementary function of linear homogenous partial differential equation with constant coefficient namely $F(D, D')Z = f(x, y)$ when the roots are distinct. 06

Q.4 A) Attempt Any Two of the following. 08

- Solve $(2D^2 - 5DD' + 2D'^2)z = 24(y - x)$
- Explain the method of solving the equation of the form $f(p, q, z) = 0$
- Solve $x(y^2 - z^2)p - y(z^2 + x^2)q = z(x^2 + y^2)$

B) Explain Charpit's method of solving the partial differential equation $f(x, y, z, p, q) = 0$ where x and y are independent variables and $P = \frac{\partial z}{\partial x}, q = \frac{\partial z}{\partial y}$ 08

Q.5 Attempt Any Two of the following. 16

- Explain the Lagrange's method of solving $Pp + Qq = R$ where P, Q, R are functions x', y, z .
- If $F(D, D')$ is homogenous function of D and D' of degree n and $F(a, b) = 0$ i.e. $(bD - aD')$ is factor of $F(D, D')$ then show that
$$\frac{1}{(bD - aD')^n} \phi(ax + by) = \frac{x^n}{b^n n!} \phi(ax + by)$$
- Find a complete integral of $x(1+y)p = y(1+x)q$
 - Solve $(D^2 - 4DD' + D - 1)z = e^{3x-2y}$

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026
STATISTICS (Special Paper - XII)
Operations Research (22221523-A)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:**
- 1) All questions are compulsory.
 - 2) Draw neat labelled diagrams wherever necessary.
 - 3) Figures to right indicate full marks.
 - 4) Use of log table and calculators is allowed.

Q.1 A) Choose the most correct alternative of the following and rewrite the sentences 10

- 1) The dummy source or destination in a transportation problem is added to _____.
 - a) Satisfying rim condition
 - b) Prevent solution from becoming degenerate
 - c) Ensure that total cost does not exceed a limit
 - d) All of the above
- 2) Non-negativity condition is an important component of LP model because _____.
 - a) variables value should remain under the control of the decision-maker
 - b) value of variables make sense and correspond to real- world problems
 - c) variables are interrelated in terms of limited resources
 - d) None of the above
- 3) A feasible solution to an LP problem _____.
 - a) must satisfy all of the problem's constraints simultaneously
 - b) need not satisfy all of the constraints, only some of them
 - c) must be a corner point of the feasible region
 - d) must optimize the value of objective function
- 4) A constraint in an LP model restricts _____.
 - a) Value of the objective function
 - b) value of the decision variable
 - c) Use of the available recourses
 - d) All of the above

- 5) To proceed with the MODI algorithm for solving an assignment problem, the number of dummy allocations need to be added are _____.
 - a) n
 - b) $2n$
 - c) $n - 1$
 - d) $2n - 1$
- 6) Which of the following method is method of obtaining initial basic feasible solution to transportation Problem?
 - a) Hungarian
 - b) North- West
 - c) Simplex
 - d) Newton Raphson
- 7) The slack for an activity is equal to _____.
 - a) $LF - LS$
 - b) $EF - ES$
 - b) $LS - ES$
 - d) None of the above
- 8) A decision alternative in decision making problem is known as _____.
 - a) Strategy
 - b) States of Nature
 - c) Payoff
 - d) None of these
- 9) The difference between the expected profit under conditions of risk and the expected profit with perfect information is called _____.
 - a) expected value of perfect information
 - b) expected marginal loss
 - c) expected opportunity loss
 - d) None of the above
- 10) Operation research analysis does not _____.
 - a) Predict future operation
 - b) Build more than one model
 - c) Collect the relevant data
 - d) Recommended decision and accept

B) Fill in the blanks**06**

- 1) The graphical method can only be used when there are _____ decision variables.
- 2) The _____ is that region which satisfies all constraints.
- 3) To solve a L.P.P. by simplex method all b_j 's should be _____
- 4) If a game involves more than two players, then it is called a _____ game.
- 5) The method of finding an initial solution based upon opportunity costs is called _____
- 6) Monte Carlo is technique for _____

Q.2 Solve any Eight of the following.**16**

- Write the definition of solution, basic solution.
- Define LPP in the mathematical form.
- Define Surplus Variable.
- What is the artificial variable?
- State the mathematical formulation for T.P.
- When is Big M method useful?
- Write similarities and differences between PERT and CPM.
- What is an opportunity loss in decision making Problem?
- What is Sequencing Problem?
- How to balance Unbalanced T. P.?

Q.3 A) Attempt any Two of the following.**10**

- Write the steps involved in the Procedure of Monte Carlo Simulation.
- A truck company on a particular day has 4 trucks for sending materials to 6 terminals. The cost of sending material from designation by different trucks will be different as given the cost matrix below. Find the assignment that will minimize the total time taken.

Terminals/ Trucks	A	B	C	D
1	3	6	2	6
2	7	1	4	4
3	3	8	5	8
4	6	4	3	7
5	5	2	4	3
6	5	7	6	2

- Explain EVPI in decision making.

B) Write the Procedure of Matrix Minima Method.**06****Q.4 A) Attempt any Two of the following.****08**

- Write the definition and Properties of Random Numbers.
- Give the Steps involved in Minimax regret criterion
- Write the dual of following LPP:

$$\text{Maximize } Z = 5X_1 + 12X_2 + 4X_3$$

Subject to the constraints,

$$X_1 + 2X_2 + X_3 \leq 10$$

$$2X_1 - 4X_2 + 3X_3 = 10$$

$$X_1, X_2, X_3 \geq 0$$

B) Solve Following LPP.**08**

$$\text{Maximize } Z = X_1 - X_2 + 3X_3$$

Subject to the constraints,

$$X_1 + X_2 + X_3 \leq 10$$

$$2X_1 - X_2 \leq 2$$

$$2X_1 - 2X_2 + 3X_3 \leq 30$$

$$X_1, X_2, X_3 \geq 0$$

Q.5 Attempt any Two of the following.

- a) Find the optimal sequence in performing the following five jobs on two machines. Processing times (in hours) are given in the following table.

Job	1	2	3	4	5
Machine M1	5	10	6	7	11
Machine M2	8	6	2	3	4

Also find total elapsed time and idle times for both machines.

- b) Find the Initial Basic Feasible Solution to the following Transportation problem by using VAM method.

		Destination				Supply
		D ₁	D ₂	D ₃	D ₄	
Source	S ₁	21	16	15	3	11
	S ₂	17	18	14	23	13
	S ₃	32	27	18	41	19
	Demand	6	10	12	15	

- c) Suggest the best strategy using the EMV criteria for the following decision-making problem.

States of Nature	Acts			P(E _i)
	A ₁	A ₂	A ₃	
E ₁	25	-10	-125	0.4
E ₂	400	440	400	0.2
E ₃	650	740	750	0.4

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026
STATISTICS (Special Paper - XII)
Regression Analysis (22221523-B)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat and labeled diagram and give equations wherever necessary.
4) Use of log table and calculator is allowed.

Q.1 A) Select the correct alternative front the following **10**

- 1) The sum of residuals in any regression model that contains an intercept is always _____.

a) zero	b) one
c) non-zero	d) positive
- 2) In simple linear regression model $Y = \beta_0 + \beta_1 X + \varepsilon$, X and Y are respectively _____.

a) response variable and regressor variable
b) response variable and predictor variable
c) intercept and slope
d) None of These
- 3) The sum of residuals weighted by the corresponding value of the regressor is always equal to _____.

a) 0.5	b) 0
c) 1	d) -1
- 4) If all observations on response variable Y are located on a straight line, then _____.

a) $SST = SSR$	b) $SSR = SS_{res}$
c) $SST = SS_{res}$	d) $SST = SSR = SS_{res}$
- 5) In logistic regression model, errors follow _____.

a) Normal distribution	b) Binomial distribution
c) Poisson distribution	d) Uniform distribution
- 6) In univariate logistic regression model, estimate of odds ratio is given by _____.

a) $\ln \beta_1$	b) $\frac{1}{\beta_1}$
c) $\sqrt{\beta_1}$	d) e^{β_1}

- 7) Hat matrix is given by _____.
 a) $X(X'X)^{-1}$ b) $X'(X'X)^{-1}$
 c) $X'(X'X)^{-1}X$ d) $X(X'X)^{-1}X'$
- 8) Backward elimination process begins with the assumption that _____.
 a) no regressors are in the model
 b) some regressors are in the model
 c) all regressors are in the model
 d) None of These
- 9) Value of adjusted R^2 always lies between _____.
 a) 0 and 1 b) -1 and 1
 c) 0 and ∞ c) $-\infty$ and ∞
- 10) Which of the following is a criterion for evaluating a regression model?
 a) large value of MS_{res} b) Partial F statistic
 c) Mallows's C_p statistic d) VIF

B) Fill in the blanks**06**

- 1) In the regression equation, $Y = 10 + 5X + \varepsilon$, the slope is _____.
 2) In simple linear model, to test hypothesis about intercept parameter _____ test is used.
 3) The transformation $\ln\left(\frac{n(x)}{1-n(x)}\right)$ is called _____.
 4) In multiple linear regression model, variance of least square estimator of β is _____.
 5) In simple linear regression model, the distribution of error term is assumed to be _____.
 6) The sum of the residuals weighted by the corresponding fitted value is always equal to _____.

Q.2 Solve Any Eight of the following.**16**

- a) State the assumptions of error term in simple linear regression model.
 b) Define the matrix H. State properties of H.
 c) Define coefficient of determination R^2 .
 d) Explain the term variable selection in linear regression.
 e) Obtain the confidence interval for β_1 .
 f) With usual notations, show that $\text{Cov}(1 + H) = 0$
 g) Write simple linear regression model.
 h) Define dichotomous independent variable with illustration.
 i) With usual notations, show that $(1 - H)X = 0$
 j) Discuss the logit transformation in the context of logistic regression model.

- Q.3 A) Attempt Any Two of the following.** **10**
- Describe forward selection method for variable selection and state its limitations.
 - Describe the Pearson's chi - square test for goodness of fit of a logistic model.
 - In multiple regression model $Y = X\beta + \varepsilon$ show that $\beta = \beta + (X'X)^{-1}X'\varepsilon$ In Usual.
- B) In usual notations, prove that.** **06**
- $Var(\hat{Y}) = \sigma^2 H$
 - $Var(\hat{\beta}) = (X'X)^{-1}\sigma^2$
- Q.4 A) Attempt Any Two of the following.** **08**
- Define residual vector in regression analysis. Obtain its mean and variance.
 - What is logistic regression model? Give a real-life situation when this model is Appropriate.
 - Define the ANOVA approach to test the significance of regression in a simple regression model.
- B) Explain the residual plot. Outline the procedure of construction of normal probability plot.** **08**
- Q.5 Attempt Any Two of the following.** **16**
- Describe a multiple linear regression model. Stating the assumptions, obtain the least square estimator (LSE) $\hat{\beta}$ of β .
 - Explain the concept of simple linear regression with illustration. Derive least squares estimators of the regression coefficients in the model.
 - Derive the maximum likelihood estimators of parameters of logistic regression model with covariate.

Seat No.	

Set	P

B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
GEOLOGY (Special Paper - XII)
Applied Geology – Prospecting and Mining Geology (22221528)

Day & Date: Monday, 04-05-2026
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:**
- 1) All questions are compulsory.
 - 2) Draw neat and labeled diagram wherever necessary.
 - 3) Figures to the right indicate full marks.
 - 4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions: 10

- 1) When the material collected to represent a rock type, or formation or an ore body in the quantitative sense then it is termed as _____.
 a) Specimen
 b) Sample
 c) Both specimen and sample can be used
 d) Quantitative specimen
- 2) In the _____ configuration, the current and potential electrode pairs have a common mid point and the distance between adjacent electrodes are equal.
 a) Double dipole
 b) Schlumberger
 c) Wenner
 d) pole-pole
- 3) Which of the following criteria are associated with the chemical composition and behaviour of elements in the earth's crust?
 a) Geological
 b) Geophysical
 c) Geochemical
 d) None of the above
- 4) The spacing of the trenches, pits and boreholes depend on _____.
 a) The length of the ore body
 b) The modes of occurrence of the deposits.
 c) The depth of the deposits
 d) The outcrops of the deposits
- 5) Which of the following is natural source geophysical method?
 a) IP method
 b) Electrical method
 c) Seismic method
 d) Gravity method
- 6) Elements provide good clues in the search for hidden ore bodies because they generally form large haloes are known as _____.
 a) Primary
 b) Pathfinder
 c) Indicator
 d) None of the above

- 7) The pathfinder element of gold is _____.
 - a) As.
 - b) Se.
 - c) Mo.
 - d) SO₄
- 8) What is the name of solid waste that was produced during mining?
 - a) Tailing
 - b) Rocks
 - c) Minerals
 - d) Deposits
- 9) The most sensitive instrument for magnetic survey is _____.
 - a) magnetic field balance
 - b) fluxgate magnetometer
 - c) proton precession magnetometer
 - d) optically pumped magnetometer
- 10) A criteria covers the geological settings associated primarily with the age of various sedimentary series (or intrusions) enclosing a mineral.
 - a) Stratigraphic criteria
 - b) Geomorphological criteria
 - c) Structural criteria
 - d) None of the above

B) Fill in the blanks.**06**

- 1) Self-potential method is the most suitable method for prospecting of _____ minerals.
- 2) Extraction of mineral and metal from the earth is called as _____.
- 3) _____ sampling which best suited to bedded, banded and vein type of deposits.
- 4) The amount of a particular element presents in the parent rock not affected by dispersion or migration is known as _____.
- 5) Which geophysical method is used for detailed exploration of oil and gas?
- 6) The openings in the mine, which serve as a means of entry is known as _____.

Q.2 Solve any Eight of the following.**16**

- a) Define Curie point.
- b) Name the types of electrical sounding methods.
- c) Give two examples of magmatic geological criteria.
- d) Name the instrument used in Gravity methods of exploration.
- e) Name any two types of mining used to extract the ore minerals.
- f) Define shaft and drift.
- g) What is mean by geochemical mobility?
- h) Name any two data corrections of gravity geophysical method.
- i) Give two applications of Seismic geophysical method.
- j) Name the sampling methods used for placer deposits.

Q.3 A) Attempt any Two of the following.**10**

- 1) Write a short note of self-potential electrical method.
- 2) Define Sampling, Discuss in brief any five types of sampling methods
- 3) Describe in short, the field procedure of seismic method with neat labelled diagram.

- B)** Explain the difference between Werner and Schlumberger electrical method. **06**
- Q.4 A) Attempt any Two of the following. 08**
- 1) Describe in detail the applications of magnetic method.
 - 2) Write a brief note on geochemical dispersion halos.
 - 3) Explain vertical electrical sounding with suitable diagram.
- B)** Define mining. Describe the types of surface mining with suitable examples. **08**
- Q.5 Attempt any Two of the following. 16**
- a)** Explain the environmental impact of mining.
 - b)** Discuss in brief the instrumentation, field procedure, data interpretation and applications of Gravity method.
 - c)** Describe in detail the different geological criteria used for Iron ore deposit.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
MICROBIOLOGY (Special Paper - XII)
Industrial Microbiology (22221532-A)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagram wherever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Rewrite the following sentences by selecting correct answer from given alternatives: 10

- 1) _____ is used as test organism for bioassay of penicillin.

a) E. coli	b) S. typhi
c) V. cholevae	d) S. aureus
- 2) Efficiency of pasteurization of milk is determined by _____ test.

a) MBRT	b) Phosphatase
c) MPN	d) SPC
- 3) Taint is spoilage of _____.

a) Meat	b) Milk
c) Vegetable	d) Bread
- 4) _____ production is an example of dual fermentation.

a) Streptomycin	b) Lysine
c) Vit B12	d) Insulin
- 5) Barley malt is used for production of _____.

a) Wine	b) Insulin
c) Beer	d) Champaign
- 6) _____ is an example of food poisoning.

a) Typhoid	b) Corona
c) Flue	d) Botulism
- 7) _____ is water activity of pure water.

a) 1	b) 8
c) 3	d) 5
- 8) _____ is main sugar present in milk.

a) Glucose	b) Lactose
c) Fructose	d) Sucrose

- 9) Ethanol is recovered by _____ process.
 a) Precipitation b) Drying
 c) Distillation d) Filtration
- 10) _____ is an example of perishable food.
 a) Bread b) Sugar
 b) Potato c) Onion

B) Answer in short.**06**

- 1) What is Putrefaction?
- 2) Which protein is present in milk?
- 3) Which organism is used for production of Lysine?
- 4) What is food infection?
- 5) What is pyrogen?
- 6) Define food preservatives.

Q.2 Solve any Eight of the following.**16**

- a) Give the composition of milk.
- b) How the eggs are spoiled?
- c) Give the types of wines.
- d) What is significance of MBRT test?
- e) What is carcinogenicity testing?
- f) What are the uses of streptomycin?
- g) How the allergy testing is done?
- h) What is rancid food?
- i) Which organisms changes color of milk?
- j) What is canning process in food presentation?

Q.3 A) Attempt any Two of the following.**10**

- 1) Write a spoilage of fruits and vegetables.
- 2) Describe the various methods of Pasteurization.
- 3) Describe in brief production of monoclonal antibodies.

B) Describe in detail Beer production.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) What are the principles of food preservation? Write on preservation of food by high temperature.
- 2) Describe in brief vitamin B12 production.
- 3) Write in brief recovery of product by precipitation and solvent extraction.

B) Describe in detail streptomycin fermentation.**08****Q.5 Attempt any Two of the following.****16**

- a) Describe in detail food borne disease.
- b) Explain the sources of microorganisms in milk and write a spoilage of milk.
- c) Describe in detail production of Grape wine.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026**

**MICROBIOLOGY (Special Paper - XII)
Bioprocess Technology (22221532-B)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat and labeled diagram and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Rewrite the following sentences by selecting correct answers from given alternatives: 10

- 1) _____ is an example of edible mushroom.

a) Rhizopus	b) Mucor
c) Aspergillus	d) Agaricus bisporus
- 2) Lactic acid bacteria are used as _____.

a) Probiotic	b) Antibiotic
c) Antiseptic	d) Antagonistic
- 3) Streptomyces griseus is used for production of _____.

a) penicillin	b) streptomycin
c) vinegar	d) amylase
- 4) _____ is an example of hard cheese.

a) Brick	b) Roquefort
c) Cheddar	d) Cottage
- 5) Acetic acid bacteria are used for production of _____.

a) vinegar	b) ethanol
c) probiotic	d) streptomycin
- 6) The purification and recovery of product after fermentation is called _____ process.

a) upstream	b) downstream
c) QC	d) R & D
- 7) During curd formation Lactose in milk is converted into _____ acid.

a) Acetic	b) Malic
c) Lactic	d) Glutamic

- 8) Salmonellosis is an example of food _____.
 a) preservation b) processing
 b) poisoning d) infection
- 9) _____ is substrate for analysis enzyme.
 a) Glucose b) Starch
 b) Protein c) Cellulose
- 10) Red spots on meat are due to growth of _____.
 a) Serratia marcescens b) Pseudomonas aeruginosa
 c) Aspergillus niger d) Penicillium notation

B) Answer in short:**06**

- 1) Define starter culture
- 2) Define food poisoning
- 3) Define is significance of probiotic
- 4) Define biomass
- 5) What is whey?
- 6) Define food spoilage

Q.2 Solve any Eight of the following.**16**

- a) Give two examples of solvents used for product recovery.
- b) Give the uses of streptomycin.
- c) What is prebiotic?
- d) What is rancid food?
- e) What are uses of vinegar?
- f) What are the principles of food preservation?
- g) What are applications of mushrooms?
- h) Which organisms are found in Idli fermentation?
- i) Give the composition of milk.
- j) Give the examples of perishable food.

Q.3 A) Attempt any Two of the following.**10**

- 1) Describe product recovery by chromatography.
- 2) Write on food as substrate for microorganisms.
- 3) Describe in brief amylase production.

B) Describe in detail probiotics.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Describe in brief food preservation by high temperature.
- 2) Give the criteria for choice of recovery process.
- 3) Describe in brief types of cheese and health benefits.

B) Describe in detail food borne diseases.**08**

Q.5 Attempt any Two of the following.

16

- a)** Describe in detail mushroom production.
- b)** Describe in detail production of bread.
- c)** Describe in detail Biomass separation and recovery of product by solvent extraction.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2026
MICROBIOLOGY (Special Paper-XII)
Fermentation Technology (22221532-C)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat and labelled diagrams wherever necessary.
3) Figure to the right indicates full marks.

Q.1 A) Multiple choice question: 10

- 1) The main objective of strain improvement is _____.
 - a) To reduce mutation frequency
 - b) To enhance yield and productivity
 - c) To minimize media cost only
 - d) To decrease metabolic activity
- 2) rDNA technology involves _____.
 - a) Mutation induction
 - b) Gene cloning and expression
 - c) Only protein purification
 - d) Media optimization
- 3) In classical media optimization, the method followed is _____.
 - a) Factorial design
 - b) One factor at a time
 - c) RSM
 - d) Genetic algorithm
- 4) The main objective of scale-up is _____.
 - a) Cost reduction only
 - b) Transfer of fermentation process from lab to production level
 - c) Sterility testing
 - d) Media formulation
- 5) Broth rheology refers to _____.
 - a) Thermal properties of broth
 - b) Flow behavior and viscosity of broth
 - c) pH of medium
 - d) Sterility of broth
- 6) Centrifugation separates components based on _____.
 - a) Charge
 - b) Density
 - c) pH
 - d) Diffusion
- 7) Ion exchange chromatography separates molecules based on _____.
 - a) Size
 - b) Charge
 - c) Shape
 - d) Solubility

- 8) Pyrogen test is used for detection of _____.
 - a) Heavy metals
 - b) Endotoxins
 - c) Antibiotic potency
 - d) pH stability
- 9) Ames test is used for _____.
 - a) Sterility testing
 - b) Mutagenicity detection
 - c) Endotoxin detection
 - d) Protein quantification
- 10) RSM is mainly used for _____.
 - a) Optimization of multiple parameters simultaneously
 - b) Sterilization of media
 - c) Testing for toxicity
 - d) Only pilot-scale fermentation

B) Fill in the blanks /definition.**06**

- 1) Cell disruption using ultrasonic waves is known as _____.
- 2) In centrifugation, higher g-force leads to _____ sedimentation rate.
- 3) Protoplast fusion is a method of _____.
- 4) Filtration sterilization is carried out using _____ pore size filters.
- 5) Agitation speed in a fermenter is often measured in _____.
- 6) The Limulus Amebocyte Lysate (LAL) test is specifically used to detect _____.

Q.2 Solve any Eight of the following.**16**

- a) Differentiate between batch and continuous sterilization?
- b) Define scale-down studies.
- c) Name two chemical mutagens used in microbial strain improvement.
- d) Differentiate between RSM and OFAT.
- e) What is the purpose of agitation in a fermentation.
- f) What is the difference between laboratory and pilot-scale fermentation.
- g) Name two methods of cell disruption.
- h) Why is toxicity testing important for fermentation products?
- i) Define Quality Assurance.
- j) Define Media Optimization.

Q.3 A) Attempt any Two of the following.**10**

- 1) Write principle and applications of RSM.
- 2) Write note on pyrogen testing.
- 3) Explain methods, used for selection of different types of mutants.

B) Explain objectives and levels of scale-up.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Explain various physiological methods of detection and quantification of fermentation product.
- 2) Explain in short sterility testing of fermented products.
- 3) Explain the principle and applications of drying.

B) Write in details the principle and applications of ion Exchange chromatography. **08**

Q.5 Attempt any Two of the following. 16

- a)** Explain in detail the classical and statistical methods of media optimization.
- b)** Explain in details the principles and methods of cell disruption.
- c)** Explain in detail the principles and methods of liquid - liquid extraction and Distillation.

Set

P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
ELECTRONICS (Special Paper - XII)
Electronics Communication (22221540-B)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary
3) Figures to the right indicate full marks.
4) Use of log tables and calculators are allowed

Q.1 A) Choose the correct alternative and rewrite the sentences again. 10

- 1) The electronic communication that takes place in two way is _____.
 - a) Multiplex
 - b) Simplex
 - c) Duplex
 - d) none of these
- 2) FSK stands for _____.
 - a) Frequency Shift Knocking
 - b) Fixed Shift Keying
 - c) Fast Shift Keying
 - d) Frequency Shift Keying
- 3) Ionospheric propagation is also known as _____.
 - a) sky wave propagation
 - b) space wave propagation
 - c) ground wave propagation
 - d) duct propagation
- 4) A super heterodyne receiver has input signal of 10 MHz, the local oscillator is tuned to 13.5 MHz The IF is _____.
 - a) 33.5 MHz
 - b) 3.5 MHz
 - c) 10.7 MHz
 - d) 455 KHz
- 5) _____ tone indicates that line you are trying is currently use.
 - a) Dial
 - b) Ring
 - c) Call wait
 - d) Busy
- 6) In communication unwanted signal is called _____ signal.
 - a) noise
 - b) demodulated
 - c) modulated
 - d) carrier
- 7) FDM stands for _____.
 - a) Frequency Data Modulation
 - b) Frequency Division Multiplexing
 - c) Fast Division Multiplexing
 - d) Frequency Data Multiplexing

- 8) The lower existing layer in an ionosphere layer _____.
a) E layer b) F1-layer
c) D layer d) F2-layer
- 9) A TV broadcast, picture signal is modulated in _____.
a) VSB b) FM
c) AM d) SSB
- 10) Telephone communication is _____ type of system.
a) simplex b) duplex
c) triplex d) full duplex

B) Fill in the blanks.

06

- 1) The term SSB is abbreviation for _____.
- 2) The term VSB is abbreviation for _____.
- 3) The term DTMF is abbreviation for _____.
- 4) The term PAM is abbreviation for _____.
- 5) The term TDM is abbreviation for _____.
- 6) The term PPM is abbreviation for _____.

Q.2 Solve any Eight of the following.

16

- a) What are the types of electronic communication system?
- b) Define AM and FM.
- c) What is radio wave propagation?
- d) What is detector?
- e) What is local loop?
- f) Give the different ones used in Telephone communication.
- g) What is frequency modulation?
- h) What are different layers of ionosphere?
- i) Define Amplitude shift keying.
- j) Define Signal to Noise ratio.

Q.3 A) Attempt any Two of the following.

10

- 1) What is noise in communication? What are its types?
- 2) Explain FDM and TDM techniques.
- 3) Concept of skip distance and virtual height.

B) Explain AM super heterodyne receiver with necessary block diagram.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Explain DTMF dialer system.
- 2) Explain need and importance of modulation.
- 3) Explain any four antenna characteristics.

B) What is digital modulation? What are its types? Explain ASK and FSK.

08

Q.5 Attempt any Two of the following.

16

- a)** Explain the working principle of a parabolic antenna and discuss its radiation pattern, frequency range, and applications.
- b)** What is scanning? What are its types? Explain Interlaced scanning.
- c)** Explain frequency modulation with its necessary mathematical analysis.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
COMPUTER SCIENCE (Special Paper - XII)
Python Programming (22221536-A)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labeled diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative: 10

- 1) In Python, threads are created using the _____ module.
a) multiprocessing b) threading
c) os d) time
- 2) Which of the following is a mutable data type?
a) List b) Dictionary
c) set d) All of these
- 3) _____ is not a keyword in Python.
a) eval b) pass
c) def d) class
- 4) What method is used to make the main thread wait until another thread finishes?
a) thread.pause() b) thread.join()
c) thread.wait() d) thread.block()
- 5) An abstract class in Python is defined using the _____ module.
a) ABC b) abc
c) abstract d) None of these
- 6) Which of these is a valid list in Python?
a) {1,2, 3} b) (1, 2, 3)
c) [1, 2, 3] d) <1, 2, 3>
- 7) _____ types of parameters allows for an arbitrary number of arguments.
a) Default b) Keyword
c) Positional d) Variable-length

- 8) The _____ returns the number of thread objects that are active.
 a) threading.activeCount()
 b) threading.currentThread()
 c) threading.enumerates()
 d) none of these.
- 9) _____ method returns an integer number selected element from the specified range.
 a) random
 b) randint()
 c) sample()
 d) get_random()
- 10) To calculate the sine of an angle in radians using the math module, use _____ function.
 a) Cos
 b) Sin
 c) sign
 d) None of these

B) Fill in the blanks.**06**

- 1) The _____ function in Python is used to open a file.
- 2) A method is declared abstract in Python by using the _____ decorator.
- 3) The _____ method in Python is a special method called a constructor, used to initialize objects.
- 4) The _____ keyword in Python is used to refer to the instance of the class in instance methods.
- 5) In Python, the _____ function is used to find the length of a string.
- 6) The _____ module provides support for working with regular expressions in Python.

Q.2 Solve the following. (Any Eight)**16**

- a) What is Python Virtual Machine (PVM)?
- b) List membership operators in Python.
- c) Write the syntax and use of the if-else statement.
- d) Give differences between lists and tuples.
- e) List out functions of the random module.
- f) What is an abstract class?
- g) What is static method?
- h) Write the use of join() method in threading.
- i) What is the difference between read() and readline() methods?
- j) Write the use of math module with its function.

Q.3 A) Attempt the following. (Any Two)**10**

- 1) What is method overriding? Give an example.
- 2) What is file opening mode? Explain different file opening modes in python.
- 3) Write a program to check given number is prime or not.

B) what is MRO (Method Resolution Order)? Explain.**06**

- Q.4 A) Attempt the following. (Any Two) 08**
- 1) What is event in threading? Explain with example
 - 2) Write a program for multilevel inheritance.
 - 3) Explain different type's parameter passing in python.
- B) What is thread Synchronization? Explain methods used for Synchronization 08**
- Q.5 Attempt the following. (Any Two) 16**
- a) Write a Python program to demonstrate how try, except, and else work.
 - b) What is use of The Super () Method? Explain with example.
 - c) Explain Features of Python in details.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026
COMPUTER SCIENCE (Special Paper - XII)
Kotlin Programming (22221536-B)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to right indicate full marks.

Q.1 A) Multiple choice questions: 10

- 1) Which company developed Kotlin?
 - a) JetBrains
 - b) Microsoft
 - c) Google
 - d) Oracle
- 2) What is the purpose of the fun keyword in Kotlin?
 - a) To declare a class
 - b) To define a constant
 - c) To create a loop
 - d) To declare a function
- 3) What does the Elvis operator (?:) do in Kotlin?
 - a) Performs null checks
 - b) Throws exceptions
 - c) Converts types
 - d) Provides a default value if the left-hand expression is null
- 4) What is an Interface in Kotlin?
 - a) A group of functions without any implementation
 - b) A constructor reference
 - c) A class that contains properties and methods
 - d) A loop control mechanism
- 5) What is throw in Kotlin?
 - a) A loop control statement
 - b) A constructor reference
 - c) Used to explicitly throw an exception
 - d) A placeholder array
- 6) Which Kotlin extension function is used to read the entire content of a file into a single String?
 - a) readLine()
 - b) readText()
 - c) forEachLine()
 - d) bufferedReader()

- 7) When overriding a function or property from a parent class in a child class, which keyword is mandatory?
 - a) open
 - b) override
 - c) public
 - d) virtual
- 8) Which function is used to iterate over a collection in Kotlin?
 - a) iterate()
 - b) forEach()
 - c) loop()
 - d) foreach()
- 9) Which keyword is used to represent the current object(instance) within a constructor or member function in Kotlin?
 - a) new
 - b) object
 - c) this
 - d) instance
- 10) Which of the following is the correct syntax for a simple lambda expression that adds two integers?
 - a) `fun (x,y) = x + y`
 - b) `(x: Int, y: Int) => x + y`
 - c) `lambda(x,y → x + y)`
 - d) `{x,y → x + y }`

B) Fill in the blanks.**06**

- 1) Kotlin files use the extension _____.
- 2) The _____ function prints output to the console.
- 3) _____ function is used to create a *mutable* list in Kotlin.
- 4) The _____ block contains code that always executes.
- 5) _____ keyword is used to define a Kotlin constructor.
- 6) _____ is a collection of abstract methods and properties

Q.2 Solve any Eight of the following.**16**

- a) What are the basic data types in Kotlin?
- b) How do you create an empty list in Kotlin?
- c) Explain Advantages of using inheritance.
- d) What is Kotlin nullable type, and how is it declared?
- e) Describe the distinction between val and var.
- f) Explain the use of open keyword in Kotlin.
- g) What is set? How do you create a set
- h) How do you define a function?
- i) What is a comment?
- j) Explain types of string literals.

Q.3 A) Attempt any Two of the following.**10**

- 1) What is the difference between a list and an array in Kotlin?
- 2) What is exception? How to handle the exception?
- 3) Write a program for break and continue.

B) What is collection? Explain its operations.**06**

Q.4 A) Attempt any Two of the following. 08

- 1) Differences between Lambda Expressions and Anonymous functions.
- 2) Write a program for implementing the interface.
- 3) Explain abstract class and method with example.

B) What is constructor? Explain types of constructors. 08

Q.5 Attempt any Two of the following. 16

- a) What is nullable types? Explain its types.
- b) What is file? Write a program for Read and write data into file.
- c) What is set? Explain its operations.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April – 2026**

**COMPUTER SCIENCE (Special Paper - XII)
Data Warehousing and Mining (22221536-C)**

Day & Date: Monday, 04-05-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to right indicate full marks.
4) Use of log tables and calculators is allowed.

Q.1 A) Multiple choice questions. 10

- 1) Which schema uses multiple fact tables and shared dimensions?
 - a) Star
 - b) Snowflake
 - c) Fact constellation
 - d) All of these
- 2) Prediction differs from classification in that prediction deals with ____ values.
 - a) Continuous
 - b) Discrete
 - c) Both
 - d) None of these
- 3) Which OLAP operation allows reorientation of cube view?
 - a) Slice
 - b) Roll-up
 - c) Dice
 - d) Pivot
- 4) Which type of clustering assumes that each data point belongs to only one cluster?
 - a) Fuzzy Clustering
 - b) Soft Clustering
 - c) Hierarchical Clustering
 - d) Hard Clustering
- 5) Which classification algorithm uses margin maximization principle?
 - a) Decision Tree
 - b) SVM
 - c) Naive Bayes
 - d) K-Means
- 6) In AdaBoost, misclassified samples are given _____.
 - a) Less weight
 - b) More weight
 - c) Equal weight
 - d) Ignored
- 7) Which metric is NOT used for evaluating classifiers?
 - a) Accuracy
 - b) Recall
 - c) Support
 - d) Precision
- 8) Hierarchical clustering produces _____.
 - a) Linear Regression
 - b) Dendrogram
 - c) Hyperplane
 - d) Data Cube

- 9) Which approach uses probabilistic models for clustering?
- a) Partitioning
 - b) Neural network
 - c) Model-based
 - d) Density
- 10) Which is an application of spatial data mining?
- a) Weather pattern analysis
 - b) Market basket analysis
 - c) Fraud detection
 - d) Spam filtering

B) Fill in the blank.**06**

- 1) _____ is the process of identifying patterns that occur frequently in data.
- 2) The measure used in decision tree splitting is _____.
- 3) In ensemble methods, Random Forest uses _____ sampling technique.
- 4) A _____ is a temporary storage area in ETL.
- 5) The method of reducing attributes using linear combinations is called.
- 6) The _____ property states that all subsets of a frequent set must also be frequent.

Q.2 Solve the following. (Any Eight)**16**

- a) Justify the following situation as a classification or prediction task and why: "A real estate company wants to estimate the selling price of a house based on its size (in square feet), number of bedrooms, location, and age of the property."
- b) Define data reduction with example.
- c) What is lift ratio in association rules?
- d) Normalize dataset: 100, 150, 200, 250 using Min-Max [0,1].
- e) What is an ensemble classifier?
- f) What is k-fold cross-validation?
- g) What are issues in data mining?
- h) What is the role of data cleaning in preprocessing?
- i) Define majority voting.
- j) Define "time-variant" in data warehouses.

Q.3 A) Attempt the following. (Any Two)**10**

- 1) Explain logistic regression with example.
- 2) In the ABC Company database, there are records of 60 employees working on a specific project. Out of these 60 employees, 35 are relevant to the project. A search was performed to identify employees relevant to the project, retrieving 30 employees. Among the 30 retrieved employees, 20 are actually relevant to the project. Construct the confusion matrix and calculate the accuracy, precision, error rate, and recall.
- 3) Explain Random Forest algorithm.

B) Explain OLAP operations in detail with examples.**06**

Q.4 A) Attempt the following. (Any Two)

- 1) Explain model-based clustering methods.
- 2) Differentiate regression and classification.
- 3) Apply the following binning techniques to smooth the given dataset using 3 equal-depth bins: Dataset: 2, 5, 7, 12, 14, 16, 18, 20, 24. Perform smoothing using the following methods:
 - i) Smoothing by bin means
 - ii) Smoothing by bin medians
 - iii) Smoothing by bin boundaries

B) Explain K-Means clustering algorithm with example.**08****Q.5 Attempt the following. (Any Two)****16**

- a) Explain Neural Network approach for classification.
- b) Explain components of Data Mining system.
- c) Consider below transactions and Apply Apriori with min support=40%, confidence=60%. Find association rules.

Transaction ID	Items
T1	{Laptop, Mouse}
T2	{Laptop, Keyboard}
T3	{Laptop, Mouse, Keyboard}
T4	{Mouse, Keyboard}
T5	{Laptop, Mouse}

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
English Compulsory
Literary Mindscapes (22221600)**

Day & Date: Tuesday, 28-04-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Rewrite the following sentences by choosing correct alternative. 08

- 1) According to Shastriji, whatever your station in future life, you should first of all think of yourselves as _____.
 a) future leaders of India b) citizens of India
 c) warriors for peak d) democracy of India
- 2) What was found in Aksionov's luggage?
 a) lots of money b) a blood-stained knife
 c) gifts for his family d) Samovar
- 3) The poem 'Endless Time' is addressed to _____.
 a) Man b) Women
 c) Sun d) God
- 4) _____ was the cause of the death of the Duchess.
 a) Illness b) Accident
 c) Drowning d) The duke
- 5) Whose grandeur does the John Keats refer to in the poem 'Ode to Beauty'?
 a) dooms of mighty dead b) Romantic
 c) grand places d) grand towers
- 6) _____ time is used in the poem 'Tree at my window'.
 a) morning b) night
 c) afternoon d) day
- 7) Choose the correct adverb to fill in the blank.
 Mrs. Shejal hurt her knee _____ riding the motorcycle.
 a) Before b) While
 c) Beside d) After

- 8)** She said “I want to talk to you”, (write in to indirect speech)
- a) She said that she wanted to talk to me.
 - b) She told that she wants to talk to me.
 - c) She said that she was wanted to talk to me.
 - d) None of the above

Q.2 Write short answer of the following. (Any Four) 12

- a) What does the Constitution of India guarantee every citizen?
- b) What was the major changes in the character of Aksionov in prison?
- c) What is the theme of the poem ‘Endless Time’?
- d) Describe the personality of the duchess.
- e) Why is ‘Ode to Beauty’ considered to be a romantic poem?
- f) What challenges did the poet and tree face together in ‘Tree at my Window’?

Q.3 Answer the following question. (Any One) 10

- a) What is the importance of Information Literacy?

OR

- b) Write a note on the life skills, known as FLIPS.

Q.4 Answer the following question. 10

What is Civic Literacy? Write the importance of it.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
PHYSICS (Special Paper - XIII)
Electrodynamics (22221617)**

Day & Date: Wednesday, 29-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw Neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Multiple Choice Question.

10

- 1) The path followed by a charged particle entering a uniform magnetic field is _____.
a) Straight line b) Circular
c) Parabolic d) Cycloidal
- 2) Laplace's equation holds true in _____.
a) A region free of charge
b) A region containing free charges
c) Any region in an electric field
d) Only in conductors
- 3) Motional EMF is the fundamental principle behind _____.
a) Transformer b) Generator
c) Capacitor d) Inductor
- 4) As per Lenz's Law, the induced EMF _____ the rate of change of magnetic flux.
a) Supports b) Opposes
c) Enhances d) Neglects
- 5) What does Faraday's Law state?
a) A changing magnetic field induces an electric field
b) A changing electric field induces a magnetic field
c) The total electric flux through a closed surface is proportional to charge enclosed
d) The divergence of the electric field is always zero
- 6) Which equation represents Ampere's Law with Maxwell's correction?
a) $\nabla \cdot B = 0$ b) $\nabla \times E = -\partial B / \partial t$
c) $\nabla \times B = \mu_0 J + \mu_0 \epsilon_0 \partial E / \partial t$ d) $\nabla \cdot E = \rho / \epsilon_0$

- 7) The quantity that represents the flow of electromagnetic energy per unit area per unit time is called _____.
 - a) Electric flux
 - b) Electric potential
 - c) Magnetic susceptibility
 - d) Poynting vector
- 8) Electromagnetic waves are classified as _____.
 - a) Circular waves
 - b) Longitudinal waves
 - c) Transverse waves
 - d) Standing waves
- 9) Total internal reflection occurs when _____.
 - a) The angle of incidence is less than the critical angle
 - b) The angle of incidence is greater than the critical angle
 - c) The refractive index of the second medium is higher
 - d) The angle of refraction is equal to 90°
- 10) The power radiated by an electric dipole varies with frequency as _____.
 - a) ω^4
 - b) ω^2
 - c) ω
 - d) $1/\omega$

B) Fill in the blanks/Definition/One sentence answer/One-word answer/ Give the name/ Predict the product etc. 06

- 1) What is an electric dipole?
- 2) What is refraction?
- 3) The velocity of an electromagnetic wave in a vacuum is _____.
- 4) The rate of change of charge within a volume being equal to the net current flowing out of the volume is called _____.
- 5) Self-induction is the phenomenon in which a changing current in a coil induces an emf in a neighboring coil. (True/False)
- 6) Poisson's equation states that the Laplacian of the electric potential is equal to the charge density divided by permittivity. (True/False)

Q.2 Solve Any Eight of the following. 16

- a) State Coulomb's law.
- b) What is surface current density?
- c) How is magnetic susceptibility defined?
- d) State Ampere's circuital law.
- e) Define electromotive force (EMF).
- f) How does the propagation direction of an electromagnetic wave relate to its electric and magnetic fields?
- g) State Poynting's theorem.
- h) Explain the law of reflection.
- i) Define the critical angle.
- j) What is meant by the electric dipole moment?

Q.3 A) Attempt Any Two of the following. 10

- 1) Show that the three vector E , B and propagation vector K are orthogonal.
- 2) Explain the concept of total internal reflection (TIR) with a suitable diagram.

3) Write Maxwell's equation in materials medium.

B) Derive the expression for the power radiated by an oscillating electric dipole. **06**

Q.4 A) Attempt Any Two of the following. **08**

- 1) Explain the path followed by a charged particle when it enters a uniform electric field.
- 2) Derive Newmann formula for mutual inductance.
- 3) Write note on displacement current.

B) Obtain integral and differential form of Faradays law. **08**

Q.5 Attempt Any Two of the following. **16**

- a) Calculate the radius of circular orbits of an electron of 5keV in magnetic field of 10^{-5} T.
- b) Obtain the boundary condition for electromagnetic field vectors $\vec{D}$ and $\vec{E}$ at the interface of two media.
- c) State Maxwell's equations in a vacuum and explain their physical significance.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
CHEMISTRY (Special Paper - XIII)
Physical Chemistry (22221609)**

Day & Date: Wednesday, 29-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of logarithmic table and calculator is allowed.

Q.1 A) Multiple Choice Question.

10

- Rotational spectra are observed in _____ region.
 - microwave
 - IR
 - radio wave
 - None of these
- The fundamental equation in the spectroscopy is _____.
 - $\Delta E = h\nu$
 - $\Delta S = h\nu$
 - $\Delta G = h\nu$
 - $\Delta V = h\nu$
- Rate of reaction _____ with increase in temperature.
 - remains constant
 - increases
 - decreases
 - None of these
- Number of cycles passing through particular point in one second is called as _____.
 - wavelength
 - wave number
 - frequency
 - energy
- In a reaction $A + B \rightarrow C + D$, molecularity is _____.
 - 1
 - 3
 - 4
 - 2
- The solution having high vapor pressure has _____ boiling point.
 - high
 - minimum
 - medium
 - None of these
- The substance which is present in large quantity in the solution is called as _____.
 - solvent
 - solute
 - component
 - All of these

- 8) Triethylamine water system is an example of a _____ solution temperature.
- a) Maximum b) Maximum-minimum
c) Minimum d) none of these
- 9) At equilibrium, free energy change is _____.
a) negative b) positive
c) zero d) All of these
- 10) For spontaneous process, change in free energy is _____.
a) negative b) positive
c) zero d) All of these

B) Fill in the blank/Definition/One sentence answer/One word answer/Give the name/predict the product etc.

06

- 1) For vibrational spectroscopy, selection rule is _____.
- 2) Define ideal solution.
- 3) Define Anti-Stoke's line.
- 4) Give statement of Raoult's law.
- 5) Define fugacity.
- 6) Give equation for Gibb's free energy.

Q.2 Solve Any Eight of the following.

16

- a) Give two applications of Raman spectroscopy.
- b) Give statement of Hooke's law.
- c) Give statement of Raoult's law.
- d) Define fractional distillation.
- e) Define zeotropic mixture.
- f) Give mathematical expression of Clapeyron Clausius equation.
- g) Define consecutive reaction.
- h) Give statement of law of mass action.
- i) Give two examples of parallel reaction.
- j) Define third order reaction. Give its types.

Q.3 A) Attempt Any Two of the following.

10

- 1) Explain rotational, vibrational and electronic band spectra with suitable diagram.
- 2) Write short note on nicotine water system.
- 3) Derive equation for van't Hoff isochore.

B) Give the characteristics of third order reaction.

06

Q.4 A) Attempt Any Two of the following.

08

- 1) Explain quantum theory of Raman effect.
- 2) Discuss phenol - water system.
- 3) Explain collision theory.

- B)** The yellow light has wavelength 5800 Å, Calculate frequency and wave number of light. **08**
($h = 6.626 \times 10^{-34} \text{ J.s}$, $c = 3 \times 10^8 \text{ m/s}$)

Q.5 Attempt Any Two of the following. **16**

- a)** Derive equation for rate constant of third order reaction when concentrations of three reactants are equal.
- b)** Explain the system of miscible liquid pair having minimum boiling point.
- c)** Derive thermodynamically van't Hoff reaction isotherm.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
BOTANY (Special Paper - XIII)
Plant Pathology (22221601)**

Day & Date: Wednesday, 29-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat and labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice question.**10**

- 1) Plant pathology is area of _____ science which deals with the diseases.
 - a) physiological
 - b) genetical
 - c) zoological
 - d) botanical
- 2) Phytopathology is thus the study of the nature, development and control of plant disease _____.
 - a) Nature
 - b) Development
 - c) Control
 - d) All of these
- 3) A parasite is not synonymous with the pathogen _____.
 - a) parasite
 - b) saprophyte
 - c) Both a and b
 - d) None of these
- 4) This condition is developed due to the rapid death of foliage is known as _____.
 - a) rot
 - b) blight
 - c) canker
 - d) scab
- 5) The size of entire plant or organ is reduced is known as _____.
 - a) stunting
 - b) mosaic
 - c) etiolatin
 - d) rosette
- 6) The development of normal tissue or organ in abnormal location is known as _____.
 - a) alternation
 - b) heterotrophy
 - c) tumerfaction
 - d) curling
- 7) Overgrowth of the tissue in response to damage is known as _____.
 - a) sarcody
 - b) bladder
 - c) callus
 - d) restoration

- 8) Sudden death of young bud is known as _____.
 a) blast
 b) angular
 c) die back
 d) damping
- 9) A pale or white appearance of leaf or fruit is known as _____.
 a) blotch
 b) shot hole
 c) scald
 d) All of these
- 10) Failure of pigments to develop other than chlorophyll is known as _____.
 a) suppression
 b) puckering
 c) variegation
 d) achromatosis

B) Fill in the blanks:

06

- 1) Seed Certification is carried out in _____ broad phases.
- 2) Seeds could be soaked in _____.
- 3) _____ in 1938 used the term aerobiology for the study of microbial life in the atmosphere.
- 4) Tobacco mosaic viruses caused by _____.
- 5) Control measure of citrus canker are _____.
- 6) The causal organism of Telya disease is _____.

Q.2 Solve Any Eight of the following.

16

- a) What is disease?
- b) Define symptoms.
- c) Write the definition of rot.
- d) Define smut.
- e) what is wilt?
- f) Give the definition of damping off.
- g) Define aerobiology.
- h) Write the definition of seed pathology
- i) What is mean by susceptible?
- j) Define seed born.

Q.3 A) Attempt Any Two of the following.

10

- 1) Explain the Concept of plant disease.
- 2) Describe Seed certification studied by you.
- 3) Give the Importance of plant diseases

B) Solve the symptoms, causal organism and control measures of Red Rot of Sugarcane.

06

Q.4 A) Attempt Any Two of the following.

08

- 1) Describe the symptoms, and control measure of Tikka Disease of Groundnut.
- 2) Write the disease cycle and control measures of Brown Spot of Maize.
- 3) Describe the Symptoms and disease cycle of Wilt of Pigeon Pea.

- B)** Describe the symptoms, causal organism, disease cycle and control measures of Grain smut of Jowar. **08**

Q.5 Attempt Any Two of the following. 16

- a)** Explain the symptoms, causal organism, disease cycle and control measures of Downy Mildew of Grapes.
- b)** Describe the symptoms, causal organism, disease cycle and control measures of Powdery Mildew of Mango.
- c)** Give the scope and importance of aerobiology in apiculture studied by you.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
ZOOLOGY (Special Paper - XIII)
Animal Physiology: Life Sustaining Systems (22221625)**

Day & Date: Wednesday, 29-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Multiple Choice Question.**10**

- 1) Digestion is a _____.
 - a) Utilization of food by an organism
 - b) Hydrolysis of complex and large food molecules with the help of enzymes
 - c) Absorption of food in intestine of animals
 - d) Breaking of high energy bonds
- 2) Gastric digestion is completed in _____.
 - a) Buccal cavity
 - b) Oesophagus
 - c) Pharynx
 - d) Stomach
- 3) Maximum percentage of CO₂ is transported in blood in the form of _____.
 - a) Carbonic acid
 - b) Dissolved in plasma
 - c) Carbaminohaemoglobin
 - d) Bicarbonates
- 4) A normal person respire in a minute _____.
 - a) 10-15 times
 - b) 12-18 times
 - c) 20-25 times
 - d) 25-30 times
- 5) How many molecules of oxygen are attached with haemoglobin in man?
 - a) 1
 - b) 2
 - c) 3
 - d) 4
- 6) Which of the following substance reabsorb in descending limb of loop of Henle?
 - a) Water
 - b) K
 - c) Cl
 - d) Na

- 7) The process ultrafiltration takes place in _____.
 a) Proximal convoluted tubule
 b) Bowmans capsule
 c) Loop of Henle
 d) Collecting tubule
- 8) Which of the following is largest blood cell?
 a) RBC
 b) Basophils
 c) Neutrophils
 d) Monocytes
- 9) S.A. node sends how many rhythmic impulses per minute?
 a) 70-80
 b) 150-160
 c) 100-110
 d) 180-190
- 10) The pace maker of heart is _____.
 a) Bundle of His
 b) A.V. node
 c) Purkinje fibres
 d) S.A. node

B) Fill in the blank/Definition/One sentence answer/One word answer/Give the name/predict the product etc. 06

- 1) What is Digestion?
- 2) Define Respiration.
- 3) What is Rh Factor?
- 4) What is AV Node?
- 5) Define cardiac cycle.
- 6) Define stressor.

Q.2 Solve Any Eight of the following. 16

- a) Oral Digestion
- b) Pulmonary Ventilation
- c) Dissociation curve
- d) What is Hemocyanin?
- e) Nephron
- f) Function of RBC
- g) Platelets
- h) Blood group
- i) Pacemaker
- j) Blood pressure

Q.3 A) Attempt Any Two of the following. 10

- 1) Mechanism of Respiration in Mammals.
- 2) What is Dialysis? Explain its mechanism of working.
- 3) Explain Blood Clotting System.

B) Respiratory pigment: Hemoglobin 06

Q.4 A) Attempt Any Two of the following. 08

- a) What is Gastric digestion? Add a note on absorption.
- b) Describe in detail Structure of mammalian heart.
- c) What is Stress? Explain in detail stress management.

B) Describe in detail Intestinal digestion? Add a note on absorption. **08**

Q.5 Attempt Any Two of the following. **16**

- a)** Describe in detail transportation of oxygen and carbon dioxide in blood.
- b)** Describe in detail mechanism of urine formation.
- c)** Describe in detail conduction of heart beat.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
MATHEMATICS (Special Paper - XIII)
Metric Spaces (22221633)**

Day & Date: Wednesday, 29-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative for each of the following. 10

- 1) The metric space (R, D) or R_d is called _____ metric space
 - a) Normal
 - b) Absolute
 - c) Usual
 - d) Discrete
- 2) Every convergent sequence in metric space is _____.
 - a) Convergent
 - b) Divergent
 - c) Cauchy sequence
 - d) Oscillatory sequence
- 3) In a metric space $\langle M, \rho \rangle$ for all $x, y, z \in M$ the triangle inequality is _____.
 - a) $\rho(x, y) \leq \rho(x, z) + \rho(z, y)$
 - b) $\rho(x, y) \geq \rho(x, z) + \rho(z, y)$
 - c) $\rho(x, y) < \rho(x, z) + \rho(z, y)$
 - d) $\rho(x, y) > \rho(x, z) + \rho(z, y)$
- 4) Every open ball in R' is _____.
 - a) an open interval
 - b) half-open interval
 - c) closed interval
 - d) half-closed interval
- 5) A function f is continuous at a iff for given $\epsilon > 0 \exists \delta > 0$ such that _____.
 - a) $f^{-1}(B[f(a); \epsilon]) \subset B[a, \delta]$
 - b) $f^{-1}(B[f(a); \epsilon]) \supset B[a, \delta]$
 - c) $f^{-1}(B[f(a); \delta]) \subset B[a, \epsilon]$
 - d) $f^{-1}(B[a; \delta]) \supset B[f(a), \epsilon]$
- 6) If $f: M_1 \rightarrow M_2$ is continuous then $f^{-1}(F)$ is closed subset of M_1 whenever F is _____.
 - a) closed subset of M_2
 - b) closed subset of M_1
 - c) open subset of M_1
 - d) open subset of M_2
- 7) In any metric space M both M and $\emptyset$ are _____.
 - a) open
 - b) closed
 - c) both open & closed
 - d) neither open nor closed

- 8) Every compact metric space is _____.
 a) complete and not bounded
 b) complete and bounded
 c) complete and totally bounded
 d) totally bounded and not complete
- 9) A closed subset of complete metric space is _____.
 a) compact
 b) closed
 c) bounded
 d) complete
- 10) The arbitrary union of open set is _____.
 a) open
 b) not open
 c) closed
 d) both open & closed

B) Fill in the blanks.**06**

- 1) If $M = R_d$ is the discrete metric space and $a \in R_d$ then $B[a; 1] = \underline{\hspace{2cm}}$.
- 2) For a class ℓ^2 , Let $S = \{S_n\} \in \ell^2$ then the norm of S is derived as
 $\|S\| = \underline{\hspace{2cm}}$
- 3) Let $M = [0, 1]$ be a metric space and $A = \{1, 1/2, 1/3, \dots\} \subset M$
 the $\text{diam } A = \underline{\hspace{2cm}}$.
- 4) A subset E of metric space M is closed subset of M if _____.
 5) If $u = \{u_n\}_{n=1}^\infty \in \ell^2$ and, let $T_u = \left\{\frac{u_n}{2}\right\}_{n=1}^\infty$ if T is contraction on ℓ^2 ,
 then $\alpha = \underline{\hspace{2cm}}$.
- 6) In the metric space M has the Heine-Borel property then M is _____.

Q.2 Attempt any Eight of the following.**16**

- a) If $|x - 2| < 1$ show that $|x^2 - 4| < 5$
- b) Let (M, d) be a metric space and let x, y, z be any three points of M
 then $d(x, y) > |d(x, z) - d(z, y)|$
- c) Define the class ℓ^2 space with suitable example.
- d) If $\lim_{x \rightarrow a} f(x) = L$ and $\lim_{x \rightarrow a} g(x) = M$ then show that

$$\lim_{x \rightarrow a} (f(x) - g(x)) = L - M$$
- e) If f is continuous at a and if $C \in R'$. Prove that Cf is continuous at a .
- f) Define open ball $B[a, r]$ in metric space.
- g) Consider the usual metric $\varrho(x, y) = |x - y|$ for $[0, 1]$ then describe
 $B(0, 1/8)$
- h) If $T(x) = x^2$ ($0 \leq x \leq 1/3$), prove that T is a contraction on $[0, 1/3]$
- i) Define the term totally bounded set.
- j) Define ϵ -dense in A .

Q.3 A) Attempt Any Two of the following. **10**

- a) Show that $d: R^2 \rightarrow R^2$ such that $d(x, y) = \max \{|x_1 - y_1|, |x_2 - y_2|\}$ where $x = (x_1, x_2)$ and $y = (y_1, y_2)$ are in R^2 is metric on R^2 .
- b) If G_1 and G_2 are open subsets of the metric space M then $G_1 \cap G_2$ is also open.
- c) If A is totally bounded of (x, d) then $\bar{A}$ is totally bounded.

B) State and prove Schwarz inequality. **06**

Q.4 A) Attempt Any Two of the following. **08**

- a) If F_1 and F_2 are closed subset of a metric space M , then show that $F_1 \cup F_2$ is closed.
- b) If A is closed subset of the compact metric space (M, ρ) then the metric space (A, ρ) is also compact.
- c) Let (M, ρ) be a metric space and let $a \in M$ and real valued function whose domain are subset of M . If $\lim_{x \rightarrow a} f(x) = L$ and $\lim_{x \rightarrow a} g(x) = N$ then $\lim_{x \rightarrow a} (f(x) \cdot g(x)) = L \cdot N$

B) Let (M, ρ) be a complete metric space, if T is a contraction on M then there is only one point x in M such that **08**

$$T_x = x$$

Q.5 Attempt Any Two of the following. **16**

- a) Find ℓ^∞ be the set of all sequences of real number if $x = \{x_n\}, y = \{y_n\}$ are ℓ^∞ and**

$$D(x, y) = \begin{matrix} \ell. u. b & |x_n - y_n| \\ 1 \leq n < \infty \end{matrix}$$

$$= \begin{matrix} \ell. u. b & \{|x_1 - y_1|, |x_2 - y_2|, \dots \dots |x_n - y_n|\} \\ 1 \leq n < \infty \end{matrix}$$

Then prove that (ℓ^∞, d) is a metric space.

- b) Let (M, ρ) be a complete metric space for each $n \in I$. Let F_n be closed subset of M such that**

$$\text{i) } F_1 \supset F_2 \supset F_3 \supset \dots F_n \supset F_{n+1} \supset \dots$$

$$\text{ii) } \text{Diam } F_n \rightarrow 0 \text{ as } n \rightarrow \infty$$

Then $\bigcap_{n=1}^{\infty} F_n$ contain precisely one point.

- c) Let $\langle M_1, \rho_1 \rangle$ and $\langle M_2, \rho_2 \rangle$ be metric space and let $f: M_1 \rightarrow M_2$. Then f is continuous on M_1 iff $f^{-1}(F)$ is also closed subset of M_1 whenever F is closed subset of M_2 .**

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
STATISTICS (Special Paper - XIII)
Statistical Inference - II (22221641)

Day & Date: Wednesday, 29-04-2026
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labeled diagrams whenever necessary.
 4) Use of log table and calculator is allowed.

Q.1 A) Choose the correct alternatives from the following. 10

- 1) Test of $H_0: \mu = 100$ against $H_1: \mu > 40$ leads to _____.
 a) left tailed test b) right tailed test
 c) two tailed test d) None of these
- 2) Accepting H_0 when H_0 is true is _____ error.
 a) Type-I b) Type-II
 c) No error d) None of these
- 3) Most frequently used method of breaking the ties is _____.
 a) mid rank method
 b) average statistics approach
 c) to omit tied values
 d) most favorable statistic approach
- 4) The ratio of likelihood under H_0 and the entire parametric space is called _____.
 a) Probability ratio b) Sequential probability ratio
 c) Likelihood ratio d) None of These
- 5) Degrees of freedom is related to _____.
 a) no. of observations in a set
 b) Hypothesis under test
 c) no. of independent observations in a set
 d) None of the above
- 6) Neyman - Pearson lemma provides _____.
 a) Unbiased C. R. b) Most powerful C. R.
 c) Admissible C. R. d) Minimal C. R.
- 7) In Sequential Probability Ratio Test (SPRT) the sample size is _____.
 a) fixed b) a random variable
 c) fixed but small d) fixed but large

- 8) Which of the following is applicable to paired data?
 a) The Sign test
 b) The Median test
 c) Wilcoxon's signed rank test
 d) both a) & c)
- 9) For finding the confidence interval for mean of normal populations when σ^2 is known, then the distribution used is _____.
 a) Chi-square
 b) t
 c) F
 d) None of these
- 10) A test which is at least as powerful as any other test of the same size is known as _____.
 a) M. P. test
 b) U. M. P. test
 c) L. R. test
 d) None of these

B) Define the following.**06**

- 1) Null and alternative hypothesis
- 2) Type-I error
- 3) Power
- 4) Type-II
- 5) Run
- 6) Pivotal quantity

Q.2 Answer Any Eight of the following.**16**

- a) Define LRT.
- b) State confidence interval for μ when σ^2 is unknown in case of $N(\mu, \sigma^2)$ distribution.
- c) U.M.P. test
- d) Average Sample Number (ASN) function
- e) Level of significance.
- f) M.P. test
- g) State confidence interval for population variance σ^2 when μ is unknown.
- h) State confidence interval for population proportion P.
- i) Run
- j) Write assumptions of non-parametric tests.

Q.3 A) Solve Any Two of the following.**10**

- a) Describe the procedure of sign test.
- b) Obtain $100(1 - \alpha)\%$ confidence interval for the parameter μ in case of $N(\mu, \sigma^2)$ distribution, when σ^2 is unknown.
- c) A coin is for which the probability of occurrence of head is P , thrown 7 times and null hypothesis is $H_0: P = 1/2$ tested against $H_1: P = 1/4$ is accepted more than one head appears, then compute
 - i) size of test
 - ii) power of test

B) Describe the procedure of Mann-Whitney U-test. **06**

Q.4 A) Solve Any Two of the following. **08**

- 1) Derive the likelihood ratio test for testing $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$ when a sample of size n is taken from $N(\mu, \sigma^2)$.
- 2) Obtain $100(1 - \alpha)\%$ confidence interval for the parameter $\mu_1 - \mu_2$ in case of normal distribution, when population variances are known
- 3) Obtain $100(1 - \alpha)$ confidence interval for ratio of two population variances in case of normal distribution.

B) Let X be a Bernoulli variate with p.m.f **08**
 $P(x, \theta) = \theta^x (1 - \theta)^{1-x}; x = 0, 1, \quad 0 \leq x \leq 1$
 Construct SPRT test for testing $H_0: \theta = \theta_0$ against $H_1: \theta = \theta_1$

Q.5 Solve Any Two of the following. **16**

- a)** Obtain M.P. critical region for the distribution
 $f(x) = \theta e^{-\theta x} \quad ; x \geq 0$
 $= 0 \quad ; \text{otherwise}$
 for testing the hypothesis $H_0: \theta = 2$ against $H_1: \theta = 1$ based on a r. s. of size n drawn from distribution $f(x)$.
- b)** State and prove Neyman- Pearson lemma.
- c)** State the procedure of Kolmogorov - Smirnov test for two independent samples.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
GEOLOGY (Special Paper - XIII)
Photogeology & Remote Sensing (22221649)**

Day & Date: Wednesday, 29-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Multiple Choice Question.**10**

- 1) Raster data is stored in _____ format.
 - a) Tabular
 - b) X-Y co-ordinate
 - c) Pixel / Grid
 - d) Flowchart
- 2) Which data model requires less space for computer storage?
 - a) Raster
 - b) Elevation
 - c) Vector
 - d) None of these
- 3) The study of the characters of the geological features on earth surface using the aerial photograph is _____.
 - a) Photointerpretation
 - b) Photogrammetry
 - c) Photo resolution
 - d) Photo reading
- 4) Digital Number (DN) of each pixel represent its _____ value.
 - a) Brightness value
 - b) Dimensional
 - c) Ground value
 - d) Temperature
- 5) An 8 - bit image can represent how many shades of single colour depending on the energy level?
 - a) 8
 - b) 256
 - c) 64
 - d) 16
- 6) _____ refers to the characteristic placement and arrangement of tone or colour in an image giving impression of visual roughness or smoothness of image.
 - a) Tone
 - b) Texture
 - c) Association
 - d) Shape
- 7) _____ orbit have their axis of rotation aligned to North - South pole of the earth.
 - a) Sun synchronous
 - b) Polar
 - c) Geostationary
 - d) None of the above

- 8) Vector data is a type of _____ data.
 - a) Numerical
 - b) Non-spatial
 - c) Spatial
 - d) Vector
- 9) Clear water reflects _____ energy.
 - a) Consistent
 - b) Less
 - c) More
 - d) None of the above
- 10) Rayleigh scattering occurs when particle size is _____ than wavelength of incoming radiation.
 - a) Very small
 - b) Equal
 - c) Smaller than or equal
 - d) None of the above

B) Answer the following questions in a One Sentence.

06

- 1) What are two types of infrared rays?
- 2) What is resolution?
- 3) Difference between vertical and oblique aerial photographs.
- 4) What is fiducial marks?
- 5) True colour composite shows which band numbers?
- 6) Which one of the following is very helpful to determine height of a feature in aerial photographs?

Q.2 Solve Any Eight of the following.

16

- a) What is node?
- b) What is active remote sensing?
- c) Define photogrammetry
- d) Define remote sensing
- e) What is density slicing?
- f) What is thermal sensing?
- g) Write types of camera.
- h) What is factor affecting scale?
- i) What is raster data?
- j) Write full form of LISS.

Q.3 A) Attempt Any Two of the following.

10

- 1) Describe Landsat Imagery Satellite.
- 2) Describe Multispectral Sensing.
- 3) Explain Hyperspectral Sensing.

B) Write short note types of aerial photographs.

06

Q.4 A) Attempt Any Two of the following.

08

- 1) Describe types of aerial photographs on the basis of film.
- 2) Explain Stereoscope Vision.
- 3) Explain Errors in Flying.

B) Describe Contrast Manipulation.

08

Q.5 Attempt Any Two of the following.

16

- a)** Describe colour composite and false colour composite.
- b)** Explain Rectification and Enhancement.
- c)** What is platform? Explain their types.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
MICROBIOLOGY (Special Paper - XIII)
Molecular Biology and Bioinformatics (22221657)**

Day & Date: Wednesday, 29-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to right indicate full marks.
4) Use of log tables and calculators is allowed.

Q.1 A) Multiple choice questions. 10

- 1) *E. coli* chromosome have approximately _____ numbers of genes.
 - a) 500
 - b) 1000
 - c) 5000
 - d) 10000
- 2) Process of synthesis of amino acids from mRNA is known as _____.
 - a) Replication
 - b) Transcription
 - c) Translation
 - d) Transduction
- 3) In the lac operon _____ number of structural genes are observed.
 - a) 4
 - b) 3
 - c) 2
 - d) 1
- 4) A sudden change in the genetic material of an organism is called a _____.
 - a) mutation
 - b) transduction
 - c) conjugation
 - d) transformation
- 5) Conjugation is process of genetic recombination in between _____.
 - a) bacteria-virus
 - b) bacteria-fungus
 - c) bacteria-protozoa
 - d) bacteria-bacteria
- 6) Taq polymerase from the *Thermus aquaticus* is used for _____.
 - a) Electrophoresis
 - b) PCR
 - c) Chromatography
 - d) Agglutination
- 7) _____ are known as molecular scissors.
 - a) DNA polymerase
 - b) RNA polymerase
 - c) Restriction endonucleases
 - d) Metallo protease
- 8) Modifications in the genetic material are practiced in _____.
 - a) Genetic engineering
 - b) Protein engineering
 - c) Bioinformatics
 - d) Metabolomics

- 9) The _____ retrieval system uses an in-built user interface for rapidly searching molecular biology sequence and bibliographic data.
 - a) Enter
 - b) Google search
 - c) Microsoft edge
 - d) Entrez
- 10) _____ program compares nucleotide or protein sequences to sequence databases and calculates the statistical significance.
 - a) NCBI
 - b) BLAST
 - c) DDBJ
 - d) EMBL

B) Define the following.

06

- 1) Transcription
- 2) Induced mutation
- 3) Electrophoresis
- 4) Bioinformatics
- 5) Database
- 6) Operon

Q.2 Answer Any Eight of the following.

16

- a) What is RNA polymerase?
- b) What is catabolite repression?
- c) What is genotype?
- d) What is transduction?
- e) What is ligase?
- f) What is algorithm in bioinformatics?
- g) Write the full form of EMBL.
- h) What is complementation?
- i) What is DNA fingerprinting?
- j) What is Western blotting?

Q.3 A) Attempt Any Two of the following.

10

- Explain in detail Lac operon.
- Describe in detail Protein Engineering.
- Write in detail on DNA sequencing.

B) Write short note on Transformation.

06

Q.4 A) Attempt Any Two of the following.

08

- Explain in detail folded fiber model.
- Discuss in detail selection, detection and isolation of mutants.
- Write in detail on agarose gel electrophoresis.

B) Describe in detail Translation.

08

Q.5 Attempt Any Two of the following.

16

- Discuss in detail various databases used in bioinformatics.
- Explain in detail gene amplification by PCR techniques.
- Write in detail on Conjugation.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
ELECTRONICS (Special Paper - XIII)
Power Electronics (22221673)**

Day & Date: Wednesday, 29-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagram whenever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and scientific calculator is allowed.

Q.1 A) Choose correct alternative and rewrite the sentence. 10

- 1) During the reverse recovery time of a power diode, it _____.
 a) It removes stored charges
 b) It stores charges
 c) It conducts forward current
 d) It blocks forward voltage
- 2) The magnitude of the forward break over voltage in the SCR depends on _____.
 a) cathode voltage b) gate current
 c) supply voltage d) load resistance
- 3) _____ is commonly used in the controlled rectifiers.
 a) PUT b) IGBT
 c) SCR d) GTO
- 4) A series inverter is called so because _____.
 a) SCRs are connected in series
 b) Load is connected in parallel
 c) Battery is connected in series with supply
 d) Commutating components are in series with the load and SCR
- 5) In an SMPS, the BJT operates mainly in _____ regions.
 a) Active and saturation b) Cut-off and saturation
 c) Cut-off and active d) Inversion and depletion
- 6) The typical range of firing angle (α) in controlled rectifiers is _____.
 a) 0° to 90° b) 0° to 120°
 c) 0° to 180° d) 90° to 180°

- 7) _____ component is essential for commutation in a parallel inverter using SCRs.
- | | |
|----------------|--------------|
| a) Zener diode | b) Diode |
| c) Fuse | d) Capacitor |
- 8) The primary function of an UPS is _____.
 a) To provide backup power during power failure
 b) To increase voltage level
 c) To reduce power consumption
 d) To regulate the frequency of AC supply
- 9) _____ current plays a crucial role in the SCR's turn-on process.
 a) Cathode current b) Holding current
 c) Latching current d) Load current
- 10) In _____ buried gate structure is observed.
 a) GTO b) PUT
 c) IGBT d) SIT

B) Fill in the blanks.**06**

- 1) Power MOSFET operates with _____ charge carriers.
- 2) _____ is the Normally ON power device.
- 3) SCR conducts only when _____.
- 4) Another name for Class C commutation is _____.
- 5) UPS Stands for _____.
- 6) Chopper circuit is also known as _____.

Q.2 Solve Any Eight of the following.**16**

- a) Define reverse recovery time of the power diode.
- b) State the drawbacks of SCR.
- c) Define firing angle and conduction angle?
- d) What do you mean by Inverter and Chopper?
- e) Draw the circuit diagram of basic SMPS circuit.
- f) State the application of SCR.
- g) Draw the symbol of SIT and Power MOSFET.
- h) Draw the circuit diagram of resistance (R) firing circuit of SCR.
- i) Give the classification of inverter according to output waveforms.
- j) Define phase control principal by using an SCR.

Q.3 A) Attempt Any Two of the following.**10**

- 1) Describe the working of Power BJT with its constructional diagram.
- 2) Explain working of speed control of DC motor using SCR.
- 3) Explain single phase half bridge inverter using SCR.

B) Describe SCR triggering circuit by using UJT.**06****Q.4 A) Attempt Any Two of the following.****08**

- a) Define Latching and Holding current of SCR.
- b) Explain in brief RC firing circuit of SCR.
- c) Explain working of basic transistorized inverter circuit.

B) Give the construction and working of IGBT. **08**

Q.5 Attempt Any Two of the following. **16**

- a)** Explain half wave-controlled rectifier with inductive load with effect of freewheel diode.
- b)** With suitable diagram explain turn on and turn off process of GTO
- c)** What is commutation of SCR? Explain working of Class A commutation.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
COMPUTER SCIENCE (Special Paper - XIII)
Network Security (22221665)**

Day & Date: Wednesday, 29-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figure to right indicate full marks.

Q.1 A) Multiple Choice Question.**10**

- 1) In asymmetric key cryptography _____ keys are required per communicating party.

a) 2	b) 3
c) 4	d) 5
- 2) _____ is a message digest algorithm.

a) DES	b) IDEA
c) MD5	d) RSA
- 3) There are _____ rounds in DES.

a) 8	b) 10
c) 14	d) 16
- 4) In _____ one bit of plain text is encrypted at a time.

a) stream cipher
b) block cipher
c) both stream and block cipher
d) None of the above
- 5) Vernam Cipher is also called as _____.

a) Rail Fence Technique	b) One-time pad
c) Book Cipher	d) Running Key Cipher
- 6) The principle of _____ ensures that only the sender and the intended recipients have access to the contents of a message.

a) confidentiality	b) authentication
c) integrity	d) access control
- 7) Password-based authentication is an example _____ of authentication.

a) 1-factor	b) 2-factor
c) 3-factor	d) 4-factor

- 8) SSL works between _____ and _____.
 - a) Web browser, Web server
 - b) Web browser, application server
 - c) Web server, application server
 - d) application server, database server
- 9) A digital certificate binds a user with _____.
 - a) the user's private key
 - b) the user's public key
 - c) the user's passport
 - d) the user's driving license
- 10) The main purpose of SET is related to _____.
 - a) secure communication between browser
 - b) digital signatures and server
 - c) message digests
 - d) secure credit card payments on the Internet

B) Fill in the blank.**06**

- 1) SHA-512 is the strongest message digest algorithm _____.
- 2) HMAC stands for _____.
- 3) In IDEA, the key size is _____.
- 4) Vernam Cipher is an example of _____.
- 5) The principle _____ of ensures that the sender of a message cannot later claim that the message was never sent.
- 6) In _____ attacks the message contents are modified.

Q.2 Answer Any Eight of the following.**16**

- a) Define computer security.
- b) Define S/MIME.
- c) Define the term Attacks.
- d) What is Decryption algorithm?
- e) List out Substitution Techniques.
- f) What is message authentication?
- g) What 4 requirements were defined by Kerberos?
- h) What is intruder?
- i) What is brute-force attack?
- j) Smartcard.

Q.3 A) Attempt Any Two of the following.**10**

- a) Explain the technical details of firewall and describe any three types of firewalls.
- b) Write brief note on E-mail Security.
- c) Write a need for security in details.

B) Explain the Process and Services of the Digital Signature in detail.**06**

- Q.4 A) Attempt Any Two of the following. 08**
- a) Explain the Structure and Analysis of DES.
 - b) Distinguish between Symmetric Key Cryptography and Asymmetric Key Cryptography.
 - c) Explain Security Services in Detail.
- B) What is meant by Ciphers? Explain the types of ciphers. 08**
- Q.5 Attempt Any Two of the following. 16**
- a) What is mean by SSL? Explain SSL Architecture in network security.
 - b) Explain and distinguish MD5 and SHA-512.
 - c) Explain User Authentication in Network Security in detail.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
PHYSICS (Special Paper - XIV)
Materials Science (22221618)**

Day & Date: Thursday, 30-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicates full marks.
3) Neat diagrams must be drawn wherever necessary.
4) Use of log table or calculator is allowed.

Q.1 A) Choose correct alternative:**10**

- 1) The ceramics normally exhibit ____ nature.
 - a) Brittle
 - b) Hard
 - c) Soft
 - d) None of the above
- 2) ____ is opposite to ductility.
 - a) Hardness
 - b) Stiffness
 - c) Brittleness
 - d) None of the above
- 3) ____ monomers undergo additional polymerisation.
 - a) Saturated
 - b) Aliphatic
 - c) Unsaturated
 - d) Aromatic
- 4) Ceramics are examples of _____.
 - a) Large particle composites
 - b) Continuous fiber composites
 - c) Microcomposites
 - d) Short fiber composites
- 5) Size of nanoparticle is _____.
 - a) 10 - 20 nm
 - b) 5 - 10 nm
 - c) 20 - 30nm
 - d) 100 - 200nm
- 6) The most important property of nanomaterial is _____.
 - a) Friction
 - b) Temperature
 - c) Pressure
 - d) Force
- 7) The strength of composite is _____.
 - a) Low
 - b) High
 - c) Zero
 - d) Infinite
- 8) The materials which are used for structural application in the field of medicine are _____.
 - a) Metals
 - b) Composites
 - c) Biomaterials
 - d) Alloys

- 9) PTZ means _____.
 a) Phosphor, zinc, tin
 b) Lead zirconium titanate
 c) Potassium zirconium titanate
 d) Phosphor zinc titanate
- 10) The tanning operations on skin of animal produces _____.
 a) Leather
 b) Cloth
 c) Wool
 d) Blood

B) Give one sentence answers of the following.**06**

- 1) What is creep?
- 2) Define the term elasticity.
- 3) What do you mean by dielectric strength.
- 4) Write any two examples of elastomers.
- 5) Give any two uses of biomaterials.
- 6) Give any two applications of composites.

Q.2 Solve any Eight of the following.**16**

- a) Define specific heat
- b) Define polymerization
- c) Give four examples of ceramics
- d) What are composites?
- e) Write applications of nanomaterials
- f) What is biomechanism?
- g) What are homopolymers?
- h) Give classification of ceramics
- i) Write important properties of ceramics
- j) Define term nanotechnology

Q.3 A) Attempt any TWO of the following.**10**

- a) Discuss classification of materials.
- b) Discuss ceramic processing.
- c) Explain properties and applications of biomaterials.

B) Write short note on fabrication methods of composites.**06****Q.4 A) Attempt any TWO of the following.****08**

- a) Discuss thermosetting polymers.
- b) Explain properties of nanomaterials.
- c) Explain properties of composite materials.

B) Explain mechanical and electrical properties of materials.**08****Q.5 Attempt any TWO of the following.****16**

- a) Discuss various physical methods of synthesis of nanostructured materials.
- b) Discuss various methods of fabrication of polymers in detail.
- c) Explain particle reinforced composites and fibre reinforced composites.

Seat No.	

Set **P****B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:****March/April – 2026****CHEMISTRY (Special Paper - XIV)****Inorganic Chemistry (22221610)**

Day & Date: Thursday, 30-04-2026

Max. Marks: 80

Time: 12:00 PM To 03:00 PM

- Instructions:**
- 1) All questions are compulsory.
 - 2) Draw neat and labeled diagram and give equations wherever necessary.
 - 3) Figures to the right indicate full marks.
 - 4) Use of logarithmic table and calculator is allowed.
(At. Wts.: H=1, C=12, O=16, N=14, Na=23, Cl=35.5)

Q.1 A) Multiple choice questions:**10**

- 1) Lanthanides are also known as _____.
 a) Transition elements b) Alkali metals
 c) Rare earth elements d) Inner transition element
- 2) _____ method commonly used for the individual separation of lanthanides.
 a) Fractional crystallization b) Ion exchange
 c) Electrolysis d) Zone refining
- 3) In the preparation of actinides, neutron capture is followed by _____.
 a) α -decay b) γ -emission
 c) Positron emission d) β -decay
- 4) The theory which explains metallic bonding due to free movement of electrons is _____.
 a) Valence bond theory b) Molecular orbital theory
 c) Free electron theory d) Crystal field theory
- 5) The energy gap between the valence band and conduction band is called _____.
 a) Fermi level b) Overlap energy
 c) Band gap d) Work function
- 6) _____ of the following is an intrinsic semiconductor.
 a) Gallium-doped germanium
 b) Boron-doped silicon
 c) Pure silicon
 d) Arsenic-doped silicon

- 7) $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ is an example of _____.
 - a) Metal alloy
 - b) Polymer
 - c) Ceramic superconductor
 - d) Organic semiconductor
- 8) _____ compound which contains three-center two-electron bonds.
 - a) Borazine
 - b) Diborane
 - c) Xenon tetrafluoride
 - d) Sulphur trioxide
- 9) Corrosion of iron in moist air is an example of _____.
 - a) Dry corrosion
 - b) Chemical corrosion
 - c) Electrochemical corrosion
 - d) Galvanic corrosion
- 10) _____ factor reduces the rate of corrosion due to difficulty in hydrogen liberation.
 - a) Moisture
 - b) Oxygen
 - c) Purity of metal
 - d) Hydrogen overvoltage

B) Fill in the blanks:

06

- 1) Lanthanides belong to the ____ block of the periodic table.
- 2) Borazine is often called inorganic ____ due to structural similarity.
- 3) The geometry of XeF_6 according to Valence Bond Theory is ____.
- 4) Phosphorus pentoxide exists as ____ molecules in the solid state.
- 5) Metals placed higher in the ____ series are more reactive and corrode easily.
- 6) The simplest mononuclear metal carbonyl is ____.

Q.2 Solve any Eight of the following.

16

- a) Write the general electronic configuration of lanthanides.
- b) State any two differences between lanthanides and actinides.
- c) State any two properties of metallic solids.
- d) What is meant by extrinsic semiconductor?
- e) Write any two differences between SO_2 and SO_3 .
- f) State the hybridization of xenon in XeF_2 .
- g) Write any two methods of protection of metals from corrosion.
- h) What is corrosion?
- i) Give the general formula of organoberyllium, and organoaluminium compounds.
- j) Why do alkyl lithium compounds exist as aggregates in solid state?

Q.3 A) Attempt Any Two of the following.

10

- 1) Explain Accelerated projectile bombardment method
- 2) Describe the classification of solids as conductors, insulators, and semiconductors on the basis of band theory.
- 3) Explain the structure of diborane.

B) Explain Passivity with reference to definition, types of passivity and Oxide film theory.

06

- Q.4 A) Attempt any Two of the following. 08**
- 1) Write the Name and symbol and atomic number of actinides
 - 2) Discuss the applications of semiconductors.
 - 3) Describe the structure of phosphorus pentoxide (P_4O_{10}).
- B) Explain types of semiconductors with suitable examples 08**
- Q.5 Attempt any Two of the following. 16**
- a)** Describe the Ion-Exchange Method for separation of lanthanides in detail.
 - b)** Discuss the structure of Alkyl Beryllium and alkyl Aluminium.
 - c)** Discuss the structures of XeF_2 and XeF_6 according to VBT approach.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
BOTANY (Special Paper - XIV)
Plant Biotechnology (22221602)**

Day & Date: Thursday, 30-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat and labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of logarithmic table and non-programmable calculator is Allowed.

Q.1 A) Select the correct alternative from the following: 10

- 1) An enzyme ____ joins fragments of DNA.
 - a) Ligase
 - b) Restriction endonuclease
 - c) Primase
 - d) Exonuclease
- 2) PCR stands for _____.
 - a) Polymerase chain reaction
 - b) People's choice reaction
 - c) Peptide chain reaction
 - d) Polymorphic chain reaction
- 3) In gene cloning, transfer of gene from bacteria to recipient bacteria is called _____.
 - a) Conjugation
 - b) Transformation
 - c) Transduction
 - d) Reproduction
- 4) ____ is another term for tissue culture.
 - a) Macropropagation
 - b) Micropropagation
 - c) Both a and b
 - d) None of these
- 5) Biotechnology provides important tools for the sustainable development of _____.
 - a) Agriculture
 - b) Fisheries
 - c) Forestry
 - d) All of these
- 6) Somatic hybridization involves the following aspects _____.
 - a) Fusion of protoplasts
 - b) Selection of hybrid cells
 - c) Identification of hybrid plants
 - d) All of these
- 7) Biotechnology is used for ____ studies.
 - a) Therapeutic
 - b) Diagnostic
 - c) Forensic
 - d) All of these

- 8) The chemical which ensures gene delivery by chemical means is _____.
 - a) Polyethylene
 - b) Calcium oxide
 - c) Sodium acetate
 - d) Sodium cyanide glycol
- 9) Transgenic plants are developed by _____.
 - a) introduction of foreign genes
 - b) Stopping spindle formation
 - c) Deleting certain chromosome parts
 - d) Introduction gene mutation
- 10) Golden rice is a transgenic crop of the future with the following _____.
 - a) Insect resistance
 - b) Carbohydrates
 - c) High vitamin A content
 - d) High Lysine content

B) Fill in the blanks:

06

- 1) Taq polymerase enzyme used in ____.
- 2) Nitrocellulose membrane used in ____.
- 3) Bt cotton is ____ resistant plant.
- 4) Cell without cell wall is called ____.
- 5) Cosmid is used as ____.
- 6) A collection of total genomic DNA from a single organism is called ____.

Q.2 Solve the following. (Any Eight)

16

- What are vectors?
- What is totipotency?
- Draw neat labelled diagram of vector bacteriophage.
- Enlist enzymes involved in recombinant DNA technology.
- Write any two applications of DNA fingerprinting.
- What is plasmid?
- What is mean by marker gene?
- Define gene cloning.
- Define tissue culture.
- Write the names of any two transgenic plants.

Q.3 A) Attempt the following. (Any Two)

10

- 1) Describe the process of Southern blotting technique.
- 2) Give an account of role of biotechnology in agriculture.
- 3) Write a note on methods of sterilization in plant tissue culture.

B) Write short note on Polymerase Chain reaction.

06

Q.4 A) Attempt the following. (Any Two)

08

- 1) Summarize the process of DNA fingerprinting.
- 2) Write note on micropropagation.
- 3) Explain in brief colony hybridization

B) Explain the process of Somatic hybridization with significance. **08**

Q.5 Attempt the following. (Any Two) **16**

- a)** Explain Agrobacterium mediated gene transfer.
- b)** Describe the enzymes involved in recombinant DNA technology.
- c)** Explain the role of biotechnology in agriculture.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
ZOOLOGY (Special Paper - XIV)
Evolutionary Biology (22221626)**

Day & Date: Thursday, 30-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Multiple Choice Question. 10

- Chemical origin of life from inorganic compounds is known as _____.
 - Chemogeny
 - Variation
 - Natural selection
 - Mutation
- The branch of science that deals with the study of fossils is known as _____.
 - Anthropology
 - Palaeontology
 - Geology
 - Archaeology
- The theory of evolution is explained in _____ book of Darwin.
 - Origin of Species
 - Descent of Man
 - Natural History
 - Principles of Geology
- $p^2 + 2pq + q^2 = 1$ is a mathematical expression of _____ equilibrium.
 - Shanona- Weiner
 - Herbert Spence
 - Darwin
 - Hardy-Weinberg
- Random change in allele frequency in small populations is known as _____.
 - Natural selection
 - Genetic drift
 - Adaptation
 - Mutation
- _____ is a sudden, permanent, and heritable change in the DNA sequence of an organism.
 - Natural selection
 - Genetic drift
 - Adaptation
 - Mutation
- When individuals move into a population, it is called as _____.
 - Emigration
 - Immigration
 - Isolation
 - Speciation

- 8) _____ occurs due to geographical isolation of population.
 a) Allopatric speciation b) Sympatric speciation
 c) Variation d) Mutation
- 9) The K-T extinction is an example of _____.
 a) Speciation b) Mass extinction
 c) Microevolution d) Natural selection
- 10) _____ is the largest unit of geological time.
 a) Era b) Period
 c) Epoch d) Eon

B) Fill in the blank.**06**

- 1) The age of fossils is determined by _____.
- 2) Survival of the fittest through natural selection is a theory of _____.
- 3) Differences among individuals of the same species is known as _____.
- 4) The Mesozoic Era is also called as age of _____.
- 5) The K-T extinction eliminated about _____.
- 6) Formation of new species within the same geographic area is known as _____.

Q.2 Solve any Eight of the following.**16**

- a) Define organic evolution.
- b) What is mean by Migration?
- c) Define palaeontology.
- d) What is a genetic code?
- e) Define the term genetic drift.
- f) What is allopatric speciation?
- g) Define Mutation.
- h) Describe the term Eon.
- i) What is a Mass extinction.
- j) Define the term species.

Q.3 A) Attempt any Two of the following.**10**

- 1) Describe the role of RNA in evolution
- 2) Describe the theory of Lamarckism.
- 3) Give the applications of fossils.

B) Write a short note on Darwinism.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) What are the different sources of variation?
- 2) describe evolution of horse.
- 3) Describe the term K-T extinction with suitable example.

B) Describe the Hardy-Weinberg law of equilibrium with suitable example.**08**

Q.5 Attempt any Two of the following.

16

- a)** Give an account on Neo-Darwinism.
- b)** Describe the term speciation with its different types.
- c)** Write a note on Socio-culture evolution of man.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
MATHEMATICS (Special Paper - XIV)
Numerical Analysis (22221634)**

Day & Date: Thursday, 30-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks
3) Use of Scientific calculator is allowed.

Q.1 A) Choose correct alternative for each of the following. 10

- In Trapezoidal rule, the function $y = f(x)$ is taken to be _____.
 - Ellipse
 - Circle
 - Straight line
 - Parabola
- If $\lambda_1, \lambda_2, \lambda_3$ are real and distinct roots then C.F. = _____.
 - $c_1(\lambda_1)^n + c_2(\lambda_2)^n + c_3(\lambda_3)^n$
 - $(c_1 + c_2 n)(\lambda_1)^n + c_3(\lambda_2)^n$
 - $\delta^n(c_1 \cos n\theta + c_2 \sin n\theta)$
 - None of these
- The solution of the equation $u_{n+3} - 3u_{n+1} + 2u_n = 0$ is _____.
 - $u_n = c_1(2)^n + (c_2 + c_3 n)(1)^n$
 - $u_n = c_1(-2)^n + (c_2 + c_3 n)(1)^n$
 - $u_n = c_1(-2)^n + (c_2 n + c_3 n^2)(1)^n$
 - $u_n = c_1(-2)^n + (c_2 + c_3 n^2)(1)^n$
- If $\Delta^3 y_0 =$ _____.
 - $y_3 + 3y_2 + 3y_1 + y_0$
 - $y_3 + 3y_2 - 3y_1 - y_0$
 - $y_3 - 3y_2 + 3y_1 - y_0$
 - $y_4 - 4y_3 + 6y_2 - 4y_1 + y_0$
- If $(1 + \Delta)(1 - \nabla) =$ _____.
 - 1
 - $-1\Delta\nabla$
 - $\Delta - \nabla$
 - 1
- Gauss - backward interpolation formula is used to interpolate values of y for _____.
 - $-1 < P < 0$
 - $0 < P < 1$
 - $0 < P < -\alpha$
 - $-\alpha < P < 0$

- 7) The exact values of $\int_0^1 \frac{x^2 dx}{1+x^3} =$ ____.
- a) 4.4056 b) 0.23105
c) 2.4056 d) 3.4056
- 8) If $f(x) = e^x$ than $\Delta^6 e^x =$ ____.
- a) $(e-1)^6 e^x$ b) $(e+1)^6 e^x$
c) e^x d) ne^x
- 9) The P.I. of $u_{n+2} - 4u_{n+1} + 4u_n = 2^n$ is ____.
- a) $(n-1)2^{n-3}$ b) $n(n-1)2^{n+3}$
c) $n(n-1)2^{n-3}$ d) $n(n+1)2^{n+3}$
- 10) The Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule obtained by $n =$ _____ in general quadrature.
- a) 1 b) 2
c) 3 d) 4

B) Fill in the blanks of following.

06

- 1) The particular integral of $(E^2 - 4E + 3)y = 3^x$ is _____.
- 2) The order of difference equation $y_{n+2} - y_{n+1} + 2y_n = 2$ is _____.
- 3) Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule is _____.
- 4) The Lagrange's interpolation formula for unequal intervals for n points is polynomial of degree _____
- 5) Relation between Δ and E is given by _____.
- 6) Homogenous equation of type $F\left(\frac{y_{x+1}}{y_x}, x\right) = 0$ to the linear form $F(u_x, x) = 0$ by putting _____.

Q.2 Attempt any Eight of the following.

16

- a) With usual notation, prove that $\Delta^3 y_2 = \nabla^3 y_5$
- b) Prove that $\nabla = 1 - E^{-1}$
- c) State the Trapezoidal rule for integration.
- d) With usual notation, prove that $(E^{\frac{1}{2}} + E^{-\frac{1}{2}})(1 + \Delta)^{\frac{1}{2}} = 2 + \Delta$
- e) Evaluate $\Delta(e^x \log 2x)$
- f) Using Newton's backward interpretation formula, find $\frac{dy}{dx}$
- g) Solve $u_{n+3} - 2u_{n+2} - 5u_{n+1} + 6u_n = 0$
- h) The equation $p(x)y_x y_{x+1} + q(x)y_{x+1} + r(x)y_x = 0$ reduces to linear form.
- i) Solve $u_{n+2} - 4u_{n+1} + 4u_n = 0$
- j) To show that $\delta = E^{\frac{1}{2}} - E^{-\frac{1}{2}}$

Q.3 A) Attempt any Two of the following.**10**

- a) The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth surface:

$x = \text{height}$	100	150	200	250	300	350	400
$y = \text{distance}$	10.63	13.03	15.04	16.81	18.42	19.90	21.27

Find the values of y when $x = 218$ ft.

- b) Prove that $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{1 + \frac{\delta^2}{4}}$
- c) Using Newton's backward difference, construct an interpolating polynomial of degree 3 for the data:
 $f(-0.75) = -0.0718125$, $f(-0.5) = -0.02475$,
 $f(-0.25) = 0.3349375$, $f(0) = 1.10100$
 Find $f\left(-\frac{1}{3}\right)$

- B)** State and prove Lagrange's interpolation formula for unequal intervals.

06**Q.4 A) Attempt any Two of the following.****08**

- a) Given the values

$x :$	5	7	11	13	17
$f(x) :$	150	392	1452	2366	5202

Evaluate $f(g)$ using Lagrange's formula.

- b) Evaluate $\int_0^1 \frac{dx}{1+x}$ using Trapezoidal rule taking $h = \frac{1}{4}$
- c) Solve
- $\Delta^2 \cos 2x$
 - $\Delta^2(ab^x)$

- B)** From the table below, for what values of x, y is minimum? Also find these values of y .

08

$x :$	3	4	5	6	7	8
$y :$	0.205	0.240	0.259	0.262	0.250	0.224

Q.5 Attempt any Two of the following.**16**

- a)** State and prove Simpson's $\left(\frac{3}{8}\right)^{\text{th}}$ rule and hence

Solve $\int_0^6 \frac{dx}{1+x^2}$

- b)** State and prove Newton's forward interpolation formula.
- c)** From the following table, estimate the number of students who obtained marks between 40 and 45

Marks	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
Number of students	31	42	51	35	31

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
STATISTICS (Special Paper - XIV)
Probability Theory (22221642)**

Day & Date: Thursday, 30-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Multiple Choice Question.**10**

- 1) If $X_n \xrightarrow{P} X$ then _____.
 - a) $X_n^2 \xrightarrow{P} X$
 - b) $X_n^2 \xrightarrow{L} X^2$
 - c) $X_n^2 \xrightarrow{2} X^2$
 - d) $X_n^2 \xrightarrow{P} X^2$
- 2) A state 2 of a Markov chain is called recurrent if _____.
 - a) it leads to every state of a MC
 - b) it communicates with every state it leads to
 - c) it does not communicate with at least one state it leads to
 - d) none of these
- 3) Which one of the following is an order statistic?
 - a) sample mode
 - b) sample median
 - c) sample mean
 - d) none of these
- 4) A state of Markov chain is said to be Ergodic if it is _____.
 - a) null persistent and aperiodic
 - b) non-null persistent and aperiodic
 - c) null persistent and periodic
 - d) non-null persistent and periodic
- 5) A stochastic matrix _____.
 - a) Row sums are unity
 - b) Column sums are unity
 - c) Both (a) and (b)
 - d) neither (a) nor (b)
- 6) If $X_n \xrightarrow{P} X$, then which of the following statements is incorrect?
 - a) $(X_n - X) \xrightarrow{P} 0$
 - b) $\frac{x_n - x}{k} \xrightarrow{P} \frac{1}{k}$
 - c) $X \frac{2}{n} \xrightarrow{P} X^2$
 - d) $KX_n \xrightarrow{P} KX$

- 7) If state 3 is transient state, then ____.
- a) $P_{33} = 1$ b) $P_{33}^{(n)} < 1$
 c) $P_{33}^{(n)} = 0$ d) $P_{33}^{(n)} = 1$
- 8) If $X_n \xrightarrow{P} X$, then ____.
- a) $KX_n \xrightarrow{P} KX$ b) $KX_n \xrightarrow{P} K$
 c) $KX_n \xrightarrow{P} X$ d) None of these
- 9) If $N(t)$ is number of occurrences by epoch t follows postulates for Poisson process the $P_n(t)$ follows ____ distribution.
- a) Geometric b) Binomial
 c) Poisson d) Normal
- 10) Distribution of ____ can be obtained using order statistic.
- a) Mean b) Variance
 c) summation of X_i d) none of these

B) Fill in the blanks.**06**

- 1) A stochastic matrix is one in which each row sum is ____.
- 2) In $M/M/1: \infty/FCFS$ model the inter arrival time is assumed to be distributed like ____.
- 3) Distribution function of $X(n)$ is ____.
- 4) Convergence in law is also called as ____.
- 5) If $P = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ then three step TPM would be ____.
- 6) If a random sample of size n is taken from $U(0,1)$ distribution then the distribution of first order statistics is identical to ____.

Q.2 Solve any Eight of the following.**16**

- a) Define queue length.
- b) State Chapman Kolmogorov equation.
- c) Find the c.d.f. of 1st order statistics.
- d) Define queue with example.
- e) Define absorbing states.
- f) Define stochastic process.
- g) Define convergence in distribution.
- h) Define Order statistic.
- i) Define persistent state.
- j) State the joint p.d.f. of i^{th} and j^{th} order statistics.

Q.3 A) Attempt any Two of the following. 10

- 1) Let $\{X_n, n \geq 1\}$ be a markov chain with state space $S = \{0,1\}$ and initial probability distribution is $\{0.4,0.6\}$ with one step transition probability matrix

$$P = \begin{bmatrix} 0.7 & 0.3 \\ 0.4 & 0.6 \end{bmatrix}$$

compute $P(X_3 = 0)$

- 2) Let $X_1, X_2, \dots, X_n$ be a sequence of random variable with mean $= \mu$ and variance $(X_i) = \sigma i^2$
Where $i = 1, 2, 3, \dots, n$. Then show that
 $\frac{s_n^2}{n} \rightarrow \mu^2$; where, $S_n = X_1 + X_2 + \dots + X_n$
- 3) One customer arrives at a counter in a bank after every 15 minutes. Staff on the counter takes 10 minutes on an average for serving a customer. Under the assumptions for applying $M/M/1: \infty / FCFS$ model, find:
- Average queue length
 - Expected waiting time in the queue

B) Short note/Solve. 06

Write a short note on queue discipline and service mechanism.

Q.4 A) Attempt any Two of the following. 08

- 1) Define Convergence in probability and convergence in Quadratic mean.
- 2) Let $\{X_n, n \geq 0\}$ be a Markov chain with state space $S = \{0,1,2\}$ and TPM is

$$P = \begin{bmatrix} 3/4 & 1/4 & 0 \\ 1/4 & 1/2 & 1/4 \\ 0 & 3/4 & 1/4 \end{bmatrix}$$

An initial probability distribution is $P(X_0 = i) = 1/3 ; i = 0, 1, 2$

Then find: (a) $P(X_1 = 1)$, and

(b) $P(X_2 = 1)$

- 3) Let $X_1, X_2, \dots, X_n$ be a random sample of size n (odd) from a density function $f(x)$ and distribution function $F(x)$, find the p.d.f. of sample median.

B) Examine whether WLLN holds for sequence $\{X_n\}$ of a random variable defined as $P[X_k = \pm\sqrt{k}] = \frac{1}{2\sqrt{k}}, P[X_k = 1] = \frac{1}{\sqrt{k}}$ 08

Q.5 Attempt any Two of the following.

- a)** For a Markov chain $\{X_n, n \geq 1\}$ one step TPM is as follows

$$P = \begin{bmatrix} 0 & 1 & 0 \\ p & 0 & q \\ 0 & 1 & 0 \end{bmatrix} \text{ check whether states are recurrent or not.}$$

- b)** State and prove the theorem of WLLN for i.i.d. random variables with finite variance.
- c)** In $M/M/1: \infty/FCFS$ model if the P_n = steady state probability that there are n customers in the system at a time t and is given by $P_n = pn(1 - p), n = 0, 1, 2$, then find the expression for
- expected length of the queue and
 - expected length of the system.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026**

**GEOLOGY (Special Paper - XIV)
Geomorphology and Geotectonic (22221650)**

Day & Date: Thursday, 30-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions. 10

- 1) _____ land comprises, Africa, South America, India, Australia and Antarctica.
 - a) Gondwana
 - b) Laurasia
 - c) Panthalassa
 - d) India
- 2) _____ erosion is a fluvial process of erosion that lengthens a stream, a valley or a gully at its head.
 - a) Headward
 - b) Valley deepening
 - c) Valley widening
 - d) None of these
- 3) Asthenosphere is the zone _____.
 - a) Separating crust and mantle
 - b) Within upper mantle
 - c) Within the lower mantle
 - d) Separating core and mantle
- 4) Ox-bow lakes, levees and flood plains are characteristics of ____ stage.
 - a) Youth
 - b) Mature
 - c) Old
 - d) None of these
- 5) "The present is the key to the past" is the principle of _____.
 - a) Uniformation
 - b) Unconformities
 - c) Uniformitarianism
 - d) Unified theories of geomorphology
- 6) The rock which is well polished by wind abrasion is called _____.
 - a) Yardangs
 - b) Pedestal rock
 - c) Ventifacts
 - d) Desert pavements
- 7) Partial melting and the production of magma takes place at _____.
 - a) divergent plate boundaries
 - b) ocean-ocean convergent plate boundaries
 - c) ocean-continent plate boundaries
 - d) All of these

- 8) Landforms of mesa and butte are formed on ____ structure.
 - a) Granitic batholiths
 - b) Horizontal lava flows or sedimentary beds
 - c) Folded and faulted region
 - d) Limestone region
- 9) The tectonically active volcanic mountain of Pacific Ocean is regarded as _____.
 - a) Ring of Fire
 - b) Ring of volcano
 - c) mountain of fire
 - d) Island of volcano
- 10) Which of the following is exogenic process?
 - a) Earthquake
 - b) Deposition
 - c) Volcano
 - d) None of these

B) Fill in the blanks.**06**

- 1) ____ is the study of the record of the Earth's magnetic field in rocks or sediments.
- 2) The term for wear and tear of the load sediments being transported by a moving natural agency through the process of mutual impacts is _____.
- 3) Compressive stresses, reverse faulting, granitic magmas, and intermediate depth earthquakes are associated with _____.
- 4) New oceanic lithosphere forms at _____ plate boundaries.
- 5) Raised banks of meandering rivers formed by deposition of fine sand, silt and clay during overbank flooding are called _____.
- 6) The variously shaped depressions of different dimensions that are developed in the riverbed are called _____.

Q.2 Solve any Eight of the following.**16**

- a) Define rejuvenation.
- b) What is a Transform boundary?
- c) What is polycyclic landscape?
- d) List the erosional processes of caused by wind.
- e) Braided streams are characteristics of which stage of river.
- f) What type of drainage pattern would you expect to find where rapid weathering along joints in bedrock controls the course of streams?
- g) Give two examples of endogenous processes.
- h) Define Hot spot.
- i) Name the types of depositional features of rivers.
- j) What is degradation?

Q.3 A) Attempt any Two of the following.**10**

- 1) Describe the different gradation process with suitable examples.
- 2) Discuss the erosion features formed by ocean currents.
- 3) Explain in brief the different types of physical weathering.

B) Define orogeny. Describe in short, the formation of Himalaya.**06**

- Q.4 A) Attempt any Two of the following. 08**
- 1) Write a short note on the mid oceanic ridge with neat labelled diagram.
 - 2) Discuss in brief the karst topography and its features with suitable diagram.
 - 3) Explain in brief Extra-terrestrial processes.
- B) Describe in detail epigenic and exogenic processes. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Define Rejuvenation. Explain the types and causes of rejuvenation.
 - b) Discuss Convergent plate boundary and its types. Add note on magmatism at convergent plate boundaries.
 - c) Define Continental drift. Explain the continental drifting with its evidence.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
MICROBIOLOGY (Special Paper - XIV)
Microbial Biochemistry (22221658)**

Day & Date: Thursday, 30-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log tables and calculators is allowed.

Q.1 A) Multiple choice questions:**10**

- 1) The Nature of enzyme _____.
 - a) Lipid
 - b) Vitamin
 - c) Carbohydrates
 - d) Protein
- 2) Ribozymes are best described as _____.
 - a) Protein catalysts
 - b) RNA molecules with catalytic activity
 - c) Isoenzymes with different subunits
 - d) Peptidoglycan degraders
- 3) Which of the following is usually a coenzyme _____.
 - a) Metal ion
 - b) Protein
 - c) Vitamin
 - d) Inorganic compound
- 4) Feedback inhibition generally occurs at _____.
 - a) First enzyme of the pathway
 - b) Last enzyme of the pathway
 - c) Middle enzyme of the pathway
 - d) Ribozymes
- 5) Sonication is commonly used for _____.
 - a) Enzyme immobilization
 - b) Enzyme assay
 - c) Cell disruption
 - d) Protein precipitation
- 6) Purification of enzymes based on solubility difference is usually done by _____.
 - a) Dialysis
 - b) Precipitation
 - c) Ion exchange chromatography
 - d) Gel filtration

- 7) Immobilized enzymes are advantageous because they _____.
 - a) Cannot be reused
 - b) Have lower activity always
 - c) Are easier to separate and reuse
 - d) Work only in vivo
- 8) The enzyme GOGAT is mainly involved in assimilation of _____.
 - a) Carbon
 - b) Nitrogen
 - c) Sulphur
 - d) Phosphorus
- 9) Which metabolic pathway generates both NADPH and pentoses?
 - a) TCA cycle
 - b) Glycolysis
 - c) Pentose phosphate pathway
 - d) Phosphoketolase pathway
- 10) Beta-oxidation is concerned with _____.
 - a) Carbohydrate metabolism
 - b) Lipid catabolism
 - c) Purine degradation
 - d) Bioluminescence

B) Fill in the blanks:**06**

- 1) Enzymes are _____ catalysts that speed up biochemical reactions without being consumed.
- 2) According to the _____ model, the active site of an enzyme is exactly complementary to the substrate.
- 3) The _____ hypothesis suggests that enzymes undergo conformational changes upon substrate binding.
- 4) _____ are RNA molecules that possess catalytic activity.
- 5) Enzyme Consist of Chain of _____.
- 6) The breakdown of fatty acids into acetyl-CoA units occurs through the _____ pathway.

Q.2 Solve any Eight of the following.**16**

- a) Define an enzyme.
- b) What is meant by enzyme specificity?
- c) State the lock and key model of enzyme action.
- d) Give one example of an allosteric enzyme.
- e) What is meant by enzyme unit?
- f) Name any one pathway in carbohydrate metabolism where pyruvate acts as a key metabolite.
- g) What is meant by covalent catalysis?
- h) Name the two subunits involved in nitrogen assimilation by the GOGAT pathway.
- i) Define Allosteric enzyme.
- j) Define cofactor with suitable examples.

- Q.3 A) Attempt any Two of the following. 10**
- 1) Explain the induced fit hypothesis of enzyme action with a suitable example.
 - 2) Differentiate between sequential and concerted models of allosteric enzyme regulation.
 - 3) Describe the role of the arabinose operon in positive control of enzyme synthesis.
- B) Explain the principle of enzyme purification by molecular size. 06**
- Q.4 A) Attempt any Two of the following. 08**
- 1) Derive the Michaelis-Menten equation
 - 2) Explain the glyoxylate bypass pathway and its significance in microbial metabolism.
 - 3) Describe the methods of enzyme immobilization and mention their applications.
- B) Discuss in detail the pentose phosphate pathway. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Explain the process of assimilation of carbon in microorganisms with suitable diagram.
 - b) Describe the process of bioluminescence.
 - c) Elaborate the biosynthesis of purine.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
ELECTRONICS (Special Paper - XIV)
Embedded System Design (22221674)**

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to right indicate full marks.

Q.1 A) Select the correct alternative. 10

- 1) Which is the input statement of C Language normally uses?
 - a) printf()
 - b) getch()
 - c) scanf()
 - d) input()
- 2) How many C Language keywords available for designer?
 - a) 16
 - b) 23
 - c) 64
 - d) 32
- 3) In C programming, the sign '%' is _____ type of operator.
 - a) Arithmetic
 - b) Relational
 - c) Logical
 - d) Bit wise
- 4) In case of stepper motor interfacing with 8051 microcontroller the line driver is needed, which IC is normally used?
 - a) UL2003
 - b) BT136
 - c) MCT2E
 - d) 7447
- 5) The 16x2 smart LCD display has RS pin that is used for selection of _____ register.
 - a) Data
 - b) Command
 - c) either a) or b) only
 - d) both a) & b)
- 6) For which microcontroller based embedded system Keil microVision IDE is used?
 - a) 89C51
 - b) 89C52
 - c) 89V51RD2
 - d) All of these
- 7) Which statement is used as superloop in microcontroller programming?
 - a) for(;;)
 - b) while (0)
 - c) for(;;)
 - d) for(1;1;)

- 8) An embedded system is designed for which application?
 - a) General
 - b) Dedicated
 - c) Hardware
 - d) Digital
- 9) In serial programming, which is checked to identify completion of transfer of data?
 - a) TR Flag
 - b) TI Flag
 - c) TF Flag
 - d) RI Flag
- 10) Which C Programming function has having highest priority for execution?
 - a) main()
 - b) print()
 - c) input()
 - d) Scan()

B) Answer the following.

06

- 1) What is the range of float variable in C programming?
- 2) Which header file is necessary to execute embedded C program for 8051?
- 3) On execution of the statement $X=Y/Z$, where $Y=15$, $Z=4$, what is the value returned to X, if X variable is integer type?
- 4) To display the BCD data on smart LCD using 8051, which code of the character should be send to LCD via port?
- 5) What is In-System programming \?
- 6) State the types of variable declaration in C programming.

Q.2 Solve any Eight of the following.

16

- a) State the features of C programming.
- b) Give the characteristics of an embedded system.
- c) Write the syntax of 'while loop' statement C programming.
- d) State the logical operations used in C language.
- e) How many controls signal are required for 16x2 LCD & state its name.
- f) Sketch the overview of embedded system architecture.
- g) State any four applications of an 8051 based embedded system.
- h) State the meaning of 'void()' function in embedded C programming.
- i) Is data types available in C language? If yes, write.
- j) Define constants and variables of the C Language.

Q.3 A) Attempt any Two of the following.

10

- Sketch the diagram of ADC interfacing to the 8051 microcontroller.
- Why the need of operating system? Write a note on endless loop.
- What is hardware delay? Write embedded C program for blinking the LED using hardware delay.

B) With neat labelled diagram and C program explain interfacing of 16x2 LCD to 8051.

06

- Q.4 A) Attempt any Two of the following. 08**
- a) Discuss the interfacing of thumbwheel switch to 8051.
 - b) Explain embedded C program for generation of square of at Port0.
 - c) Explain the local & global variable declaration in C programming.
- B) What is loop statement in C programming? Discuss the various loops with suitable example. 08**
- Q.5 Attempt any Two of the following. 16**
- a) What is 'if control statement? Describe in detail if control statement in detail with suitable example.
 - b) What is operator concept in C programme? Explain operators with suitable example.
 - c) Describe in detail the designing of an embedded system for humidity measurement.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
COMPUTER SCIENCE (Special Paper - XIV)
Linux and Shell Programming (22221666)

Day & Date: Thursday, 30-04-2026
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 A) Multiple choice questions.**10**

- 1) _____ can be developed the Linux Operating System.
 - a) Stephen Bourne
 - b) Linus Torvalds
 - c) Bill Joy
 - d) David Korn
- 2) Maximum size of Linux filename is _____.
 - a) 255 bytes
 - b) 128 bytes
 - c) 32 bytes
 - d) 64 bytes
- 3) Which of the following feature are supports by Linux?
 - a) Portability
 - b) Communication
 - c) Security
 - d) All of these
- 4) Which combination of keys is used to exit from terminal?
 - a) Ctrl +t
 - b) Ctrl + z
 - c) Ctrl + d
 - d) Ctrl + e
- 5) The command to change the owner of a file is _____.
 - a) Chgrp
 - b) set
 - c) Chmod
 - d) chown
- 6) What is the purpose of id command?
 - a) Print effective and real UID
 - b) Print effective and real GID
 - c) Both A and B
 - d) None of these
- 7) Which command is used to list all the files in your current directory?
 - a) ls -l
 - b) ls -t
 - c) ls -a
 - d) ls -i
- 8) Which command is used to change password of your Linux system?
 - a) Password
 - b) Pass
 - c) change -p
 - d) Passwd

- 9) Which command is used to get the kernel version in Linux?
 - a) uname-r
 - b) Kernel
 - c) uname-n
 - d) uname-s
- 10) The system administrator is also called the _____.
 - a) super user
 - b) root user
 - c) service user
 - d) regular user

B) Fill in the blanks.

06

- 1) GRUB stands for ____.
- 2) ____ is the extension of Shell Program file.
- 3) The command to change the owner of a file is ____.
- 4) DHCP Stands for ____.
- 5) The state of the file system is contained in ____.
- 6) RAID Stands for ____.

Q.2 Solve any Eight of the following.

16

- a) What is Kernel?
- b) What are the basic components of Linux?
- c) What is Data Block?
- d) What is the use of pipe?
- e) What is egrep command?
- f) What is Shell Scripts?
- g) What is mean by Process status in Linux?
- h) Explain cd and pwd command?
- i) Define super Block.
- j) Define the hard links?

Q.3 A) Write a short note on any Two of the following.

10

- 1) Write the procedure for creates the user? Explain Useradd and usermod command.
- 2) What is boot loader? Explain LILO in details?
- 3) Explain with example different file Printing Commands?

B) Short Note:

06

- 1) `chmod` and `chgrp` command
- 2) samba server

Q.4 A) Attempt any Two of the following.

08

- 1) Explain different feature of Linux operating system.
- 2) What is Shell? Explain types of Shell.
- 3) What is Vi editor? Explain the modes in Vi editor.

B) Describe/Explain/Solve

08

What is mean by system administer? Explain Role of System Administrator.

Q.5 Attempt any Two of the following.

16

- a)** What is Linux? Explain Architecture of Linux system.
- b)** Explain data types and operators in shell scripting?
- c)** Explain the different Communication commands with example.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
PHYSICS (Special Paper - XV)
Atomic, Molecular Physics and Quantum Mechanics (22221619)**

Day & Date: Saturday, 02-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams whenever necessary.
2) Figures to the right indicate full marks.
3) Use of log table or calculator is allowed.

Q.1 A) Select correct alternative from the following. 10

- 1) Most intense line in doublet corresponds to _____.
 a) Maximum j value b) j and ℓ change in same way
 c) Both a and b together d) zero j value
- 2) Elements with configuration ns^1 for last orbit are called _____.
 a) alkali metals b) alkaline earth metals
 c) halogen d) inert gases
- 3) When the atom is placed in external weak magnetic field, then we observe _____.
 a) normal Zeeman effect b) anomalous Zeeman effect
 c) Paschen-back effect d) Stark effect
- 4) In Paschen-back effect, every energy level corresponding to a given ℓ value splits into _____ sub levels.
 a) 2ℓ b) $(2\ell + 1)$
 c) $2(2\ell + 1)$ d) $2(2\ell + 2)$
- 5) The reduced mass (μ) of rigid rotator is given by _____.
 a) $\frac{m_1 + m_2}{m_1 m_2}$ b) $\frac{m_1 m_2}{m_1 + m_2}$
 c) $\frac{m_1}{m_1 + m_2}$ d) $\frac{m_2}{m_1 + m_2}$
- 6) If wave function Ψ is imaginary then probability density is _____.
 a) Negative b) Positive
 c) a positive real quantity d) a negative real quantity
- 7) Reduced Plank's constant is _____.
 a) $h/2\pi$ b) h/π
 c) $h\pi$ d) $2\pi h$

- 8) The minimum energy of particle confined to one dimensional rigid box is obtained by substituting n equal to _____.
 - a) one
 - b) zero
 - c) half
 - d) Two
- 9) The zero point energy of linear harmonic oscillator is given by _____.
 - a) $E_0 = 0$
 - b) $E_0 = \hbar\omega$
 - c) $E_0 = \frac{3}{2}\hbar\omega$
 - d) $E_0 = \frac{1}{2}\hbar\omega$
- 10) In quantum mechanics raising operator is given by _____.
 - a) $L_+ = L_x + iL_y$
 - b) $L_+ = L_x - iL_y$
 - c) $L_+ = L_z + iL_y$
 - d) $L_+ = L_z - iL_y$

B) Fill in the blank.

06

- 1) The $1S^2 2S^2 2P^6 3S^1$ is the electronic configuration is _____.
- 2) When the atom is placed in external weak magnetic field, then we observe _____.
- 3) The Lande's g factor for $^2S_{1/2}$ level ($L=0, S=1/2, J=1/2$) is _____.
- 4) The molecular system can be stable if the total energy possessed by the molecule is _____.
- 5) The energy spectrum of particle in one - dimensional rigid box has the nature of _____.
- 6) The kinetic energy operator is given by _____.

Q.2 Solve any Eight of the following.

16

- State Probability density.
- Give any two properties of Raman lines.
- What is a commutation rule?
- What is Paschen back effect?
- Find eigen value of $(\sin nx)$ for operator d^2/d^2x .
- Define Sharp lines and Principle lines.
- Calculate the reduced mass of CO diatomic molecule.
[Mass of C = 1.99×10^{-26} kg & Mass of O = 2.66×10^{-26} kg]
- State Heisenberg's uncertainty principle.
- What is an operator?
- State Zero point energy.

Q.3 A) Attempt any Two of the following.

10

- 1) Derive Schrodinger's time independent wave equation in three dimension.
- 2) Derive the expression for rotational energy levels of diatomic molecule.
- 3) The Raman exciting line in an experiment is $4358 \text{ \AA}$. A sample gives Stoke's line at $4458 \text{ \AA}$. Deduce the wavelength of anti-Stoke's line.

B) What is the Stark effect? And also discuss Stark effect in weak field in hydrogen. **06**

Q.4 A) Attempt any two of the following. 08

- a) State and express Ladder operator.
- b) Derive the component of orbital angular momentum L_x .
- c) State all quantum numbers.

B) Using the steady state Schrodinger's wave equation, derive the energy eigen values for the motion of particle in three dimensional rigid box. **08**

Q.5 Attempt any two of the following. 16

- a) Explain anomalous Zeeman effect and obtain an expression for term shift.
- b) Solve Schrodinger's equation for hydrogen atom and discuss the radial wave equation.
- c) Obtain Zero point energy in case of linear harmonic oscillator.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
CHEMISTRY (Special Paper - XV)
Organic Chemistry (22221611)**

Day & Date: Saturday, 02-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagram and give equations wherever necessary.

Q.1 A) Choose the most correct alternative. 10

- 1) Pyrrole is _____ in nature.

a) neutral	b) amphoteric
c) basic	d) acidic
- 2) Reaction of bromine with pyridine is an example of _____ reaction.

a) electrophilic substitution	b) electrophilic addition
c) nucleophilic substitution	d) rearrangement
- 3) Which of the following is not chemotherapeutic agent?

a) Antituberculars	b) Antibiotics
c) Antimalarial	d) Hypnotics
- 4) _____ is non-reducing sugar.

a) glucose	b) fructose
c) lactose	d) sucrose
- 5) Which of the following carbohydrates does not undergo further hydrolysis.

a) monosaccharide	b) disaccharide
c) trisaccharide	d) polysaccharide
- 6) Open chain of D-glucose contains _____ asymmetric carbon atoms.

a) 3	b) 4
c) 5	d) 6
- 7) _____ vitamin is a fat-insoluble vitamin.

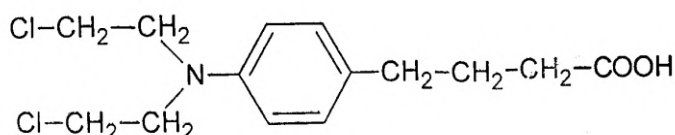
a) A	b) B
c) D	d) K
- 8) Adrenaline contain _____ -OH groups.

a) one	b) two
c) three	d) four

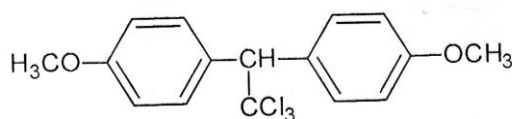
- 9) Generally _____ is responsible for colour of the compound.
- hypsochrome
 - auxochrome
 - bathochrome
 - chromophore
- 10) Ethophan act as _____.
- plant growth regulatory substance
 - insecticide
 - herbicide
 - acaricide

B) Fill in the blanks.**06**

- Pyridine on reaction with conc. HNO_3 + conc. H_2SO_4 gives _____.
- Ketohexose is ketone carbohydrate having _____ carbon atoms.
- Orange is rich source of vitamin _____.
- Name of following drug is _____.



- Along with chromophore, another group present in dye which deepens the colour is called _____.
- Name of following insecticide is _____.

**Q.2 Solve any Eight of the following.****16**

- Why pyridine is more basic than pyrrole.
- Give any two methods for preparation of pyrrole.
- Define reducing and non-reducing sugar.
- Give the structure and source of vitamin A.
- What are qualities of ideal drugs?
- Give the source and uses of cellulose.
- Give synthesis of Orange IV dye.
- What are qualities of good dye?
- Give synthesis of Baygon (Propoxur)
- What are the uses of Carbaryl (Sevin)?

Q.3 A) Attempt any Two of the following.**10**

- How quinoline is prepared by Skraup's synthesis? Explain with mechanism.
- How will you convert glucose to fructose?
- Give synthesis and uses of Indole-3-acetic acid.

B) What are carbohydrates? Give classification of carbohydrate.**06**

Q.4 A) Attempt any Two of the following.**08**

- 1) What is action of a) NaNH_2 b) n-butyl lithium? Give general mechanism for nucleophilic substitution of pyridine.
- 2) Write a note on mutarotation
- 3) How the structure of Adrenaline is proved on the basis of analytical ground?

B) What are drugs? Give detail classification of drugs based on their therapeutic action.

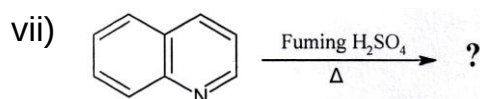
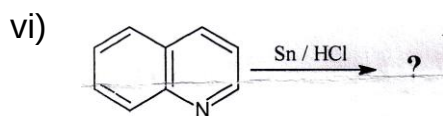
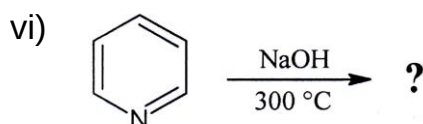
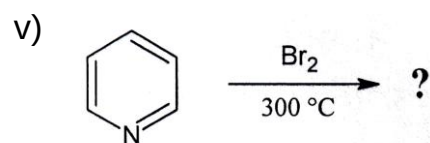
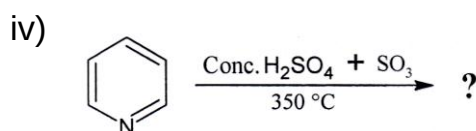
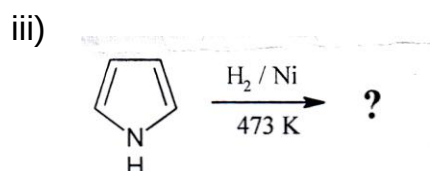
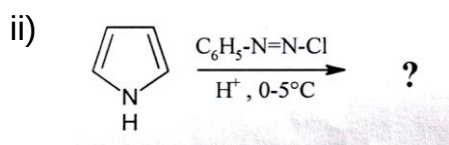
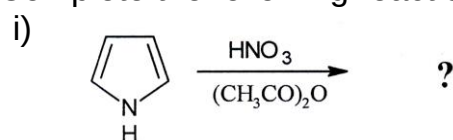
08**Q.5 Answer any Two of the following.****16**

a) Give the synthesis of:

- i) Ethambutol.
- ii) Ibuprofen.

b) What are dyes? Give classification of dyes based on chemical constitution

c) Complete the following reactions.



Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
BOTANY (Special Paper - XV)
Cell Biology (22221603)**

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.

10

- The genetic material of Prokaryotic cell is called _____.
 - Nucleoid
 - nucleus
 - centromere
 - mesosome
- The subunit of ribosome of prokaryotic cell are _____.
 - 60 S and 40 S
 - 20 S and 90S
 - 50 S and 30 S
 - Deviation
- The cell organelle _____ is known as power house of cell.
 - Chloroplast
 - Mitochondria
 - Nucleus
 - Ribosome
- Chromatin is essentially composed of _____.
 - DNA only
 - DNA and Histone
 - RNA only
 - RNA and Ribosome
- Thylakoids are present in _____.
 - Mitochondria
 - Vacuole
 - Chloroplast
 - Ribosome
- The chromosome having centromere at terminal end are called _____.
 - sub metacentric
 - telocentric
 - metacentric
 - acrocentric
- Animal cell different from plant cell in having _____.
 - Ribosome
 - nucleus
 - Golgi apparatus
 - Centrosomes
- In compound microscope, the first lens that magnifies the specimen is _____.
 - Eyepiece
 - Objectives
 - condenser
 - Mirror

- 9) In plant cells, cytokinesis occurs by, _____.
a) Cleavage of furrow formation
b) Cell plate formation
c) Centriole activity
d) Chromosome splitting
- 10) Meiosis occurs in _____.
a) Somatic cell
b) germ cell
c) nerve cell
d) muscle cell

B) Fill in the blanks:

06

- 1) Robert Hook discovered _____ of cell.
- 2) Sticky character to bacterial cell wall due to _____.
- 3) The surface of RER bears _____.
- 4) Give the name of microbodies.
- 5) Circular DNA present in _____.
- 6) Structural and functional unit of life is called _____.

Q.2 Answer the following. (Any Eight)

16

- a) Write the function of mitochondria.
- b) Define Karyotype.
- c) Define meiosis.
- d) Draw neat labelled diagram of meiosis.
- e) Write the role of nucleus.
- f) What is Lamphbrush chromosome?
- g) Give any two differences of mitosis and meiosis.
- h) Give the functions of Glyoxisomes.
- i) Write the use of phase contrast microscope.
- j) What is mean by resolving power of microscope.

Q.3 A) Attempt any Two of the following.

10

- 1) Write the principle and application of light microscope.
- 2) What is cell theory? Explain in brief.
- 3) Explain the ultrastructure of Mitochondria.

B) Write a short note on prokaryotic cell.

06

Q.4 A) Attempt the following. (Any Two)

08

- 1) Explain in brief composition of cell membrane.
- 2) Write a note on scanning electron microscope.
- 3) Describe the cell cycle.

B) Explain in brief morphology of chromosome.

08

Q.5 Attempt the following. (Any Two)

16

- Explain in brief eukaryotic cell with suitable diagram and its functions.
- Explain the process of mitosis with its significance.
- Describe the ultrastructure of chloroplast with its function.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
ZOOLOGY (Special Paper - XV)
Animal Behavior and Chronobiology (22221627)**

Day & Date: Saturday, 02-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculators is not allowed.

Q.1 A) Multiple choice questions:**10**

- 1) _____ is considered as father of classical conditioning.
 - a) Konrad Lorenz
 - b) Karl von Frisch
 - c) Niko Tinbergen
 - d) Ivan Pavlov
- 2) Building of nest by birds, singing to attract males, territoriality, migration, parental care are examples of _____ type of behavior.
 - a) Innate or stereotyped or Instinctive
 - b) Learned Behaviors
 - c) Standardized
 - d) Conventional
- 3) The scientific division of biology that study animal behavior is called as _____.
 - a) Applied Zoology
 - b) Ecology
 - c) Ethology
 - d) Ethnology
- 4) Three pioneers in the study of animal behavior-Tinbergen, Frisch and Lorenz received novel prize in the year _____.
 - a) 1960
 - b) 1973
 - c) 1999
 - d) 1980
- 5) Birds learning to ignore scare crow is an example of _____ behavior.
 - a) Habituation
 - b) Imprinting
 - c) Reflexes
 - d) Conditioning
- 6) In circadian cycle, biological clocks are entrained to day/night cycles that approximate only a _____ hour cycle.
 - a) 10
 - b) 20
 - c) 24
 - d) 48

- 7) The environmental factor that drive endogenous biological rhythms is called _____.
 - a) Search Image
 - b) Zeitberger
 - c) Migration
 - d) Chemical Cue
- 8) The modification of behavior as a result of experience is called _____.
 - a) Orientation
 - b) Ethology
 - c) Learning
 - d) Habituation
- 9) _____ hormone is produced in response to darkness.
 - a) Growth Hormone
 - b) Melatonin
 - c) Prolactin
 - d) Testosterone
- 10) In most species, _____ usually invest more in their offspring.
 - a) Siblings
 - b) Male
 - c) Conspecifics
 - d) Female

B) Give one sentence answer to the following.

06

- 1) Taxis
- 2) Stimulus
- 3) Chronomedicine
- 4) Altruism
- 5) Migration
- 6) Chronobiology

Q.2 Solve any eight of the following.

16

- Define- kinesis with example
- Define- instinct with example
- Define- imprinting with example
- Melatonin and its function
- Define- altruism with example
- Define- chronotherapy
- Define- courtship
- Define- Chronopharmacology
- Define- reflex with example
- Define- habituation with example

Q.3 A) Attempt any Two of the following.

10

- 1) Define Chronobiology and its role in diseases.
- 2) Elaborate on proximate and ultimate causes of behavior with suitable examples.
- 3) Discuss Niko Tinbergen's contributions to the study of animal instincts with an example.

B) Write short note.

06

With suitable examples, discuss Konrad Lorenz's contribution in behavioral science.

- Q.4 A) Attempt any Two of the following. 08**
- 1) Explain the concept of society with honey bee as an example.
 - 2) Write an account on the significance of asymmetry of sex and sexual dimorphism.
 - 3) Discuss photoperiod and regulation of seasonal reproduction in vertebrates.
- B) Describe/Explain/Solve 08**
- Define mate choice and with suitable examples elaborate intra and intersexual selection.
- Q.5 Attempt any Two of the following. 16**
- a) Give a detailed account on the foraging and dance language in honey bees.
 - b) Define 'associative learning' and discuss classical and operant conditioning with example.
 - c) Explain characteristics and types of biological rhythms with their significance.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
MATHEMATICS (Special Paper - XV)
Integral Calculus (22221635)

Day & Date: Saturday, 02-05-2026
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternatives for each of the following. 10

1) $\int_a^{\infty} \frac{\sin x}{\sqrt{x}} dx$ where $a > 0$ is _____.

- a) Convergent b) Divergent
 c) Oscillatory d) Proper

2) $\int_0^{2\pi} \tan x \, dx$ is an improper integral of _____.

- a) First kind b) Second kind
 c) Third kind d) Both a and b

3) $\int_a^b \frac{dx}{(x-a)^m}$ is convergent if _____.

- a) $m > 1$ b) $m = 1$
 c) $m \geq 1$ d) $m < 1$

4) If $\int_a^{\infty} |f(x)| dx$ is convergent then the integral $\int_a^{\infty} f(x) dx$ is _____.

- a) Conditionally convergent b) Uniform convergent
 c) Absolutely convergent d) Divergent

5) The value of $\int_0^1 x^4(1-x)^3 dx$ is _____.

- a) $\frac{1}{280}$ b) $\frac{1}{180}$
 c) $\frac{1}{380}$ d) 1

- 6) The integral $\int_0^{\infty} x^{n-1} e^{-x} dx$ is defined as ____.
- Beta function
 - Gamma function
 - Beta and Gamma function
 - Laplace transform
- 7) If $0 < p < 1$ then $\Gamma(p) \Gamma(1-p) = \frac{\pi}{\sin p\pi}$.
- 1
 - $\frac{\pi}{2}$
 - $\frac{\pi}{\sin p\pi}$
 - $\frac{p\pi}{\sin p\pi}$
- 8) The $\int_0^2 \int_0^{3y} y dy dx = \underline{\hspace{2cm}}$.
- 3
 - 8
 - 9
 - 4
- 9) The value of $\int_0^{\pi} \int_0^{a(1+\cos \theta)} r dr d\theta = \underline{\hspace{2cm}}$.
- $3\pi a^2$
 - $\frac{3}{4}\pi a^2$
 - $\frac{3}{5}\pi a^2$
 - π
- 10) To change a given double integration from cartesian to polar co-ordinate we use the formula ____.
- $dx dy = d\theta dr$
 - $dx dy = r d\theta dr$
 - $dx dy = r^2 dr d\theta$
 - $r dx dy = d\theta dr$

B) Fill in the blank.**06**

- Value of $\Gamma(2)$ is ____.
- $\int_0^{\infty} \sin x dx$ is an improper integral of ____ kind.
- Define Beta function.
- The value of $\Gamma(n+1) = \underline{\hspace{2cm}}$.
- The integral is said to be proper integral if ____.
- Another form of $\beta(m, n) = \underline{\hspace{2cm}}$.

Q.2 Solve the following. (Any Eight)

a) Show that $\int_0^{\pi} \sqrt{\frac{1}{2}} = \sqrt{\pi}$

b) Evaluate $\int_0^{\pi} \sqrt{\tan \theta}$

c) Evaluate $\int_0^{\infty} e^{-x^4} dx$

d) Show that $\beta(m, n) = \beta(n, m)$.

e) Evaluate $\int_0^1 \int_{x^2}^{2-x} y dy dx$

f) Solve $\int_1^{\log 8} \int_0^{\log y} e^{x+y} dx dy$

g) Evaluate $\int_0^1 \int_0^2 dx dy$

h) Test the converges of $\int_0^1 \frac{dx}{x^3}$

i) Test the converges of $\int_0^1 \frac{dx}{x^3(1+x^2)}$

j) Define Improper integral of second kind.

Q.3 A) Attempt the following. (Any Two)

a) Show that $\int_0^{\pi/2} \sin x \cdot \log \sin x$ is convergent with value $\log(2/e)$

b) Prove that $\int_0^{\pi/2} \sin^m \theta \cdot \cos^n \theta d\theta = \frac{\sqrt{\frac{m+1}{2}} \sqrt{\frac{n+1}{2}}}{2 \sqrt{\frac{m+n+2}{2}}}$

c) Show that the area of ellipse.

$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is πab using double integration.

B) Solve $\iint xy dx dy$ over the frist quadrant of $x^2 + y^2 = a^2$

Q.4 A) Attempt the following. (Any Two)**08**

- a) Change the order of integration $\int_0^{2a} \int_{x^2/4a}^{(3a-x)} f(xy) dx dy$
- b) Show that $\Gamma(1+n) \Gamma(1-n) = \frac{n\pi}{\sin n\pi}$
- c) Test the Converges of $\int_0^2 \frac{\log x}{\sqrt{2-x}} dx$

B) Show that $\sqrt{\pi} \Gamma(2m) = 2^{2m-1} \Gamma(m) \Gamma(m + \frac{1}{2})$

08**Q.5 Attempt the following. (Any Two)****16**

- a) State and prove Abel's test for improper integral of a product of two function.
- b) Solve the following.
- Compute $\Gamma(-\frac{1}{2})$, $\Gamma(-\frac{3}{2})$
 - Show that $\beta(m, n) = \frac{\Gamma(m) \Gamma(n)}{\Gamma(m+n)}$
- c) Transform the double integration $\iint x^{m-1} y^{n-1} dx dy$ by using the transformation formula $x + y = u, y - u = v$

Seat No.	

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
STATISTICS (Special Paper - XV)
Designs of Experiments (22221643)**

Day & Date: Saturday, 02-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions.

10

- 1) The principle of local control is mainly used to _____.
a) Reduce block size b) Reduce error variance
c) Increase treatments d) Randomize units
- 2) In CRD, the total degrees of freedom are equal to _____.
a) $n - 1$ b) $t - 1$
c) $n - t$ d) t
- 3) In RBD, the two-way classification consists of _____.
a) Rows and columns b) Treatments and blocks
c) Blocks and replications d) Factors and levels
- 4) In LSD, the number of treatments must be equal to _____.
a) Rows only b) Columns only
c) Rows and columns d) Replications
- 5) The F-test in ANOVA is based on _____.
a) Normal distribution b) Binomial distribution
c) t distribution d) F distribution
- 6) Efficiency of RBD over CRD is usually _____.
a) Less than 100% b) Equal to 100%
c) More than 100% d) Cannot be determined
- 7) In ANOCOVA, the concomitant variable is used to _____.
a) Increase treatments b) Reduce error variance
c) Avoid randomization d) Increase replications
- 8) In a 2^2 factorial experiment, the number of treatment combinations is _____.
a) 2 b) 3
c) 4 d) 8

- 9) Confounding in factorial experiments is introduced to _____.
 a) Reduce systematic error b) Control higher order interactions
 c) Reduce randomization d) Reduce replication
- 10) The three basic principles of DOE are _____.
 a) Replication, Randomization, Local Control
 b) Confounding, Blocking, Interaction
 c) Randomization, Control, Estimation
 d) Local Control, ANOVA, Randomization

B) Fill in the blanks / Definitions / One sentence answers. 06

- 1) The basic unit on which a treatment is applied is called _____.
 2) In CRD, the total variation is divided into _____ and error.
 3) The number of degrees of freedom in rows of LSD is _____.
 4) In RBD, missing plot technique is applied when _____.
 5) The test for significance in ANOCOVA is carried out using _____ statistic.
 6) The number of main effects in a 2^3 factorial experiment is _____.

Q.2 Solve the following. (Any Eight) 16

- a) State and explain the principles of randomization, replication, and local control.
 b) Define CRD. Write its assumptions.
 c) Derive the ANOVA table for CRD.
 d) Write a note on "Choice of plot size and shape".
 e) Explain the need for blocking.
 f) Define RBD. Write its model and assumptions.
 g) Explain layout of a Latin Square Design with example.
 h) State the assumptions of ANOVA in LSD.
 i) Define concomitant variable in ANOCOVA. State its importance.
 j) Write short note on main and interaction effects in factorial experiments.

Q.3 A) Attempt the following. (Any Two) 10

- 1) Explain analysis of variance in RBD with one example.
 2) Derive the expected mean sum of squares in CRD.
 3) Explain the layout and analysis of LSD with single missing observation.

B) Short Note. 06
 Explain the efficiency of LSD over RBD.

Q.4 A) Answer the following. (Any Two) 08

- 1) Explain 2^2 factorial experiment and derive its ANOVA table.
 2) Explain the concept of partial confounding in 2^3 factorial design.
 3) Discuss the assumptions and interpretation of ANOCOVA in RBD.

B) Describe / Explain / Solve.**08**

Construct the ANOVA table for 2^3 factorial experiment using Yate's procedure.

Q.5 Attempt the following. (Any Two)**16**

- a) Explain the layout, assumptions, and applications of CRD.
- b) Discuss in detail the analysis of ANOCOVA with one concomitant variable.
- c) Explain total confounding in 2^3 factorial designs with suitable layout.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
GEOLOGY (Special Paper - XV)
Environmental Geology (22221651)**

Day & Date: Saturday, 02-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Multiple Choice Question.**10**

- 1) Sediment on slope if _____ is stable.
 - a) fully water saturated b) dry
 - c) very dry d) moist
- 2) Development of cracks on hill could be one of the signs of _____ hazard.
 - a) flood b) Tsunami
 - c) volcanic d) all of those in a, b & c
- 3) Sudden rise in carbon & Sulphur in lake water could be indicator of _____ disaster.
 - a) landslide b) volcanic
 - c) flood d) avalanche
- 4) Siberia could release _____ damaging the ozone layer.
 - a) Methane b) Sulphur-dioxide
 - c) Chlorine d) Oxygen
- 5) Assam falls in _____ seismic zone.
 - a) I b) VI
 - c) IV d) V
- 6) Geological cause of siltation in dam is _____ that may cause _____.
 - a) tectonic, earthquake
 - b) weathering, flood
 - c) transportation, deposition
 - d) tree removal, global warming
- 7) Ideally speaking, in earth energy balance, tally should be _____ in % terms.
 - a) 1 b) zero
 - c) 50 d) 100

- 8) In Himalaya foothills region _____ is common.
 - a) Tsunami
 - b) flood
 - c) volcano
 - d) earthquake
- 9) Low intensity & prolonged duration of rain may cause _____ hazard.
 - a) avalanche
 - b) earthquake
 - c) Flood & landslide
 - d) erosion
- 10) Multiple problems like flood & landslides may be caused due to _____.
 - a) grazing animals
 - b) Deforestation
 - c) pandemic
 - d) underground mining

B) Fill in the blanks.

06

- 1) Polar regions & Sahara are types of _____.
- 2) Levee are built to control _____.
- 3) 'Heat Surge' hazard is associated with _____.
- 4) Recent potholes are developed in _____ City.
- 5) Unsuitable site selection & faulty design of dam may cause _____ disaster.
- 6) Disaster management plan is fundamentally designed based on the _____.

Q.2 Solve any Eight of the following.

16

- a) What is significance of levee in environmental terms?
- b) What are two important parameters for predicting volcanic hazard?
- c) What is significance of river terraces?
- d) What is main natural source of energy for the life on the earth?
- e) What type nuclear power is? What source is used for it?
- f) What type of hazards the geological, process like erosion?
- g) What are two preparedness tools for volcanic hazard?
- h) Which type of energy is generated from dark mirror like panels installed on the open ground & roof tops?
- i) What could be two indicators of desertification hazards?
- j) Which type of climates is in Western Ghats region?

Q.3 A) Answer any Two of the following.

10

- 1) Describe the climates at Polar and Thar regions.
- 2) Describe the role of vegetation & rock type causing flood.
- 3) Describe the remedies for avalanche hazard.

B) Write short note on preparedness for flood hazard.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Describe the data types for preparedness of flood in disaster management plan.
- 2) Describe the mitigation phase for landslide hazard.
- 3) Describe role of temperature & gravity in any two hazards.

- B)** Define environmental geology. Describe its interdisciplinary approach in disaster management. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Define landslide? Describe the preparedness for landslide.
- b)** Describe the earth's energy budget.
- c)** What is El_Nino & La_Nina? How does it affect the floods on the earth.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026**

**MICROBIOLOGY (Special Paper - XV)
Environmental Microbiology (22221659)**

Day & Date: Saturday, 02-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to right indicate full marks.
4) Use of log tables and calculator is allowed.

Q.1 A) Rewrite the following sentence choosing correct alternative. 10

- 1) The term bioaerosol refers to _____.
 - a) Plant spores
 - b) Organic pesticides
 - c) Suspended airborne particles of biological origin
 - d) artificial sir purifier
- 2) What does BSL stand for in laboratory safety?
 - a) Biosecurity Level
 - b) Biosafety Laboratory Standard
 - c) Biological Safety Level
 - d) Biotechnology Safety Level
- 3) What is the increased productivity of ponds and lakes due to excess nutrients called?

a) Bio-magnification	b) Extinction
c) Eutrophication	d) Deforestation
- 4) High BOD indicates _____.

a) less polluted water	b) more polluted water
c) less number of organism	d) none of the above
- 5) Which of the following factors are responsible for the stability of thermophiles at high temperatures?
 - a) increased leakage of cell components
 - b) presence of large no. of polar amino acids and alpha-helix protein
 - c) thermal stability of ribosomes
 - d) presence of Inositol diphosphate and thermal stability of ribosomes

- 6) Which of the following mechanism is used for bioleaching of uranium?
 - a) Direct Leaching Mechanism
 - b) Indirect Leaching Mechanism
 - c) Acid Leaching Mechanism
 - d) Alkali Leaching Mechanism
- 7) Which of the following is the most common bacteria used for bioleaching?
 - a) Spirillum
 - b) Coccus
 - c) Bacillus
 - d) Streptococcus
- 8) Out of the following, which bacteria is oil eating bacteria that can clean up oil spills in sea?
 - a) Coliform
 - b) Pseudomonas
 - c) Thiobacillus
 - d) Streptococcus
- 9) Desulphovibrio desulfuricans (A) and Pseudomonas species (B) are involved in mercury bioremediation. Which of the statements below is correct?
 - a) A converts methyl mercury to mercuric ion, B converts mercury to methyl mercury.
 - b) A converts mercury to methyl mercury, B converts mercury to mercuric ion.
 - c) A converts mercury to methyl mercury, B converts methyl mercury to mercuric ion.
 - d) A converts methyl mercury to mercuric ion, B converts mercury to mercuric ion.
- 10) Which of the following microbial processes is most directly involved in carbon sequestration in soil?
 - a) Nitrogen fixation
 - b) Decomposition of organic matter
 - c) Nitrification
 - d) Photosynthesis

B) Answer the following.

06

- 1) Define COD.
- 2) What is TDS?
- 3) Define carbon credit.
- 4) Give the long form of RDC.
- 5) Define bioaerosol.
- 6) What is whey?

- Q.2 Solve any Eight of the following. 16**
- a) What is infectious dust?
 - b) Give the objectives of biosafety.
 - c) Define Osmophiles.
 - d) Define bioleaching.
 - e) Write on types of microorganisms found in marine water and their role
 - f) Define BOD
 - g) Define Eutrophication
 - h) Give the role of State biosafety coordination committee
 - i) What is Acidophile?
 - j) What are the different types of waste?
- Q.3 A) Attempt any Two of the following. 10**
- 1) Write an account on sugar industry waste and its treatment.
 - 2) Write an account on carbon sequestration.
 - 3) Explain the methods of study of air borne microorganisms.
- B) Explain the types of fresh water bodies with reference to classification of lakes, sources, consequences and control. 06**
- Q.4 A) Attempt any Two of the following. 08**
- 1) Write an account on Eutrophication.
 - 2) Write an account on characteristics of dairy waste and its treatment.
 - 3) Explain various methods of bioaerosol control.
- B) Explain the waste water assessment methods. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Explain in detail microbial leaching and the commercial leaching methods for copper and iron.
 - b) Explain the characteristics of thermophiles & Barophiles as extremophiles and its role.
 - c) Describe the waste water treatment methods.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
ELECTRONICS (Special Paper - XV)
Electronics Instrumentation (22221675)**

Day & Date: Saturday, 02-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Multiple Choice Question.**10**

- 1) _____ is the function of an Earth Ground in electronic circuits.
 - a) Acts as a power source
 - b) Supplies current during operation
 - c) Provides a common reference point for voltages
 - d) Balances the signal
- 2) A Faraday Cage works based on _____ principle.
 - a) Magnetic Induction
 - b) Electrostatic Shielding
 - c) Ohm's Law
 - d) Capacitance Discharge
- 3) The gain of an instrumentation amplifier can be varied by changing _____.
 - a) Supply voltage
 - b) Capacitor
 - c) A single resistor in the first stage
 - d) the input offset voltage
- 4) The AD594/AD595 include an internal _____.
 - a) Signal generator
 - b) Cold junction compensator
 - c) Analog multiplexer
 - d) ADC
- 5) _____ components moves in response to the input signals in an X-Y recorder.
 - a) Galvanometer
 - b) Stylus or pen
 - c) Capacitor
 - d) Sensor
- 6) The X-axis of an X-T recorder typically represents _____.
 - a) Voltage
 - b) Frequency
 - c) Time
 - d) Pressure

- 7) A function generator is used to _____.
 - a) Measure resistance
 - b) Generate standard waveforms like sine, square, and triangle
 - c) Amplify signals
 - d) Display waveforms
- 8) The signal is stored on a magnetic tape in the form of _____.
 - a) Optical pulses
 - b) Mechanical vibrations
 - c) Magnetic flux changes
 - d) Electric charge
- 9) The CRO is electron beam _____.
 - a) current meter
 - b) Voltmeter
 - c) op-amp non-inverting
 - d) all of these
- 10) Conductivity meter measures _____.
 - a) Acidity of a solution
 - b) Temperature of a solution
 - c) Electrical conductivity of a solution
 - d) Pressure of a gas

B) One sentence answer.**06**

- 1) An instrumentation amplifier typically consists of how many operational amplifiers?
- 2) What is the function of an ADC in a data acquisition system?
- 3) What is the purpose of a multiplexer in data acquisition?
- 4) Why is shielding important in electronic instrumentation?
- 5) What is the typical pH range a pH meter can measure?
- 6) What is the use of LCR Q meter?

Q.2 Solve any Eight of the following.**16**

- a) Draw general block diagram for electronic instrument design for measurement.
- b) What is Recorder?
- c) Draw block diagram of pH meter.
- d) What is Instrumentation Amplifier?
- e) What is need of DAS?
- f) Give the Salient features of AD 620.
- g) Give the need of Programmable Instrumentation Amplifiers.
- h) What is 4-20mA current transmission?
- i) What is NRZ recording?
- j) Draw the block diagram of DC signal conditioning techniques.

Q.3 A) Attempt any Two of the following.**10**

- a) Explain Ratiometric and logarithmic conversion.
- b) Explain Magnetic recorder.
- c) Explain Basic operation of Data logger.

B) Write a note on X-T Recorder.**06**

- Q.4 A) Attempt any Two of the following. 08**
- a) Explain Temperature meter.
 - b) Explain Chopper Amplifier.
 - c) Explain Multi channel DAS.
- B) Explain Electromagnetic and Electrostatic shielding 08**
- Q.5 Attempt any Two of the following. 16**
- a) Draw the block diagram of Digital Storage Oscilloscope and explain the function of each block.
 - b) Draw the diagram of Bridge Amplifier and explain it in brief.
 - c) Give Salient features, Draw & Explain Block diagram and Pin description of AD594/595.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
COMPUTER SCIENCE (Special Paper - XV)
ASP.Net Core MVC (22221667)

Day & Date: Saturday, 02-05-2026
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labeled diagrams wherever necessary.
 3) Figures to right indicate full marks.

Q.1 A) Multiple Choice Question.**10**

- 1) In ASP.NET Core _____ middleware handles routing between endpoints.
 - a) UseAuthorization()
 - b) UseEndpoints()
 - c) UseStaticFiles()
 - d) UseRouting()
- 2) The @RenderBody() method is used in _____ file.
 - a) _ViewStart.cshtml
 - b) _Layout.cshtml
 - c) Index.cshtml
 - d) _ViewImports.cshtml
- 3) _____ attribute ensures that a field is required in a model.
 - a) [Required]
 - b) [NotNull]
 - c) [Mandatory]
 - d) [Key]
- 4) To update an entity in EF Core, the method used is _____.
 - a) Update()
 - b) Modify()
 - c) Save()
 - d) Edit()
- 5) The default root folder for views is _____.
 - a) /Pages
 - b) /Views
 - c) /Resources
 - d) /Static
- 6) launchSettings.json typically contains _____.
 - a) database schema
 - b) environment and profile settings
 - c) view templates
 - d) CSS and JavaScript links
- 7) SSMS stands for _____.
 - a) SQL Secure Management System
 - b) SQL Server Management Studio
 - c) System Security
 - d) SQL Service Management System

- 8) Persistent cookies remain until _____.
 a) Expiry time is reached b) Session ends
 c) Browser restarts d) Logout
- 9) HTML Helpers are used to _____.
 a) Generate HTML elements in Razor views
 b) Manage models
 c) Control routing
 d) Handle middleware
- 10) _____ type of data does ViewData store.
 a) Key-Value pairs b) Arrays
 c) Lists only d) Database records

B) Fill in the blanks. 06

- 1) The _____ property of DbContext represents a table in the database.
- 2) The command line tool for EF Core is _____.
- 3) The _____ method is used to render partial view in a Razor page.
- 4) The _____ folder is used to store Razor Pages.
- 5) The _____ file is used to store launch profiles for the application.
- 6) To export data to Excel, we use _____ libraries.

Q.2 Solve any Eight of the following. 16

- a) What is Middleware? Explain with example.
- b) What is ViewData? How is it different from ViewBag?
- c) What are code first approach?
- d) Explain GET and POST methods.
- e) What is purpose of Dependency Injection?
- f) What is One-to-One and One-to-Many Relationships with code?
- g) Which packages use to create pdf file?
- h) What is a Non-Persistent Cookie?
- i) What is InProcess hosting?
- j) What is meant by Entity State?

Q.3 A) Attempt any Two of the following. 10

- 1) Write program to display Fibonacci series.
- 2) Explain various Action Results in details.
- 3) Explain validation in ASP.NET Core.

B) Explain how to perform CRUD operations using EF Core. 06

Q.4 A) Attempt any Two of the following. 08

- 1) Explain the folder structure of ASP.NET Core project.
- 2) What is use of Validation Helpers? Explain all validation helpers with examples.
- 3) Explain View Component with example.

B) Explain Entity Framework Core Architecture in detail. 08

Q.5 Solve any Two of the following.**16**

- a)** Explain Cookies and Session Management with example.
- b)** What is Tag Helper? Create a custom Tag Helper to display a formatted date.
- c)** What is Database First approach? Explain commands and steps.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
PHYSICS (Special Paper - XVI)
Electronics (22221620)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks
3) Draw neat-labeled diagrams wherever necessary.
4) Use of Log table and Calculator is allowed.

Q.1 A) Select the correct alternatives from the following: 10

- 1) Slew rate of the operational amplifier is measured in _____.
a) $\mu\text{sec}/V$
b) $V/\mu\text{sec}$
c) $\mu V/\text{sec}$
d) $\text{sec}/\mu V$
- 2) When an input voltage of $1V$ is applied to an OP-AMP having $A_v = 10^6$ and bias supply of $+15V$, the output voltage available?
a) $15 \times 10^6 V$
b) $10^6 V$
c) $15\mu v$
d) $15V$
- 3) Astable multivibrator is also called as _____.
a) free running multivibrator
b) constant multivibrator
c) asymmetric multivibrator
d) symmetric multivibrator
- 4) An SCR behaves as a _____ Switch.
a) bidirectional
b) Unidirectional
c) mechanical
d) multidirectional
- 5) The I – V Characteristics of the a TRIAC in the first and third quadrants are essentially identical to those of _____ in the first quadrant.
a) Transistor
b) SCR
c) FET
d) UJT
- 6) The normal way to turn ON a diac is by _____.
a) gate current
b) gate voltage
c) breakover voltage
d) none of the above
- 7) _____ is passive display.
a) LED
b) LCD
c) CRT
d) gas discharge plasma

- 8) In gas discharge plasma displays, cold cathode numerical indicators are called _____.
 - a) Cathode
 - b) anode
 - c) Nixie
 - d) gate
- 9) The input impedance of a MOSFET is of the order of _____.
 - a) Ω
 - b) a few hundred Ω
 - c) $k\Omega$
 - d) several $M\Omega$
- 10) A MOSFET uses electric field of a _____ to control the channel current.
 - a) Capacitor
 - b) battery
 - c) Generator
 - d) none of the above

B) Fill in the blank/Definition/One sentence answer/One word answer/Give the name/Predict the product etc.

06

- 1) What is Diac?
- 2) Draw a symbol of E-MOSFET
- 3) What is an operational amplifier?
- 4) Define Duty cycle in a stable multivibrator
- 5) The LCD is Liquid _____ display
- 6) Give any one advantage of the LEDs?

Q.2 Solve the following. (Any Eight)

16

- a) Explain Op-amp as Schmitt trigger.
- b) Draw the functional block diagram of IC-555.
- c) Describe Turn ON method of SCR.
- d) Describe the important applications of the TRIAC.
- e) Draw the symbol of the diac and triac.
- f) What are the characteristics of LCD?
- g) State the principal of the gas discharge plasma display.
- h) Write transconductance and input impedance of D-MOSFET
- i) What was the need to develop MOSFET?
- j) What do you understand by Nixie?

Q.3 A) Answer the following. (Any Two)

10

- 1) Explain circuit operation of D-MOSFET (both depletion and enhance mode).
- 2) An op-amp is used in inverting mode with $R_1 = 1k\Omega$, $R_2 = 12k\Omega$, $V_{cc} = \pm 15V$ Calculate the output voltage for the inputs
 - i) $V_i = 150mv$
 - ii) $V_i = 2V0$
- 3) Explain the application of timer IC 555 as a linear ramp generator.

B) Write short note on operational amplifier (op-amp) as comparator.

06

- Q.4 A) Attempt the following. (Any Two) 08**
- 1) Explain Diac as lamp dimmer.
 - 2) Explain Electrophoretic Image Displays (EPID).
 - 3) Give comparison between JFET and D-MOSFET.
- B) Describe/Explain/Solve. 08**
- Explain construction, working and characteristics of the TRIAC.
- Q.5 Attempt the following. (Any Two) 16**
- a) Describe the op-amp as adder and subtractor.
 - b) Explain monostable operation of IC-555 timer.
 - c) Explain construction working and characteristics of SCR.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
CHEMISTRY (Special Paper - XVI)
Analytical and Industrial Organic Chemistry (22221616-A)**

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

10

- _____ is an example of synthetic polymer.
a) wool b) silk
c) protein d) PVC
- Reduction by NaBH_4 involves transfer of _____.
a) OH^- b) H^+
c) Cl^- d) H^-
- Selenium dioxide is _____ agent.
a) Oxidizing b) reducing
c) Dehydrating d) none of these
- Generally, _____ is used as phase transfer catalyst.
a) sodium chloride b) sodium cyanide
c) quaternary ammonium salt d) sodium bromide
- Microwave assisted reactions are _____.
a) clean b) fast
c) fuel efficient d) all of these
- Column chromatography is an example of _____ chromatography.
a) partition b) adsorption
c) ion exchange d) all of these
- Soap and glycerol are prepared by hydrolysis of _____.
a) triol b) tetrone
c) acid chloride d) triglyceride
- _____ is used for preparation of teepol.
a) lavryl amine b) t-amine
c) α -olefins d) none of these

- 9) Alcoholic beverages contain _____.
a) methanol b) 1-propanol
c) ethanal d) ethanol
- 10) In clarifier, clear juice is obtained in _____ layer.
a) upper b) bottom
c) Middle d) none of these

B) Fill in the blank.

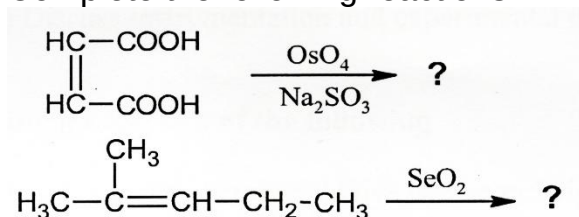
06

- 1) 1,3-butadiene and acrylonitrile on polymerization gives _____.
- 2) 1,3-dithiane is _____ membered ring.
- 3) Biocatalytic reactions are catalyzed by _____.
- 4) In chromatography, components from the mixture are separated due to continuous distribution between stationary and _____ phase.
- 5) _____ detergents are known as invert soap.
- 6) Celotex is manufactured from _____ which is byproduct of sugar industry.

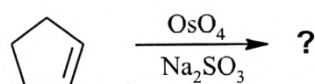
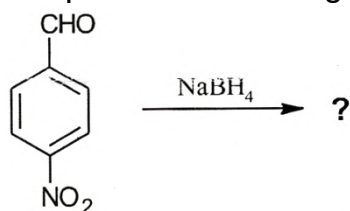
Q.2 Solve any Eight of the following.

16

- a)** Give synthesis and uses of polythene.
b) Complete the following reactions



- c) Give applications of column chromatography.
- d) What is Umpolung concept?
- e) Give synthesis of Polychloroprene.
- f) Complete the following reactions.



- g) Give different byproducts of alcohol industry.
- h) What are ionic liquids? Give one example.
- i) Explain adsorbent used in column chromatography.
- j) Give the preparation of deriphat.

Q.3 A) Attempt any Two of the following.

10

- 1) Write a note on Ziegler-Natta Polymerization.
- 2) Give one example each for reduction of aldehyde, ketone, acid, amide and ester by using lithium aluminium hydride.
- 3) Write a note on Phase transfer catalyst.

B) Discuss classification of polymers based on general physical properties. **06**

Q.4 A) Attempt any Two of the following. 08

- 1) What is basic principle of thin layer chromatography? Give applications of TLC.
- 2) Write a note on cleansing action of soap.
- 3) Explain fermentation process in the manufacture of ethyl alcohol.

B) Discuss instrumentation and experimental details of gas chromatography. **08**

Q.5 Attempt any Two of the following. 16

- a) What is green chemistry? Give twelve principles of green chemistry.
- b) Explain different raw materials used in preparation of soap.
- c) Discuss process of crystallization and separation of crystals in the manufacture of sugar.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
CHEMISTRY (Special Paper - XVI)
Applied Organic Chemistry (22221616-B)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Acid reacts with sodium bicarbonate to give effervesces of _____.
 - a) CO_2
 - b) H_2
 - c) H_2O
 - d) NH_3
- 2) The phase transfer catalyst is soluble in _____.
 - a) Only water
 - b) only organic solvent
 - c) Water and organic solvent both
 - d) H_2SO_4
- 3) What is the primary function of hairspray?
 - a) To cleanse the hair and scalp
 - b) To coat hair strands with polymers, holding the hairstyle in place
 - c) To add moisture and conditioning to the hair
 - d) To permanently alter the hairs structure.
- 4) What is a common chemical found in permanent hair dyes that helps open the hairs Protein layers?
 - a) NaOH
 - b) acetic acid
 - c) KOH
 - d) Ammonia
- 5) What is a key reason for the increasing demand for essential oils in cosmetics?
 - a) They are cheaper than synthetic alternatives.
 - b) Consumers are more aware of the health risks associated with artificial Ingredients.
 - c) They are more stable than synthetic fragrances.
 - d) They are approved for use in all cosmetic products without restriction.

- 6) Eugenol is a major active ingredient found in the essential oil of which plant?
 - a) Eucalyptus
 - b) Jasmine
 - c) Clove
 - d) Sandalwood
- 7) What is a notable property of jasmine oil in cosmetics?
 - a) Clears up chest congestion
 - b) Increases blood circulation
 - c) Purifies the air
 - d) Helps with blemishes, dryness, oily skin, and wrinkles
- 8) From which microorganism is streptomycin primarily obtained?
 - a) *Penicillium chrysogenum*
 - b) *Bacillus subtilis*
 - c) *Streptomyces griseus*
 - d) *Escherichia coli*
- 9) The primary purpose of sizing warp yarns is to _____.
 - a) Increase yarn elongation
 - b) Make the fabric softer
 - c) Provide a protective coating for abrasion resistance
 - d) Decrease the yarn's uniformity
- 10) For effective hydrogen peroxide bleaching of cotton, the process is typically carried out at _____.
 - a) A neutral pH and low temperature
 - b) An alkaline pH and boiling temperature
 - c) An acidic pH and boiling temperature
 - d) An acidic pH and low temperature

B) Fill in the blank.**06**

- 1) The process of burning off protruding fibers from the fabric surface is known as _____.
- 2) Vitamin B12 can be produced as a by-product during the fermentation of _____ type of antibiotic?
- 3) Eugenol is the major active component of _____ essential oil.
- 4) The melanin responsible for black and brown hair color is _____.
- 5) Zeolites are shape selective catalyst known as _____ catalyst.
- 6) When using chemical methods for separating organic binary mixtures, the components are separated based on their differential _____ in acidic or basic solutions.

Q.2 Solve any Eight of the following. (Any Eight)**16**

- a) Write short notes on Zeolites as green catalysts.
- b) Explain reactions in ionic liquid.
- c) Write the preparation and uses of Hair dye.
- d) Give the uses of shampoo and sun tan lotion.
- e) Write the structural formula of Eugenol and geraniol.
- f) Give uses and chemical structure of Jasnone and civetone in perfumes.

- g) What are essential oils give the uses of essential oils.
- h) What are the ideal conditions for streptomycin production by fermentation?
- i) What is sizing process give objective of sizing.
- j) Explain singeing and desizing

Q.3 A) Attempt of the following. (Any Two) 10

- 1) What are the twelve principal of green chemistry
- 2) Give preparation and uses of shaving cream
- 3) Write preparation and uses of artificial flavours

B) Write in brief preparation of vitamin B12 by fermentation process 06

Q.4 A) Attempt any Two of the following. (Any Two) 08

- 1) Write details about separation of mixture using aqueous medium and ether.
- 2) Give the preparation and uses of nail enamel.
- 3) How sandalwood oil and eucalyptus oil is extracted give their uses?

B) Give outline of the process of bleaching cotton. 08

Q.5 Attempt of the following. (Any Two) 16

- a) Explain principle of binary mixture separation of organic compounds with flow chart
- b) What are vanishing creams and lipsticks give their preparation and uses in brief.
- c) Give the preparation and uses of 2- phenyl ethyl alcohol.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
BOTANY (Special Paper - XVI)
Nursery, Gardening and Horticulture (22221608-A)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice question.**10**

- 1) _____ are vital sciences as they suffice the very basic need of food for the Human beings.

a) Agriculture	b) Horticulture
c) Floriculture	d) Both a and b
- 2) Formal designed garden are arranged in _____ Pattern.

a) Geometrical	b) Triangle
c) Hexagon	d) Pentagon
- 3) The concept of computer applications for landscape gardening is comparatively _____.

a) Old	b) New
c) Ancient	d) Outdated
- 4) In a seed of maize scutellum is considered as cotyledon because it _____.

a) Protect the embryo
b) Absorb food material and supplies them to the embryo
c) Contain food
d) None of these
- 5) Seed bank are considered as _____.

a) Seed libraries	b) Seed distribution
c) Gene bank	d) Gene libraries
- 6) The seed act came into force _____.

a) 1958	b) 1966
c) 1946	d) 1972
- 7) Queen of flower is _____.

a) Jasmine	b) Hibiscus
c) Rose	d) Aster

- 8) Which among these is plant growth retardant?
 - a) Gibberellin
 - b) Auxin
 - c) Cytokinin
 - d) ABA
- 9) Which of the following is known as garden city?
 - a) Chennai
 - b) Bengaluru
 - c) Ahmedabad
 - d) Mumbai
- 10) Seed production technology deals with _____.
 - a) Maintenance
 - b) Quantity
 - c) Preservation
 - d) All of these

B) Fill in the blank.**06**

- 1) Bio-pesticides are pesticides of _____ Origin.
- 2) Two different plants join together as one plant mean _____.
- 3) The tag colour of Breeders seed is _____.
- 4) Mound layering is also called as _____.
- 5) The study of growing and marketing flowers is called _____.
- 6) The branch of agriculture which leads with garden crop is _____.

Q.2 Solve any Eight of the following.**16**

- a) Define Manure.
- b) Define Nursery.
- c) Define Cutting.
- d) Define Cut flowers.
- e) What do you mean by seed production technology?
- f) What is Scion?
- g) Enlist the method of seed dormancy breaking.
- h) Define Floriculture.
- i) Define seed bank.
- j) Define Biofertilizer.

Q.3 A) Attempt any Two of the following.**10**

- 1) Give application of plant growth regulators.
- 2) Explain in detail the procedure of making Bonsai.
- 3) What is a grafting? Describe different types of grafting

B) Write Short note on formal and informal garden.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Describe objectives of nursery.
- 2) Describe cut flowers studied by you.
- 3) Define vegetative propagation? Explain types of budding.

B) Explain the structure and types of seeds.**08**

Q.5 Attempt any Two of the following.

16

- a)** What is a weed? Describe in detail method of weed control.
- b)** Describe the importance of flower shows and exhibitions studied by you.
- c)** Describe scope and importance of Nursery.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
BOTANY (Special Paper - XVI)
Biostatistics (22221608-B)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat, labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Statistics helps in _____ fields.
 - a) Decision making, LIC, banks
 - b) Government agencies and industries.
 - c) Business, trade, index numbers
 - d) All the above
- 2) Speed of a vehicle is an example of _____.
 - a) Discrete variable
 - b) Continuous
 - c) Nominal
 - d) Ordinal
- 3) Primary data means _____.
 - a) Original data
 - b) It may be result of survey
 - c) It may be result of enquiry
 - d) All the above
- 4) Pie diagram is a _____.
 - a) One-dimensional diagram
 - b) Two-dimensional diagram
 - c) Circular diagram
 - d) Three-dimensional diagram
- 5) *Me* or *Mdn* sign is used for _____.
 - a) Arithmetic mean
 - b) Median
 - c) Mode
 - d) Deviation
- 6) Standard deviation was first worked out by _____.
 - a) Karl Pearson
 - b) Milton Friedman
 - c) Harvey Goldstein
 - d) Herman Hollerith
- 7) In a throw of coin what is the probability of getting head.
 - a) 1
 - b) 2
 - c) $\frac{1}{2}$
 - d) 0

- 8) The samples having less than _____ observations are said to be small size sample.
- | | |
|--------|--------|
| a) 50 | b) 100 |
| c) 200 | d) 300 |
- 9) Chi-square test or χ^2 -test was worked out by _____.
- | | |
|---------------------|---------------------|
| a) Milton Friedman | b) Harvey Goldstein |
| c) Herman Hollerith | d) Karl Pearson |
- 10) In a throw of dice what is the probability of getting number greater than 5?
- | | |
|----------|----------|
| a) $1/2$ | b) $1/3$ |
| c) $1/5$ | d) $1/6$ |

B) Answer the following.**06**

- 1) Define biostatistics.
- 2) Define sampling method.
- 3) Define histogram.
- 4) What is mean by discrete or discontinuous variables?
- 5) Define probability.
- 6) Define null hypothesis.

Q.2 Solve the following. (Any Eight)**16**

- a) Define mode.
- b) Define dispersion.
- c) Define range.
- d) Give the formula to calculate probability.
- e) What is mean by events?
- f) What is meant by Random experiment or trial.
- g) Mentions sample point and sample space.
- h) Give definition of central tendency.
- i) Define tabulation.
- j) Define variance.

Q.3 A) Attempt the following. (Any Two)**10**

- a) Discuss use of biostatistics.
- b) Mention merits and demerits of primary data collections.
- c) Mention merits and demerits of arithmetic mean.

B) Describe the different types of probability**06****Q.4 A) Attempt the following. (Any Two)****08**

- a) Discuss the basic concepts of biostatistics.
- b) Mention any two types of events.
- c) Write short note on chi square test.

B) Write note on one-dimensional diagrams.**08**

Q.5 Attempt the following. (Any Two)**16**

- a)** Describe the different sources of secondary data collection.
- b)** Calculate the S. D. of the following data on the heights (in cm) of 10 plants:
73, 75, 80, 42, 57, 65, 52, 42, 47, 67.
- c)** Describe the methods of primary data collection.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
ZOOLOGY (Special Paper - XVI)
Applied Zoology (22221628)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to right indicate full marks
4) Use of log table and calculators is allowed

Q.1 A) Multiple choice questions. 10

- Rearing and Breeding of fish in specially constructed tanks and ponds are known as _____.
 - Lacculture
 - Pisciculture
 - Pearl culture
 - Vermiculture
- Freezing, smoking, canning and pickling of fishes are most popular methods of fish _____.
 - Preservation
 - Breeding
 - Conservation
 - Fishing
- Rearing of fish in salt water is called _____ fishery.
 - Fresh water
 - Estuarine water
 - Marine water
 - Brackish water
- Fishing gears and nets are tools to capture _____ organisms.
 - Aquatic
 - Terrestrial
 - Arboreal
 - Desert
- The practice of maintaining honey bee colonies in bee hives is called _____.
 - Sericulture
 - Vermiculture
 - Apiculture
 - Aquaculture
- _____ species of honey bee are giant.
 - A. cerana
 - A. dorsata
 - A. florea
 - A. indica
- Palas, Kusum and Ber are the host plants of _____ insect.
 - Honey bee
 - Lac
 - B. mori
 - Mosquito

- 8) _____ is the leading producer of silk followed by India.
- a) Japan b) China
- c) Sri Lanka d) Norway
- 9) Custard is a product of _____.
- a) Poultry b) Lac culture
- c) Apiculture d) Dairy
- 10) The yellow colour of cow milk is due to the _____.
- a) Polytene b) Pepsin
- c) Carotene d) Chitin

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) *Macrobrachium malcolmsonii* is a scientific name of fresh water _____.
- 2) _____ is a full form of GIB.
- 3) rearing of silk moth is called as _____.
- 4) *Bombyx mori* feed on _____ leaves.
- 5) _____ also helps in Pollination with yield of honey.
- 6) Cheese, Creame, Paneer, butter etc. are the product of _____ industry.

Q.2 Solve the following. (Any Eight) **16**

- Breeding pond
- Fish seed
- Fishing gear
- Medicinal value of honey
- Lac insect
- Bee hive
- Name of the common dairy animals
- Nutritive value of egg
- Zebrafish
- What is transgenic animals

Q.3 A) Attempt the following. (Any Two) 10

- 1) Give an account on fish preservation.
- 2) What is apiculture? Describe bee products.
- 3) Life cycle of silkworm.

B) Describe life cycle of lac insect. 06

Q.4 A) Attempt the following. (Any Two) 08

- 1) Give an account on prawn culture.
- 2) Describe species of honey bees in India.
- 3) Give an account on types of silk.

B) Give an account on housing and equipment of poultry management. **08**

Q.5 Attempt the following. (Any Two)

16

- a)** Give an account on byproducts of fishing industry.
- b)** Describe the transgenic animals and its significance.
- c)** Describe life history of silkworm.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
MATHEMATICS (Special Paper - XVI)
Graph Theory (22221640-A)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. **10**

- 1) If $e = (u, v)$ is edge in diagram then u is called as _____.
 a) isolated vertex b) terminal vertex
 c) initial vertex d) None of these
- 2) A vertex is called pendant vertex if and only if it has degree _____.
 a) 0 b) 1
 c) 2 d) 3
- 3) A vertex with zero in degree is called as _____.
 a) source b) sink
 c) initial vertex d) isolated vertex
- 4) Repeated vertex is not allowed in _____.
 a) Walk b) Trail
 c) Path d) Circuit
- 5) Complete graph K_n is Eulerian if $n =$ _____.
 a) 2 b) 4
 c) 5 d) 6
- 6) A tree with n vertices has _____ edges.
 a) $n + 1$ b) $n - 1$
 c) n d) n^2
- 7) In a rooted tree if vertex u has no children the u is called as _____.
 a) Leaf b) Siblings
 c) Internal vertex d) None of these
- 8) The complete graph K_n has _____ different spanning trees.
 a) n^2 b) n
 c) n^{n-2} d) $\frac{1}{n}$

- 9) Convert $1011011_{(2)}$ to decimal ____.
- a) 90 b) 91
c) 92 d) 94
- 10) Convert $33_{(8)}$ to binary ____.
- a) 11011 b) 11010
c) 10110 d) 11001

B) Fill in the blank/Answer the following questions.

06

- 1) Convert $\log_{(10)}$ to binary _____.
- 2) Convert $3526_{(8)}$ to binary _____.
- 3) Draw wheel W_5 _____.
- 4) Give an example of graph which is Hamiltonian but not Eulerian.
- 5) Draw the graph Whose Adjacency Matrix

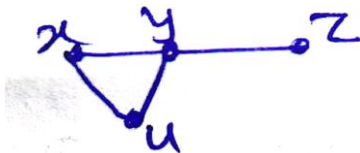
$$\begin{matrix} & v_1 & v_2 & v_3 & v_4 \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix} \end{matrix}$$

- 6) Draw any two tree on three vertices.

Q.2 Attempt Any Eight of the following.

16

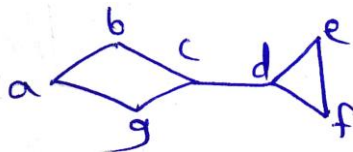
- Covert $3D59_{(16)}$ to octal.
- Covert $2704_{(8)}$ to decimal.
- Define complete and regular graph
- Find degree of each vertex



- e) Draw a graph of chemical molecules methane CH_4
 f) Draw binary tree representation of $[(a + b) \star c] + d/e$
 g) Draw any four spanning tree of graph



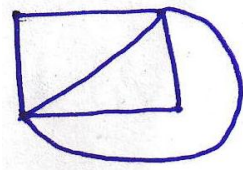
- ### h) Find diameter of graph



- i) Draw the graph whose incidence matrix is

$$\begin{bmatrix} v_1 & e_1 & e_2 & e_3 & e_4 & e_5 \\ v_2 & 1 & 0 & 0 & -1 & 1 \\ v_3 & -1 & 1 & 0 & 0 & 0 \\ v_4 & 0 & -1 & 1 & 0 & -1 \\ & 0 & 0 & -1 & 1 & 0 \end{bmatrix}$$

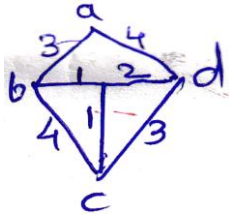
j) Verify Eulers theorem for



Q.3 A) Attempt Any Two of the following.

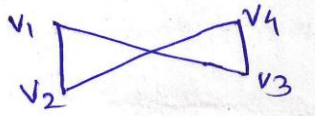
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- In non-directed graph show that total number of odd degree vertices is even.
- Convert
 - $437.4375_{(10)}$ to octal
 - $27.A3C_{(16)}$ to binary
- By using Kruskal's algorithm find minimal spanning tree of graph.



B) Find number of walk of length 3 from v_3 to v_1 and also check the connectedness of graph.

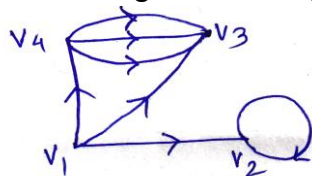
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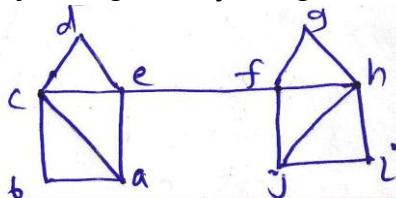
Q.4 A) Attempt Any Two of the following.

08

- Find indegree out degree and total degree of each vertex.



- Write short note on polish prefix and post fix notation.
- By using Fleury's algorithm find Eulers circuit.

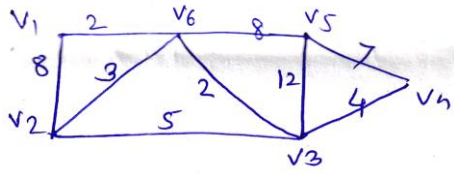


- B)
- $101010111_{(2)}$ to octal
 - $73D5_{(16)}$ to octal
 - $9719_{(10)}$ to Hexadecimal
 - $25146_{(8)}$ to decimal

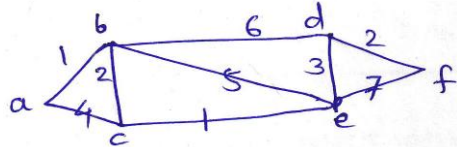
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Q.5 Attempt Any Two of the following.

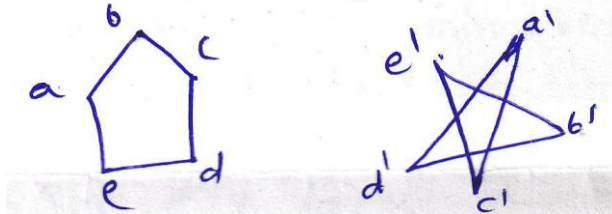
- a)** Find the minimal spanning tree of the weighted graph Prim's algorithm.



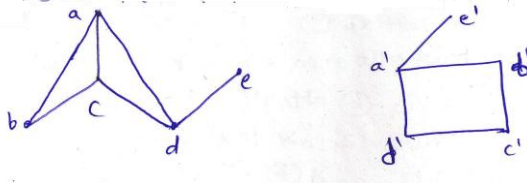
- b)** Apply Dijkstra's algorithm to the graph find shortest path from a to f .



- c)** i) Show that the given pair of graphs are isomorphic



- ii) Show that following graph G and G' are not isomorphic.



Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
MATHEMATICS (Special Paper - XVI)
Programming in C (22221640-B)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 16

- 1) Which of the following is valid 'C' variable name?

a) int	b) float
c) total_count	d) 123number
- 2) C language was developed by _____.

a) James Gosling	b) Dennis Ritechie
c) Bjarne Stroustrup	d) Ken Thomson
- 3) Which operator has the highest precedence in C?

a) +	b) =
c) ()	d) ξ
- 4) What will the following expression return _____.
 $5 > 2 \ \xi \ \xi \ 3 < 1?$

a) 1	b) 0
c) -1	d) Error
- 5) Which keyword is used to define a symbolic constant in C?

a) const	b) define
c) # define	d) constant
- 6) Which of the following is used to read a single character from the user?

a) scanf ("%d")	b) getchar()
c) gets()	d) putchar()
- 7) Which looping statement is guaranteed to execute at least once?

a) for	b) while
c) do....while	d) goto

- 8) The default return type of a function in C is _____.
 - a) int
 - b) float
 - c) void
 - d) char
- 9) What is the output of printf ("%d", 10/3);?
 - a) 3.33
 - b) 3
 - c) 10
 - d) 0
- 10) What is the size of an int on most 32-bit systems?
 - a) 2 bytes
 - b) 4 bytes
 - c) 8 bytes
 - d) 1 byte
- 11) What will size of (char) return?
 - a) 2
 - b) 1
 - c) 4
 - d) Depends on compiler
- 12) The result of the expression (5 == 5); 10:20; is ____
 - a) 5
 - b) 10
 - c) 20
 - d) 0
- 13) Which of the following functions is used to print formatted output?
 - a) scanf()
 - b) gets()
 - c) printf()
 - d) putchar()
- 14) What is an array in C?
 - a) a type of structure
 - b) a pointer
 - c) a collection of variables of different types
 - d) a collection of variables of the same type
- 15) Which statement is used to skip the current iteration of a loop?
 - a) break
 - b) continue
 - c) exit
 - d) skip
- 16) Which of the following is a valid function declaration?
 - a) int func;
 - b) int func()
 - c) func int()
 - d) function int();

Q.2 Solve Any Eight of the following.

16

- a) List any four features of the C programming Language.
- b) What is a keyword? Given two examples.
- c) Define a constant and given its syntax.
- d) Explain increment and decrement operators with examples.
- e) What is the difference between = and == in C?
- f) What is the use of scanf() function?
- g) Explain the difference between while and do....while loops.
- h) Write the syntax of a one-dimensional array declaration.
- i) What is a function prototype?
- j) Write any two advantages of using user-defined functions?

- Q.3 A) Attempt Any Two of the following. 10**
- a) Structure of a C program
 - b) Operators precedence and associativity
 - c) Formatted input and output
- B) Write a C-program to check whether the number entered by the users is even or odd. 06**
- Q.4 Attempt Any Two of the following. 16**
- a) Explain the different type of decision making statements in C with examples.
 - b) Describe types of loops in C with syntax and flowchart of each.
 - c) Write a program to find the largest of three numbers using nested if...else statements.
- Q.5 Attempt Any Two of the following. 16**
- a) Explain in detail the different data types available in the programming language C.
 - b) Explain the concepts of formatted input and formatted output in C. Discuss the functions used for these operations, their syntax, format specifiers and provide examples to illustrate How they work.
 - c) Write a C-program to calculate the electricity bill for customers. The charges are as follows.
 - For the first 100 units : Rs. 1.20 Per unit
 - For the next 100 units : Rs. 2.00 Per unit
(101 - 200)
 - For the next 100 units : Rs. 3.00 Per unit
(201 - 300)
 - For unit above 300 : Rs. 5.00 Per units

Seat No.	

Set **P****B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:****March/April - 2026****STATISTICS (Special Paper - XVI)
Quality Management (22221648- A)**

Day & Date: Monday, 04-05-2026

Max. Marks: 80

Time: 12:00 PM To 03:00 PM

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Which charts are particularly more effective for sample size One?
 - a) P-charts
 - b) C-charts
 - c) $\bar{X}$ & S chart
 - d) CUSUM Chart
- 2) Deming's philosophy had _____ principles.
 - a) 10
 - b) 12
 - c) 14
 - d) 20
- 3) EWMA Control charts first introduced by _____.
 - a) Lucas
 - b) Saccucci
 - c) Shewarts
 - d) Roberts
- 4) What is the full form of E in the EWMA chart?
 - a) Exponentially
 - b) Experimentally
 - c) Exactly
 - d) Estimated
- 5) Average Sample number for single sampling plan _____.
 - a) N
 - b) n
 - c) $N - n$
 - d) None of these
- 6) In acceptance sampling, when there is a finite probability that the lot may be rejected even if quality is actually good is called _____.
 - a) Producer's risk
 - b) Consumer's risk
 - c) both a) and b)
 - d) None of these
- 7) The structure function of a binary system S takes any one of _____ possible values.
 - a) 4
 - b) 2
 - c) 3
 - d) None of these

- 8) EWMA charts are better than Shewhart control charts in detecting the _____ shift.
- | | |
|------------------|-------------------|
| a) Large process | b) Medium process |
| c) Small process | d) Every process |
- 9) When we accept the lot in single sampling plan,
- | | |
|------------|------------------|
| a) $d < c$ | b) $d \geq c$ |
| c) $d > c$ | d) None of these |
- 10) Range of λ in EWMA expression.
- | | |
|------------|-------------|
| a) 0 to 1 | b) 1 to 10 |
| c) -1 to 1 | d) 0 to 100 |

B) Fill in the blanks.**06**

- 1) TQM stands for _____.
- 2) DMAIC is often associated with _____.
- 3) Number of dimensions of quality _____.
- 4) AOQ stands for _____.
- 5) The structure function of a binary system S takes any one of _____ possible values.
- 6) A set of components whose functioning ensures the functioning of the system is known as _____.

Q.2 Solve any Eight of the following.**16**

- a) What are the major benefits of TQM?
- b) What is ATI?
- c) What is important of customer retention?
- d) List the seven tools of quality?
- e) Define Series System.
- f) Define fraction defective (P)?
- g) Explain scatter plot or diagram in short.
- h) What is check sheet?
- i) What is meant by "cost of quality"?
- j) Define a Structure function of a system of n components.

Q.3 A) Attempt any Two of the following.**10**

- a) Write a note on magnificent tool of quality- Control Chart.
- b) Derive an expression for Average Total Inspection (ATI) for a Double Sampling Plan (DSP).
- c) Show that hazard rate of a series system of components having independent life times is summation of component hazard rates.

- B)** In a single sampling plan if sample size $n = 10$, acceptance number $C = 2$, and lot quality $p = 0.08$, find the probability of accepting the lot by using binomial distribution.

06

Q.4 A) Attempt any Two of the following. 08

- a) Explain Eight dimensions of quality.
- b) Define Pareto diagram. Explain how to construct it.
- c) Explain PDCA cycle for continuous improvement.

B) Explain the Tabular CUSUM for monitoring the process mean. 08

Q.5 Attempt any Two of the following. 16

- a) Write a note on magnificent tool of quality- Cause and effect diagram.
- b) Explain Double Sampling plan.
- c) Find the failure rate function (hazard rate) for a 2-out-of-3 system, where components are independent and life time T_1 of i th component is exponentially distributed with mean 100 hrs, for $i = 1, 2, 3$.

Seat No.	

Set P

B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
Statistics (Special Paper - XVI)
Time Series Analysis and Reliability Theory (22221648-B)

Day & Date: Monday, 04-05-2026
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Prosperity, Recession, and Depression in a business cycle are examples of _____.
 a) Irregular Variation b) Secular Trend
 c) Cyclical Variation d) Seasonal Variation
- 2) In Simple Exponential Smoothing, if the smoothing constant (α) is close to 1, it means:
 a) Greater weight is given to older data.
 b) Greater weight is given to the most recent observation.
 c) The forecast is highly stable and ignores recent changes.
 d) There is no smoothing occurring.
- 3) A time series is said to be "Strictly Stationary" if it's _____.
 a) Mean changes linearly over time.
 b) Variance increases over time.
 c) Statistical properties (mean, variance, etc.) are constant over time.
 d) Seasonal patterns are perfectly predictable.
- 4) The correlation between a time series and a lagged version of itself is called _____.
 a) Cross-correlation b) Partial Regression
 c) Autocorrelation d) Multi-collinearity
- 5) What does the "MA" stand for in an AR (P) model?
 a) Master Average b) Moving Average
 c) Mean Analysis d) Mathematical Approximation
- 6) Which method of trend estimation has the disadvantage of losing data points at the beginning and the end of the series?
 a) Freehand Curve Method b) Moving Average Method
 c) Method of Least Squares d) Ratio-to-Trend Method

- 7) Which method is considered the best and most reliable for measuring seasonal indices?
 - a) Ratio-to-Moving Average Method
 - b) Method of Simple Averages
 - c) Method of Semi-Averages
 - d) Freehand Method
- 8) In the Ratio-to-Trend method, seasonal indices are calculated by expressing the original data as a percentage of _____.
 - a) The moving average
 - b) The trend values (T)
 - c) The previous year's value
 - d) The arithmetic mean
- 9) If quarterly sales data is used, the sum of the four seasonal indices in a multiplicative model should ideally be _____.
 - a) 100
 - b) 400
 - c) 1200
 - d) 0
- 10) Which of the following is an example of seasonal variation?
 - a) A general increase in gold prices over 20 years.
 - b) A surge in air conditioner sales every summer.
 - c) A sudden drop in production due to a strike.
 - d) A five-year economic recession.

B) Define the following terms:**06**

- 1) Time series.
- 2) Seasonality
- 3) Irregular variation
- 4) Moving average
- 5) Seasonal index
- 6) Autocorrelation

Q.2 Define any Eight of the following.**16**

- a) Distinguish between Additive and Multiplicative models.
- b) Why is the 'Method of Least Squares' preferred over the 'Graphic Method'?
- c) Define 'Centering' in the context of Moving Averages.
- d) What is 'Link Relatives' in time series?
- e) Give two limitations of the Moving Average method.
- f) Give two examples of Irregular Variations.
- g) Define chain relative.
- h) What are the components of time series?
- i) Write any two examples in which time series is applicable.
- j) Write p^{th} order autoregressive model AR (p) model.

Q.3 A) Attempt any Two of the following.**10**

- a) Define Time Series and explain its four main components.
- b) What are the merits and demerits of the Moving Average method?
- c) Explain the "Link Relative Method" for measuring Seasonal Variations.

B) Explain the “Method of Least Squares” for fitting a straight-line trend. **06**

Q.4 A) Attempt any Two of the following. **08**

- Define “Stationarity” and explain why it is important in Time Series Analysis.
- What is “Exponential Smoothing”? Explain with its formula.
- Discuss the "Ratio-to-Trend" Method.

B) Describe the “Ratio-to-Moving Average” method for measuring seasonal variations. **08**

Q.5 Attempt any Two of the following. **16**

- Obtain the seasonal indices for the quarters by ratio to moving average method.

Year	Quarters No.			
	I	II	III	IV
2021	45	40	39	36
2022	42	38	37	34
2023	46	33	39	31
2024	47	37	36	33

- Explain in details the procedure of ‘double exponential smoothing’.
- Fit a straight-line trend using the Method of Least Squares and forecast values for 2027 and 2028.

Year	2020	2021	2022	2023	2024
Sales (000s)	150	170	190	200	230

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
GEOLOGY (Special Paper - XVI)
Geochemistry (22221652)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions. 10

- 1) The average composition of igneous rocks was proposed by _____.
a) Goldschmidt b) Schonbein
c) Clarke and Washington d) None
- 2) The upper crust of the earth mainly consists of _____.
a) Sandstone
b) Shale
c) Limestone
d) Igneous and metamorphic rocks
- 3) Which of the following method is used for dating relatively recent geological event?
a) K - Ar method b) U - Pb method
c) Carbon - 14 methods d) Rb - Sr method
- 4) Ionic and covalent bonds are the rule in geological compounds. Which among the following are illustrative of covalent bond.
a) NaCl and AgCl b) ZnS and SiO₄
c) Cl₂ and SO₄ d) HCl and CaS
- 5) Elements are those of the B subgroup whose ions have 18-electron in the outer shell are _____.
a) Siderophile b) Chalcophile
c) Lithophile d) Atmosphere
- 6) Quartz and Tridymite are the example of _____.
a) Polymorphism b) Isomorphism
c) Diadochy d) None of-these
- 7) Which one of the following are siderolites?
a) Iron meteorites b) Iron-stony meteorites
c) Stony meteorites d) Metallic meteorites

- 8) Which of the following is Evaporates in secondary environment?
 - a) $\text{Fe}(\text{OH})_3$
 - b) CaSO_4
 - c) CaCO_3
 - d) SiO_2
- 9) The planet and their satellites that rotate in retrograde rotation direction _____.
 - a) Uranus
 - b) Jupiter
 - c) Saturn
 - d) Neptune
- 10) Which of the following is radiogenic isotope?
 - a) Argon
 - b) Carbon
 - c) Sulfur
 - d) Oxygen

B) Fill in the blanks.

06

- 1) _____ elements those which occur in very low concentrations in common rocks (usually $< 0.1\%$ by weight).
- 2) Chalcophile elements have an affinity for a _____ phase.
- 3) Long -term changes in the geochemical cycle are known as _____.
- 4) The most abundant chemical element in the earth's crust is _____.
- 5) Elements which readily-form ions with an outermost 8-electron shell are _____.
- 6) When a minor element has small charge and ionic radius similar to a major element it as being _____ in the crystal lattices containing the major element.

Q.2 Solve the following. (Any Eight)

16

- a) Name the four chalcophile elements of geochemical classification.
- b) Give any two examples of Isomorphism.
- c) List the four most abundant elements in average composition of igneous rocks.
- d) Give the examples of hydrophobic sol.
- e) Define Chondrite.
- f) Which of the two planets rotate in retrograde rotation?
- g) Define geochronology.
- h) Name REE elements.
- i) List the radiogenic isotopes.
- j) Name any two examples of aerosol.

Q.3 A) Attempt the following. (Any Two)

10

- Discuss in short Ur-Th-Pb method of dating the geologic event
- Write the short note on solid solution substitution with suitable diagram.
- Explain in brief geochemical cycle.

B) Write short note on composition of igneous rocks.

06

- Q.4 A) Attempt the following. (Any Two) 08**
- a) Explain the carbon dating method in detail.
 - b) Discuss the difference between compatible and incompatible elements.
 - c) Define colloids. Explain in types of colloids with suitable example.
- B) Describe the types of chemical bonding with coordination number. 08**
- Q.5 Attempt the following. (Any Two) 16**
- a) Describe in short, the different types of radioactivity. Add note on radioactive decay.
 - b) Give an account of geochemical classification of the earth.
 - c) Define meteorites. Explain in brief the composition of meteorites.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
MICROBIOLOGY (Special Paper - XVI)
Medical Microbiology (22221664-A)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice questions. 10

- 1) Bactericidal agents _____.
 - a) Kill bacteria
 - b) Prevent bacterial multiplication
 - c) Both a & b
 - d) None of the above
- 2) Which of the following is an example of the live vaccine?
 - a) pertusis
 - b) cholera
 - c) mumps
 - d) rabies
- 3) Chloramphenicol does not affect the eukaryotic cells because _____.
 - a) They have 30 S ribosomes
 - b) They have mitochondria
 - c) They have 80 S ribosomes
 - d) None of the above
- 4) Penicillin is Drug acting on _____.
 - a) Cell walls
 - b) Cell membrane
 - c) Nucleic acid synthesis
 - d) None of the above
- 5) Antibiotics used for the treatment of cholera are _____.
 - a) Tetracyclines
 - b) Penicillins
 - c) Streptomycines
 - d) None of these
- 6) *Bacilli Calmette Guerin* (BCG) contains the avirulent strains of _____.
 - a) Human tubercle bacilli
 - b) Avian tubercle bacilli
 - c) Bovine tubercle bacilli
 - d) Atypical mycobacteria
- 7) *Pseudomonas aeruginosa* Causes _____.
 - a) Blue pus
 - b) Black pus
 - c) yellow pus
 - d) orange pus
- 8) Causative agent of Tinea nigra _____.
 - a) *Malassezia furfur*
 - b) *Exophiala werneckii*
 - c) *Candida albicans*
 - d) *Aspergillus flavus*
- 9) The main causative organism of gas gangrene is _____.
 - a) *B. anthrax*
 - b) *Clostridium tetani*
 - c) *Cl. Difficile*
 - d) *Cl. perfringens*

- 10) The cholera toxin is a type of ____.
- | | |
|--------------|----------------|
| a) Endotoxin | b) Enterotoxin |
| c) cytotoxin | d) Neurotoxin |

B) Answer following questions in one word/ sentence: 06

- 1) What is the symptom of Tuberculosis
- 2) Which test is used to determine antibiotic susceptibility?
- 3) Give example of Antifungal Antibiotic.
- 4) What is a common mechanism of viral pathogenicity?
- 5) Which bacterial structure is primarily involved in adhesion to host cells?
- 6) Give example of killed vaccine.

Q.2 Solve the following. (Any Eight) 16

- a) Define Pathogenicity.
- b) Give Examples of Bacterial Exotoxin.
- c) What is the mode of transmission of Cholera.
- d) Name the causative agent of Mucormycosis.
- e) Define vaccine.
- f) Give two examples of bioweapons.
- g) Give two examples of drugs acting on protein synthesis.
- h) Give two examples of drugs acting on cell wall.
- i) What are the advantages of Bioweapons?
- j) Define MIC.

Q.3 A) Write Short Notes: (Any Two) 10

- a) Differentiate between Endotoxin and Exotoxin.
- b) Write a note on the transmission mechanism of Rocky Mountain spotted fever.
- c) Describe in detail staphylococcal wound infections.

B) Write a note on Ideal characteristics of Chemotherapeutic agents. 06

Q.4 A) Attempt the following. (Any Two) 08

- a) Differentiate between Attenuated and killed vaccines.
- b) Write a note on the Basic principles of Microbial adhesion.
- c) Write a note on Drugs acting on Nucleic acid Synthesis.

B) Write an essay on Cholera. 08

Q.5 Attempt the following. (Any Two) 16

- a) Write an essay on Malaria.
- b) Describe in detail Antibiotic Resistance with special emphasis on Mechanism and impact.
- c) Write an essay on Vaccines.

Seat No.	

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026**

**MICROBIOLOGY (Special Paper - XVI)
Clinical Microbiology (22221664-B)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice question. 10

- 1) Bactericidal agents _____.
 - a) Kill bacteria
 - b) Prevent bacterial multiplication
 - c) Both a & b
 - d) None of the above
- 2) Which of the following specimens is used to diagnose urinary tract infections (UTIs)?
 - a) Sputum
 - b) Blood
 - c) Urine
 - d) CSF
- 3) Chloramphenicol does not affect the eukaryotic cells because _____.
 - a) They have 30 S ribosomes
 - b) They have mitochondria
 - c) They have 80 S ribosomes
 - d) None of the above
- 4) Penicillin is Drug acting on _____.
 - a) Cell Wall
 - b) Cell Membrane
 - c) Nucleic acid synthesis
 - d) None of the above
- 5) Antibiotics used for the treatment of cholera is _____.
 - a) Tetracycline
 - b) Penicillins
 - c) Streptomycines
 - d) None of these
- 6) *Bacilli Calmette Guerin* (BCG) contains the avirulent strains of _____.
 - a) Human tubercle bacilli
 - b) Avian tubercle bacilli
 - c) Bovine tubercle bacilli
 - d) A typical mycobacteria
- 7) *Pseudomonas aeruginosa* Causes _____.
 - a) blue pus
 - b) Black pus
 - c) yellow pus
 - d) orange pus
- 8) Cerebrospinal Fluid (CSF) is collected to diagnose _____.
 - a) Gastrointestinal infections
 - b) Meningitis
 - c) Skin infections
 - d) Urinary tract infections
- 9) The main causative organism of gas gangrene is _____.
 - a) *B. anthrax*
 - b) *Clostridium tetani*
 - c) *Cl. difficile*
 - d) *Cl. perfringens*

- 10) The cholera toxin is a type of _____.
a) Endo toxin b) Enterotoxin
c) cytotoxin d) Neurotoxin

B) Give short answers to the following:

06

- 1) What is the symptom of tuberculosis?
- 2) Name test is used to determine antibiotic susceptibility.
- 3) Give example of antifungal antibiotic.
- 4) What is a common mechanism of viral pathogenicity?
- 5) Which bacterial structure is primarily involved in adhesion to host cells?
- 6) What is the meaning of Incineration?

Q.2 Answer the following. (Any Eight)

16

- a) Define Pathogenicity.
- b) Give Examples of Bacterial Exotoxins.
- c) What is the mode of transmission of Cholera.
- d) Name the causative agent of Mucormycosis.
- e) Why Biomedical waste management is important?
- f) What are the types of clinical Specimen?
- g) Give two examples of drugs acting on protein synthesis.
- h) Give two examples of drugs acting on cell wall.
- i) How morphological characterization is useful in diagnosis of infections?
- j) Define MIC.

Q.3 A) Attempt the following. (Any Two)

10

- 1) Differentiate between Endotoxin and Exotoxin.
- 2) Write a note on Yellow fever.
- 3) Describe in detail staphylococcal wound infections.

B) Write a note on Ideal characteristics of Chemotherapeutic agents.

06

Q.4 A) Attempt the following. (Any Two)

08

- 1) Write a note on Serological diagnosis.
- 2) Write a note on the Basic principles of Microbial adhesion.
- 3) Write a note on Drugs acting on Nucleic acid Synthesis.

B) Write a note on antibiotic susceptibility testing.

08

Q.5 Attempt the following. (Any Two)

16

- Write an essay on Malaria.
- Describe in detail Antibiotic Resistance with special emphasis on Mechanism and impact.
- explain in detail mechanism of action of Drugs acting on folic acid metabolism.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
MICROBIOLOGY (Special Paper - XVI)
Health Microbiology (22221664-C)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Rewrite the following sentences by selecting correct answer from given alternatives. 10

- _____ Organism is used as Bioweapon.
 - Bacillus subtilis
 - E.coli
 - S.aureus
 - Bacillus anthracis
- Penicillin inhibits synthesis of _____ of bacteria.
 - Cell wall
 - Nucleic acid
 - Protein
 - Cell membrane
- Leprosy is caused by _____.
 - Mycobacterium tuberculosis
 - Ps. aeruginosa
 - Mycobacterium leprae
 - Cl. perfringens
- _____ is symptom of malaria.
 - Vomiting
 - Abdominal pain
 - Fever
 - Cough
- _____ test is used for diagnosis of Tuberculosis.
 - MPN
 - VDRL
 - Widal
 - Mantoux
- BCG vaccine is used to increase immunity against _____.
 - Tuberculosis
 - Yellow fever
 - Malaria
 - Mucormycosis
- Oxidase test positive is characteristics of _____.
 - Clostridium
 - Staphylococcus
 - Pseudomonas
 - Mycobacterium
- _____ increases virulence of S. aureus
 - Amylase
 - Coagulase
 - Catalase
 - Lipase

- 9) Remdesvir is _____ agent.
- a) Antifungal b) Antibacterial
- c) Antiviral d) Antimalarial
- 10) Cholera toxin increases the activity of _____ enzyme in human intestinal cells.
- a) Urases b) Coagulase
- c) DN Aase d) Adenylate cyclase

B) Answer in short

06

- 1) In which host plasmodium reproduces sexually?
- 2) Define Pathogenecity.
- 3) How tuberculosis spreads
- 4) Which pigment is produced by Pseudomonas?
- 5) What is action of sulphonamides on microorganisms?
- 6) What is causative agent of mucormycosis?

Q.2 Solve the following. (Any Eight)

16

- a) What are the symptoms of yellow fever?
- b) What is invasion?
- c) Define attenuated vaccine?
- d) Give the activity of chloramphenicol.
- e) What is drug resistance?
- f) Define Bioweapon.
- g) Define Toxoids.
- h) What is chemotherapy?
- i) Which medium is used for cultivation of mycobacterium tuberculosis.
- j) Define vDNA Vaccines.

Q.3 A) Attempt the following. (Any Two)

10

- 1) Give the mechanism of bacterial invasion.
- 2) Describe the activity of streptomycin.
- 3) Comment on Antifungal agents.

B) Describe in brief Leprosy.

06

Q.4 A) Attempt the following. (Any Two)

08

- 1) Write short notes on new generation vaccines.
- 2) Describe in short Antibiotic Sensitivity Test.
- 3) Describe in brief Malaria.

B) Describe in detail Tuberculosis.

08

Q.5 Attempt the following. (Any Two)

16

- Describe in detail antibiotics acting on cell wall and protein synthesis.
- Describe various types of bacterial toxins and their mechanism of action.
- Describe in detail infections caused by *pseudomonas aeruginosa*.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
ELECTRONICS (Special Paper - XVI)
Virtual Instrumentation (22221680-A)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice questions:**10**

- 1) _____ is the part of LabVIEW.
 - a) Front panel
 - b) Block diagram
 - c) Connector pane
 - d) All of the mentioned
- 2) _____ is the default format for numeric objects.
 - a) Double precision
 - b) Single precision
 - c) Virtual precision
 - d) External precision
- 3) A bridge circuit uses _____ method of measurement.
 - a) relative
 - b) comparison
 - c) absolute
 - d) differential
- 4) Each cluster contains a _____ component.
 - a) single
 - b) double
 - c) Both a and b
 - d) None of these
- 5) Software Layer Diagram consists _____.
 - a) Application software
 - b) Test and Data management software
 - c) Measurement and control software
 - d) All of these
- 6) On an array _____ operations carried.
 - a) three
 - b) four
 - c) five
 - d) two
- 7) In LabVIEW, integers are represented with the colour _____.
 - a) Black
 - b) Blue
 - c) Orange
 - d) Green
- 8) An express VI that keeps track of time while the VI continues to execute.
 - a) Elapsed time
 - b) Time delay
 - c) Enum
 - d) Tact time

- 9) _____ adjustments is usually adjusted first in an instrument requiring calibration.
- | | |
|---------------|---------|
| a) Dead band | b) Span |
| c) Hysteresis | d) Zero |
- 10) The DAS system used for _____.
- | | |
|----------------------|--------------------|
| a) data processing | b) data conversion |
| c) data transmission | d) All of these |

B) State True or False.**06**

- 1) VISA is the lower level of functions in the LabVIEW instrument driver.
- 2) LabVIEW stands for Laboratory Virtual Instrument Electronics Workbench.
- 3) Linearization and isolation are features of signal conditioning.
- 4) Virtual instruments are user defined.
- 5) Decreasing application software development time cost is disadvantage of VI.
- 6) LabVIEW accepts a maximum word length of 32 bits.

Q.2 Solve any Eight of the following.**16**

- a) Mention the role of software's in VI.
- b) List out the various functions available in structure.
- c) What is stacked shift register?
- d) What is mean by polymorphic VI?
- e) Write the syntax for two types of WHILE loop.
- f) Define Virtual Instrumentation.
- g) State the different debugging process in LabVIEW.
- h) What is File I/O?
- i) Name the different operations of cluster.
- j) Mention the characteristics of virtual instrumentation.

Q.3 A) Attempt any Two of the following.**10**

- a) Explain formula nodes for virtual instrumentation.
- b) Write a note on wires in VI software.
- c) Explain the Applications of LabVIEW.

B) Draw the architecture of VI and indicate the parts, explain it.**06****Q.4 A) Attempt any Two of the following.****08**

- a) Distinguish between Virtual Instrument and Traditional Instrument.
- b) Explain the three parts of LabVIEW with three floating palette.
- c) Explain array and its function in detail.

B) Explain the modular programming concept in LabVIEW using sub VI with procedure and example.**08**

Q.5 Attempt any Two of the following.**16**

- a)** Write a note on data- flow techniques. Explain graphical programming in data flow.
- b)** What is DAS? Explain DAS for Measurement of physical parameters with block diagram.
- c)** Explain the following in detail with suitable examples.
 - i) Shift registers
 - ii) Local variables and Global variables
 - iii) Feedback node
 - iv) Formula node

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
ELECTRONICS (Special Paper - XVI)
Modern Communication Systems (22221680- B)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

Q.1 A) Choose correct alternative and rewrite the sentences. 10

- 1) _____ device that converts received light into an electrical signal.
 - a) Optical Source
 - b) Optical Amplifier
 - c) Photodetector
 - d) Optical transmitter
- 2) The signal path from ground station to satellite is known as _____.
 - a) down link
 - b) Down converter
 - c) Up converter
 - d) Up link
- 3) The channel width of the transmitter in a cell phone system is _____.
 - a) 30 KHz
 - b) 60 KHz
 - c) 30 MHz
 - d) 30 MHz
- 4) Waveguide is a _____.
 - a) hollow insulating tube
 - b) hollow metal tube
 - c) solid rectangular metal rod
 - d) none of these
- 5) _____ is the principle is used in the working of an optical fiber.
 - a) Diffraction
 - b) Reflection
 - c) Refraction
 - d) Total Internal Reflection
- 6) Full form of LAN is _____.
 - a) Local Areas Network
 - b) Location Area Network
 - c) Light Area Network
 - d) Land Area Network
- 7) The problem of overcrowding radio spectrum is solved by _____ waves.
 - a) sky
 - b) micro
 - c) space
 - d) direct
- 8) In mobile phones SIM stands for _____.
 - a) system identity module
 - b) source identity module
 - c) subscriber identity module
 - d) substitute identity module

- 9) A specialized cable designed to transmit alternating current of radio frequency is known as _____.
a) transmission line b) coaxial cable
c) shield coax d) twisted pair
- 10) _____ wireless technology is used to exchange data between devices over short distances.
a) Wi-Fi b) Bluetooth
c) NFC d) Zigbee

B) Fill in the blanks.**06**

- 1) The refractive index of core is _____ the refractive index of cladding.
- 2) The term RADAR is the abbreviation for _____.
- 3) The term LASER is the abbreviation for _____.
- 4) Working principle of microwave tube is based on _____ modulation.
- 5) The term QPSK is the abbreviation for _____.
- 6) _____ is the Transferred Electron Device.

Q.2 Solve any Eight of the following.**16**

- a) Define Bit rate and Baud rate.
- b) State condition for total internal reflection.
- c) State the function of intrinsic layer in pin diode.
- d) State the roll of transponder.
- e) Define uplink and downlink frequency in satellite communication.
- f) What is cavity resonator?
- g) What do you mean by computer networking? What are its types?
- h) State concept of communication using Bluetooth.
- i) What is roll of control unit in cell phone?
- j) Define cell in a mobile communication.

Q.3 A) Attempt any Two of the following.**10**

- 1) With constructional diagram explain working of Gunn diode.
- 2) With the help of block diagram explain earth station in satellite communication.
- 3) Explain strip line and micro strip line.

B) Give the construction and working of the p-i-n diode.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Compare Step Index and Graded index optical fiber.
- 2) Explain cell phone with necessary block diagram.
- 3) Explain block diagram of optical fiber communication system.

B) With concept of velocity modulation explain working of Klystron tube.**08**

Q.5 Attempt any Two of the following.

16

- a) What is Network topology? What are its types? With diagram explain any two of them.
- b) Explain pulsed radar system with the help of block diagram.
- c) Explain construction and working of LASER diode.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
COMPUTER SCIENCE (Special Paper - XVI)
Advanced Python (22221672-A)**

Day & Date: Monday, 04-05-2026

Max. Marks: 80

Time: 12:00 PM To 03:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. 10

- 1) In Python, _____ module is used for GUI programming in Python.

a) tkinter	b) sys
c) os	d) time
- 2) To execute MySQL Stored Procedure in Python _____ is used.

a) callproc()	b) fetch()
c) fetchall()	d) cursor
- 3) Which widget is used-for multi-line text input?

a) Entry	b) Menu
c) Text	d) Button
- 4) _____ methods are used to retrieve results from cursor in mysql python connectivity.

a) Fetchone()	b) Fetchall()
c) fetchmany()	d) all of these
- 5) Which function is used to read an Excel file?

a) open_excel()	b) read_excel()
c) excel_read()	d) load_excel()
- 6) In Pandas _____ data structure is one-dimensional.

a) DataFrame	b) Panel
c) Series	d) none of these
- 7) Which geometry manager uses rows and columns?

a) Pack	b) Place
c) Grid	d) none of these
- 8) What does NumPy stand for?

a) Numerical Python	b) number python
c) numeric programming	d) network program

- 9) _____ is the core object of NumPy.
- a) List b) ndarray
c) tuple d) series
- 10) _____ widget is used for multi-line text input.
- a) messagebox b) filedialog
c) fontdialog d) inputdialog

B) Fill in the blanks.

06

- 1) GUI stands for _____ User Interface.
- 2) The widget used to display static text is called _____.
- 3) The Python package used to connect MySQL with Python is called _____.
- 4) The _____ layout manager arranges widgets in rows and columns.
- 5) _____ command is used to create project “myside” in Django.
- 6) _____ widget in Tkinter is used as a container to organize other widgets.

Q.2 Solve any Eight of the following.

16

- a) What is model in Django?
- b) What is array indexing?
- c) What are dialog boxes in Tkinter?
- d) List out the commands used in Django.
- e) Write a note Entry in Tkinter.
- f) What is a stored procedure?
- g) What is the MVC?
- h) What is ORM in Django?
- i) What is a Series in Pandas?
- j) Why is NumPy important in scientific computing?

Q.3 A) Attempt any Two of the following.

10

- Explain GUI programming in Python and discuss the advantages of GUI applications.
- What is difference between frame and canvas? Explain with example.
- What is a cursor? Explain its role in database connectivity.

B) Explain steps for database connectivity in detail.

06

Q.4 A) Attempt any Two of the following.

08

- Write the steps involved in developing a simple GUI application using Tkinter.
- Write a program to retrieve student records from MySQL.
- Write GUI application for addition of two number. (use Entry, Button and Label)

B) What is Matplotlib libraries? Explain its use for data visualization.

08

Q.5 Attempt any Two of the following.

16

- a)** Describe Series and DataFrame with suitable examples.
- b)** Explain Django architecture (MVT) in detail.
- c)** Write a Python program to demonstrate basic mathematical and array manipulation using NumPy.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026
COMPUTER SCIENCE (Special Paper - XVI)
Mobile Application Development Using Kotlin (22221672-B)**

Day & Date: Monday, 04-05-2026

Max. Marks: 80

Time: 12:00 PM To 03:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternatives. 10

- 1) _____ is the correct name for the layout design file of an activity in android application.
 - a) MainActivity.java
 - b) activity_main.xml
 - c) Gradle.sql
 - d) None of these
- 2) _____ Android Studio folders includes drawable files for different launcher icon.
 - a) Mipmap
 - b) Layout
 - c) String
 - d) Values
- 3) If you want to configure a link between two Android activities in the same Android application, you need to use _____.
 - a) Gradle
 - b) Toast
 - c) seek bar
 - d) intent
- 4) SQLite is an Open Source Database system embedded into every Android device.
 - a) True
 - b) False
- 5) _____ Component represents the single screen with the user interface.
 - a) Activity
 - b) Service
 - c) Broadcast receiver
 - d) content provider
- 6) _____ is responsible for code compilation, testing, deployment and conversion of the code into .dex file.
 - a) AppCode
 - b) Gradle
 - c) manifest
 - d) None of these
- 7) _____ Virtual machine is used by android operation system.
 - a) Dalvik
 - b) JVM
 - c) simple
 - d) Android

- 8) Which of the following is not a component of Android?
 - a) Servlet
 - b) Activity
 - c) Broadcast Receiver
 - d) None of these
- 9) The _____ arranges widgets in positions relative to each other.
 - a) LinearLayout
 - b) ConstraintLayout
 - c) RelativeLayout
 - d) None of these
- 10) What is the extension of dex code?
 - a) .txt
 - b) .java
 - c) .class
 - d) .dex

B) Fill in the blanks.

06

- 1) AVD stands for _____.
- 2) The full form of DVM is _____.
- 3) The _____ is a layout that arranges other views either horizontally in a single column or vertically in a single row.
- 4) _____ function is used to start a new Activity in android.
- 5) _____ file is known as the **manifest file** in Android.
- 6) _____ is the built in database in the Android.

Q.2 Solve any Eight of the following.

16

- a) What is Android?
- b) Write a note on TextView.
- c) Write a note on ImageView.
- d) Datepicker view in Android.
- e) What is DVM?
- f) Content provider registration in AndroidManifest.xml.
- g) What is use of Geocoding?
- h) Write Registration of activity in AndroidManifest.xml.
- i) What is intent filter?
- j) What is use of String.xml?

Q.3 A) Attempt any Two of the following.

10

- 1) List out Android Market Application Store.
- 2) Write a program to display typed content of EditText in TextView.
- 3) Write a List of System generated intent.

B) What is intent? Explain type of Intent.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Write the list of methods in Service, explain all methods.
- 2) Differentiate View and ViewGroup.
- 3) Explain Broadcast receiver.

B) Explain Content provider.

08

Q.5 Attempt any Two of the following.

16

- a) What are different Android Layouts? Explain anyone.
- b) Write a program to demonstrate Linear Layout. (write XML file with button, EditText and TextView).
- c) Explain AndroidManifest.xml.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April – 2026**

**COMPUTER SCIENCE (Special Paper - XVI)
Data Visualization using Power BI (22221672-C)**

Day & Date: Monday, 04-05-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice questions: 10

- 1) Which Power BI component is used to share and collaborate on reports across an organization?
 - a) Power BI Service
 - b) Power BI Builder
 - c) Power BI Desktop
 - d) Power Query Editor
- 2) Which file format is not supported as a data source in Power BI?
 - a) .xls
 - b) .CSV
 - c) .docx
 - d) .XML
- 3) Which relationship type in Power BI connects multiple values in one table to multiple values in another?
 - a) One-to-one
 - b) One-to-many
 - c) Many-to-many
 - d) Self-join
- 4) Which function in DAX returns the last date in the current context?
 - a) LASTNONBLANK
 - b) LASTDATE
 - c) MAX
 - d) CALENDAR
- 5) Which transformation in Power Query helps combine two or more rows into a single row?
 - a) Append
 - b) Merge
 - c) Group By
 - d) Split
- 6) Which visualization is best to show trends over time?
 - a) Line chart
 - b) Card
 - c) Matrix
 - d) Donut
- 7) Which Power BI feature helps in transforming and cleaning data before analysis?
 - a) Power Query
 - b) Power BI Desktop
 - c) Power Pivot
 - d) Power View

- 8) Which function returns the current user's domain identity?
 - a) USERNAME()
 - b) LOOKUPVALUE()
 - c) VALUES()
 - d) TODAY()
- 9) Which of the following is not a data view in Power BI Desktop?
 - a) Report view
 - b) Model view
 - c) Relationship view
 - d) Data view
- 10) Which dashboard element allows setting interactive filtering across visuals?
 - a) Slicer
 - b) KPI
 - c) Tooltip
 - d) Matrix

B) Fill in the blanks. 06

- 1) _____ is used to perform ETL operations in Power BI.
- 2) The default file format for saving Power BI Desktop projects is _____.
- 3) _____ function returns the current system date in DAX.
- 4) _____ view in Power BI Desktop is used to manage relationships.
- 5) _____ is used to create calculated fields based on existing columns.
- 6) A _____ visual is used to compare progress against a target.

Q.2 Solve any Eight of the following. 16

- a) What are the major differences between dashboards and reports?
- b) Define Power Query Editor. What are its key uses?
- c) What is the importance of relationships in Power BI models?
- d) What is DirectQuery mode?
- e) Define cardinality in Power BI relationships.
- f) Explain the difference between Delete and Remove in Power Query.
- g) What is calculated measures?
- h) List out different types of slicers.
- i) What is the difference between SUM and SUMX functions in DAX?
- j) What is Row-level Security (RLS) in Power BI?

Q.3 A) Attempt any Two of the following. 10

- 1) Explain Power BI architecture with diagram.
- 2) Explain data types in Power BI.
- 3) Explain Card and KPI visuals in Power BI with examples.

B) Explain the hierarchies with example. 06

Q.4 A) Attempt any Two of the following. 08

- 1) Explain CALCULATE () function in DAX with example.
- 2) Define Append queries. Explain its uses.
- 3) Explain Q&A visual in Power BI.

B) Describe the various types of filters. 08

Q.5 Attempt any Two of the following.

- a) Explain the architecture and components of Power Query Editor.
- b) What is a Matrix visual? How does it differ from a Table visual?
- c) Consider the following sales dataset and write DAX queries:

OrderID	Customer	Region	Amount	Date
1	Asha	East	1200	2023-01-10
2	Raj	North	800	2023-01-12
3	Meera	East	1500	2023-01-13
4	John	West	900	2023-02-10
5	Raj	North	1100	2023-02-15

- i) Find total sales by Region.
- ii) Calculate the average sales amount.
- iii) Find total sales for customer "Raj".
- iv) Count total transactions in February.
- v) Create a calculated column to extract Month from Date.
- vi) Find the highest sales amount.
- vii) Find the total sales for each customer.
- viii) Create a calculated column to extract Year from Date.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - I) (CBCS) Examination: March/April – 2026
MICROBIOLOGY (Paper – II)
Cell cytology and Microbial Techniques (22221115)

Day & Date: Thursday, 14-05-2026

Max. Marks: 40

Time: 03:00 PM To 05:00 PM

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 Multiple choice questions.**08**

- 1) The cell wall of Gram-positive bacteria mainly contains _____.
 a) Thin peptidoglycan layer
 b) Thick peptidoglycan layer with teichoic acid
 c) Lipopolysaccharide
 d) Mycolic acid only
- 2) The Bacterial ribosomes are _____.
 a) 70S type
 b) 80S type
 c) 30S only
 d) 50S only
- 3) The Endospore resistance is mainly due to the presence of _____.
 a) Lipid coat
 b) High calcium dipicolinate
 c) Peptidoglycan
 d) Proteins
- 4) A bacterial cell capsule is composed mostly of _____.
 a) Proteins only
 b) Nucleic acids
 c) Polysaccharides
 d) Sterols
- 5) The Numerical aperture is directly related to _____.
 a) Field of view
 b) Resolving power
 c) Magnification only
 d) Color of stain
- 6) Which microscope uses an electron beam instead of light?
 a) Compound microscope
 b) SEM & TEM
 c) Phase contrast
 d) Fluorescent microscope
- 7) UV radiation kills microorganisms mainly by _____.
 a) Cell wall destruction
 b) DNA thymine dimer formation
 c) Protein cross-linking
 d) Cell membrane lysis
- 8) The Phenol coefficient is used to evaluate the power of _____.
 a) Filtration membrane
 b) Chemical disinfectant
 c) Dry heat device
 d) Autoclave

- Q.2 Answer Any Four of the following. 08**
- a) Define Magnification
 - b) Write the principle of the compound microscope.
 - c) Define capsule
 - d) Give any two functions of flagella.
 - e) Define Sterilization
- Q.3 Write short note on Any Two of the following. 08**
- a) Write a short note on Monochrome staining.
 - b) Write a short note on the Gram-positive bacteria.
 - c) Write a short note on the Sterilization by temperature.
- Q.4 Answer Any Two of the following. 08**
- a) Describe the structure and role of pili in bacteria.
 - b) Describe the fluid-mosaic model of the plasma membrane with a suitable diagram.
 - c) Discuss the sterilization by chemical agents - Phenols, Alcohols.
- Q.5 Answer Any One of the following. 08**
- a) Explain in detail the structure and functions of the ribosome and nucleoid in a bacterial cell.
 - b) Describe the principle, working, and applications of the Scanning Electron Microscope.

Set P

**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April – 2026
ELECTRONICS (Paper – III)
Semiconductor Devices (22221226)**

Day & Date: Friday, 08-05-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of logarithmic table and Calculator is allowed.

0.1 Multiple choice questions 08

- 1) The minimum forward break over voltage at which diode conducts is also called _____.
a) off voltage b) break down voltage
c) conduction voltage d) Knee voltage
- 2) _____ diode is operating in reverse bias.
a) LED b) p-n junction
c) Photo d) All of these
- 3) The base of transistor is _____ doped.
a) Heavily b) Lightly
c) Moderately d) All of these
- 4) In p-channel FET current is conducted by _____.
a) holes b) electrons
c) electrons and holes d) none of these
- 5) The three terminals of SCR are _____.
a) Anode, Collector, Cathode b) Anode, Base, Cathode
c) Anode, Gate, Cathode d) Anode, MT1, MT2
- 6) Phosphorus is _____ type of impurity.
a) Acceptor b) Intrinsic
c) Neutral d) Donor
- 7) Varactor diode works in _____ bias.
a) reverse b) forward
c) zero d) breakdown
- 8) In cut-off region, transistor current is _____.
a) Maximum b) Zero
c) Moderate d) Infinite

- Q.2 Answer any Four of the following. 08**
- a) Define Semiconductor. State its types.
 - b) Draw the symbol of LED and Photo diode with label.
 - c) In a transistor circuit $I_E = 1 \text{ mA}$, $I_c = 0.94 \text{ mA}$. What is the value of I_B ?
 - d) Compare BJT and FET.
 - e) Draw the symbol of TRIAC and DIAC.
 - f) State the applications of LED.
- Q.3 Attempt any Two of the following. 08**
- a) What is meant by extrinsic semiconductor? Explain n-type semiconductor.
 - b) Explain construction of Zener diode.
 - c) Define current gain β and α of a transistor. Obtain the relation between them.
- Q.4 Answer any two of the following. 08**
- a) Explain working of n-channel JFET.
 - b) Explain construction of SCR.
 - c) Explain working of LED.
- Q.5 Answer any one of the following. 08**
- a) Explain input and output characteristics of a transistor in CE configuration.
 - b) Explain construction & I-V characteristics of D-MOSFET.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination:
March/April - 2026
ELECTRONICS (Paper - IV)
Digital Electronics (22221227)**

Day & Date: Saturday, 09-05-2026
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Multiple choice questions.**08**

- 1) TTL stands for _____.
 a) Transistor Total Level b) Transistor Transfer Logic
 c) Transistor Transfer Level d) Transistor Transistor Logic
- 2) Multiplexer's are also called as _____.
 a) Data distributor b) Data adder
 c) Data selector d) All of these
- 3) J-K flip flop toggles when _____ and-trigger pulses is given.
 a) J=0, K =0 b) J= 1, K =1
 c) J=0, K=1 d) J= 1, K=0
- 4) In _____ counter the complemented output of last flip flop is connected to D input of first flip flop.
 a) twisted ring b) ring
 c) decade d) up-down
- 5) To construct decade counter _____ flip flops are required.
 a) five b) three
 c) four d) two
- 6) Racing around condition is eliminated in _____.
 a) R-S b) J-K
 c) D d) J-K MS
- 7) Normally in shift register _____ type of flip-flops is used.
 a) D b) J-K
 c) J-K MS d) T
- 8) Normally to construct counters _____ Flip-flops are used.
 a) J-K b) J-K MS
 c) D d) R-S

- Q.2 Attempt any FOUR of the following. 08**
- a) Define the term power dissipation and Figure of Merit.
 - b) Draw the logic diagram of 4:1 Multiplexer.
 - c) Write the truth table of D flip flop.
 - d) Give the types of shift register.
 - e) Draw the diagram of mod-2 counter.
 - f) What do you mean by race around condition.
- Q.3 Attempt any TWO of the following. 08**
- a) Explain R-S flip-flop using NOR gates.
 - b) Define the terms:
 - i) Priority Encoder
 - ii) Decoder
 - iii) Multiplexer
 - iv) De-multiplexer
 - c) With suitable logic diagram explain the action 1:4 De-multiplexer.
- Q.4 Attempt any TWO of the following. 08**
- a) Explain D Flip-flop.
 - b) With suitable diagram explain working of Johnson Counter.
 - c) With suitable diagram explain the action of TTL NAND gate.
- Q.5 Attempt any ONE of the following. 08**
- a) What is mean by counter? What are its types? Explain the working of 3-bit synchronous counter with timing diagram.
 - b) Explain construction and working of 3:8 decode with suitable diagram.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:
March/April - 2026
MICROBIOLOGY (Special Paper - XIII)
Microbial Genetics (19201660)**

Day & Date: Wednesday, 29-04-2026
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

Q.1 A) Choose the correct alternative and rewrite the sentence again. 10

- 1) In DNA fingerprinting technique _____ used as marker.
 - a) Enzyme
 - b) VNTR
 - c) Lipid
 - d) Protein
- 2) _____ is a nucleotide sequence database.
 - a) SWISSPROT
 - b) EMBL
 - c) PROSITE
 - d) TREMBL
- 3) _____ is a structural gene in Lac operon of *E.coli* encodes β galactosidase enzyme.
 - a) Lac A
 - b) Lac Y
 - c) Lac I
 - d) Lac Z
- 4) In replication unwinding of DNA is carried out by _____ enzyme.
 - a) Primase
 - b) Topoisomerase
 - c) DNA polymerase
 - d) Helicase
- 5) The enzymatic nucleotide DNA sequencing also known as _____ Method.
 - a) Sanger
 - b) Automated
 - c) Maxam-Gilbert
 - d) Edman
- 6) _____ type of gel electrophoresis most commonly used for separation of large fragments of DNA.
 - a) PAGE
 - b) SDS-PAGE
 - c) Agarose
 - d) 2D PAGE
- 7) A point mutation which includes addition or deletion of nucleotide in the m-RNA known is as _____ mutation.
 - a) Frame shift
 - b) Non sense
 - c) Missense
 - d) Translocation

- 8) Eco RI _____ type of restriction enzyme most commonly used in r-DNA technology.
 - a) Type I
 - b) Type II
 - c) Type III
 - d) Type IV
- 9) The long chain of adenine is added at the nascent chain of RNA in the 3' end during poly-adenylation by the enzyme _____.
 - a) Poly A polymerase
 - b) Taq polymerase
 - c) RNA polymerase
 - d) DNA polymerase
- 10) A population with _____ selection would most quickly leads to two groups with few shared traits.
 - a) Directional
 - b) Disruptive
 - c) Stabilizing
 - d) All of above

B) Define the following.

06

- 1) Define semiconservative DNA replication.
- 2) Define phenotype.
- 3) Define auxotroph.
- 4) What is DDBJ?
- 5) Define nonsense mutation.
- 6) Define vector.

Q.2 Solve any Eight of the following.

16

- a) What is PDB?
- b) What is Okazaki fragment?
- c) What is a Gene bank?
- d) What is bioinformatics?
- e) What is adaptor?
- f) What is folded fiber model of DNA?
- g) What is missense mutation?
- h) Enlist the applications of protein engineering.
- i) What is a BLAST?
- j) Enlist the applications of DNA finger printing.

Q.3 A) Attempt any Two of the following.

10

- Give a detailed account on Restriction endonucleases.
- Describe in detail cis - trans test.
- Describe in detail agarose gel electrophoresis.

B) Discuss in detail Lac operon.

06

Q.4 A) Attempt any Two of the following.

08

- 1) What is role of σ (Sigma) factor of RNA polymerase? Discuss in detail Mechanism of transcription.
- 2) Discuss in detail effect of mutation on time course of phenotypic expression.
- 3) Describe in detail selection of recombinant on the basis of white-blue screening.

- B)** Define DNA profiling. Discuss in brief steps involved in DNA fingerprinting. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Discuss in detail vectors used in genetic engineering.
- b)** Define DNA replication. Describe in detail mechanism of DNA replication.
- c)** Describe in detail DNA sequencing by sanger method.

Set P

B.Sc. (Plain) (Semester - I) (CBCS) Examination: March/April – 2026
STATISTICS (Paper - II)
Elementary Probability Theory (22221109)

Day & Date: Saturday, 16-05-2026

Max. Marks: 40

Time: 12:00 PM To 02:00 PM

Instructions:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat & well labelled diagram wherever necessary
- 4) Use of calculator allowed.

Q.1 Fill in the blanks by choosing correct alternatives. 08

- Sample space of appearing for an examination till passing is _____.
sample space.
 - a) discrete
 - b) countably infinite
 - c) continuous
 - d) none of these
- The sample space of a deterministic experiment contains _____.
 - a) only one sample point
 - b) more than one sample point
 - c) countably infinite number of sample point
 - d) infinite sample points
- Events A and A^c are _____.
 - a) Mutually exclusive events
 - b) sure events
 - c) independent events
 - d) None of these
- In tossing of three coins, probability of getting at most one head is _____.
 - a) $\frac{3}{8}$
 - b) $\frac{7}{8}$
 - c) $\frac{1}{2}$
 - d) $\frac{1}{8}$
- The probability that any month selected at random will have at least 4 Sundays is _____.
 - a) $\frac{1}{7}$
 - b) $\frac{2}{7}$
 - c) $\frac{4}{7}$
 - d) $\frac{7}{7}$
- If A and B are events such that $P(A) = 0.6$, $P(B) = 0.5$ and $P(A \cap B) = 0.3$ then $P(\bar{A} \cap B) =$ _____.
 - a) 0.4
 - b) 0.8
 - c) 0.2
 - d) 0.3

7) If $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{4}$, $P(A/B) = \frac{1}{6}$, then $P(B/A) = \underline{\hspace{2cm}}$.

a) $\frac{1}{4}$	b) $\frac{1}{8}$
c) $\frac{3}{4}$	d) None of these

8) If A and B are independent events with $P(A) = 0.4$ and $P(B) = 0.5$, then $P(A \cup B)$ is equal to $\underline{\hspace{2cm}}$.

a) 0.65	b) 0.70
c) 0.1	d) 0.25

Q.2 Answer the following. (Any Four)

08

- Define Random experiment with suitable example.
- Define a Priori definition of probability.
- If A and B are mutually exclusive and exhaustive events such that $P(A) = 2P(B)$, then find $P(A)$.
- Define conditional probability of A given B .
- Define pairwise independent of events A, B and C .

Q.3 Write Short Notes. (Any Two)

08

- Three coins are tossed and whether each shows head or tail is recorded. Write the following events.
 - A : Exactly two coins show tails
 - B : At least two coins show tails
- With usual notation prove that
 - $P(\phi) = 0$
 - $P(\bar{A}) = 1 - P(A)$
- Let A and B are independent events such that $P(A) = 0.2, P(A \cup B) = 0.6$. Find
 - $P(B)$
 - $P(\bar{A} \cap B)$

Q.4 Answer the following. (Any Two)

08

- The probability that at least one of A and B occur is 0.6. If A and B occur simultaneously with probability 0.2, then find $P(\bar{A}) + P(\bar{B})$.
- In a class of 50 students, 28 opted for NCC, 30 opted for NSS and 18 opted both NCC and NSS. One of the student is selected at random. Find the probability that
 - The student opted for NCC but not NSS
 - The student opted for NSS but not NCC
- If A and B are independent then
 - A and $\bar{B}$ are independent
 - $\bar{A}$ and B are independent

Q.5 Answer the following. (Any One)

08

- Prove that for any two events A and B

$$P(A \cap B) \leq P(A) \leq P(A \cup B) \leq P(A) + P(B).$$
- Define conditional probability of an event. Show that conditional probability satisfies all the axioms of unconditional probability.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - I) (CBCS) Examination: March/April – 2026
MATHEMATICS (Paper - II)
Calculus (22221117)

Day & Date: Tuesday, 19-05-2026
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 Choose the correct alternatives from the options.**08**

- 1) Which of the following is not an indeterminate form?
 - a) $[\infty + \infty]$
 - b) $[\infty - \infty]$
 - c) $[0. \infty]$
 - d) $\left[\frac{\infty}{\infty}\right]$
- 2) If $y = x^m$ then $y_n = \underline{\hspace{2cm}}$ if $n > m$
 - a) 0
 - b) $m!$
 - c) $n!$
 - d) $m! x^{n-m} (n - m)!$
- 3) The series expansion of e^x in powers of x is _____.
 - a) $1 + x + \frac{x^2}{2} + \frac{x^3}{3} + \dots$
 - b) $1 - x + \frac{x^2}{2} - \frac{x^3}{3} + \dots$
 - c) $1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$
 - d) $1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \dots$
- 4) The degree of homogeneous function $f(x, y) = \frac{x^{1/3+y^{1/3}}}{x^{1/5-y^{1/5}}}$ is _____.
 - a) $\frac{4}{15}$
 - b) $\frac{3}{15}$
 - c) $\frac{2}{15}$
 - d) $\frac{1}{15}$
- 5) If $u = \sin^{-1} \left(\frac{x}{y} \right)$ then $\frac{\partial u}{\partial x} = \underline{\hspace{2cm}}$.
 - a) $\frac{x}{\sqrt{y^2 - x^2}}$
 - b) $\frac{x}{\sqrt{x^2 - y^2}}$
 - c) $\frac{1}{\sqrt{y^2 - x^2}}$
 - d) $\frac{1}{\sqrt{x^2 - y^2}}$
- 6) The value of $\int_0^{\pi/2} \cos^6 x \, dx = \underline{\hspace{2cm}}$.
 - a) $\frac{5}{32}$
 - b) $\frac{5\pi}{32}$
 - c) $\frac{6\pi}{32}$
 - d) $\frac{6}{32}$

- [illegible]

Q.2 Answer Any Four of the following.

08

- Evaluate $\lim_{x \rightarrow 1} \frac{1 + \log x - x}{1 - 2x + x^2}$
- If $y = \sin(ax + b)$ then show that $y_n = \sin\left(ax + b + n\frac{\pi}{2}\right) a^n$
- If $u = x^3 - 3xy^2$ and $v = 3x^2y - y^3$ then find the value of $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}$
- Evaluate $\int_0^{\pi/2} \cos^7 x \, dx$
- If $\vec{f} = 2xy\hat{i} + 3yz\hat{j} + 4xz\hat{k}$ then find $\text{div } \vec{f}$ at the point $(1, 2, 3)$

Q.3 Attempt Any Two of the following.

08

- a)** Find n^{th} derivative of $y = \frac{7x-6}{(x-1)(x-2)}$
- b)** If $z = f(x, y)$ is a homogeneous function of x and y of degree n then show that
- $$x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = nz$$
- c)** If $\vec{f} = (y^2 + z^3)\hat{i} + (z^2 - x)\hat{j} + (x^3 - y^2)\hat{k}$ then show that $\vec{f}$ is a Solenoidal.

Q.4 Answer Any Two of the following.

08

- a)** Evaluate $\int_0^{\pi/2} \sin^8 x \cos^{10} x \, dx$
- b)** If $v = 2(ax + by)^2 - (x^2 + y^2)$ and $a^2 + b^2 = 1$ then show that $\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 0$
- c)** If $\vec{f} = xz^3\hat{i} - 2x^2yz\hat{j} + 2yz^4\hat{k}$ then find $\text{div } \vec{f}$ and $\text{curl } \vec{f}$ at $(1, -1, 1)$

Q.5 Answer Any One of the following.

08

- a)** State and prove Leibnitz's Theorem.
- b)** i) If $z = f(x, y)$ is a homogeneous functions of x and y of degree n and $z = f(u)$ then show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = n \frac{f(u)}{f'(u)}$
- ii) If $u = \cot^{-1} \left(\frac{x+y}{\sqrt{x}+\sqrt{y}} \right)$ then show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + \frac{1}{4} \sin 2u = 0$