Seat No.	

Set **P**

M.Sc. (Biotechnology) (Sem - I) (New) (NEP CBCS) Examination: March/April - 2025
Biochemistry and Enzymology (2311101)

Day & Date: Thursday, 15-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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

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

1) In the Pentose Phosphate pathway how many ATP molecules are produced?
a) 3 b) 2
c) 1 d) 0

2) The citric acid cycle is also known as _____
a) Tricarboxylic acid cycle b) Glycolysis
c) Gluconeogenesis d) EMP

3) Complex 4 is also known as _____
a) cytochrome oxidase
b) NADH hydrogenase
c) Succinate dehydrogenase
d) cytochrome bc1 complex

4) Glucose is converted into Glucose-6-Phosphate with the help of which enzyme _____
a) Hexokinase b) Keto-aldolase
c) Isomerase d) Dehydrogenase

5) The type of reaction center in the photosystem II is _____
a) Iron-Sulphur b) Quinone-type reaction centre
c) Oxygen d) Iron

6) Which of the following is the simplest form of carbohydrates?
a) Carboxyl group
b) Aldehyde and Ketone group
c) Alcohol and carboxyl group
d) Hydroxyl and hydrogen group

7) Which of the following is the source of electrons in photosynthesis?
a) NADH b) Water
c) Carbohydrates d) CO_2

8) Which of the following is the example of epimers?

a) Glucose and Ribose
b) Glucose and Galactose
c) Galactose, Mannose, Glucose
d) Glucose, Ribose Mannose

B) Write weather the following statements are true or false **04**

1) Photorespiration involves oxidation of RuBP
2) Non-cyclic photophosphorylation results in the production of only ATP
3) The water-soluble photosynthetic pigment is xanthophyll
4) DIPF is an example of an irreversible inhibitor

Q.2 Answer the following questions. (Any Six) **12**

a) Define the term cyclic phosphorylation.
b) What is meant by photosystem I and II, explain.
c) Define lipids and classify them with suitable examples.
d) Write a note on the Rubisco enzyme.
e) Write a note on the allosteric site.
f) Define what are enzymes and their types with examples.

Q.3 Answer the following questions. (Any Three) **12**

a) Mention the significance of Vmax and Km.
b) Explain what is meant by Lineweaver Burk Plot.
c) Write a note on enzymes as Biosensors with examples.
d) Explain enzyme inhibition and state competitive and uncompetitive inhibition.

Q.4 Answer the following question. (Any Two) **12**

a) Explain the pathway of TCA cycle.
b) Mention the details of Photosynthesis its location, and light harvesting in green plants.
c) Explain all the reactions involved in the pathway of glycolysis.

Q.5 Answer the following question (Any two) **12**

a) Mention what is meant by Michaelis - Menten Equation.
b) Outline the steps involved in the pentose phosphate pathway.
c) Explain the endocrine system and mention all hormones in human body.

Seat No.	

Set **P**

M.Sc. (Biotechnology) (Sem - I) (New) (NEP CBCS) Examination: March/April - 2025
Cell and Molecular Biology (2311102)

Day & Date: Saturday, 17-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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 A) Multiple choice questions. **08**

1) This drug inhibits the initiation step of translation ____.
a) Ricin b) Streptomycin
c) Tetracycline d) Cyclohexylamine

2) Cytoskeletal filaments are polymers of
a) Proteins b) Carbohydrates
c) ribonucleic acids d) Deoxyribonucleic acids

3) A single strand of mRNA attached to complex of ribosomes is called
a) Okazaki fragments b) polypeptide
c) Polymer d) Polysome

4) DNA replication is ____.
a) semi-conservative and semi- discontinuous
b) semi-conservative and discontinuous
c) conservative and discontinuous
d) Conservative

5) Base pairing between mRNA and _____rRNAs help in the selection translation initiation site.
a) 5.8S rRNA b) 5S rRNA
c) 16S rRNA d) 28S rRNA

6) ____ of the following form 5’ cap.
a) 3’ —> 5’ NPP linkage b) 3’ —> 3’PPP linkage
c) 5’ —> 5’ PPP linkage d) 5’ —>3’PPP linkage

7) **If the mutation has a negligible effect on the function of a gene, it is known as a ____.**
a) Substitution mutation b) Frame shift mutation
c) Silent mutation d) Insertion mutation

8) This elongation factor is known as translocase ____.

a) EF2 b) EFG
c) Both (a) and (b) d) EF-Tu and EF-Ts

B) Fill in the blanks. **04**

a) Termination of replication is triggered by ____ protein.
b) The 3' – 5' phosphodiester linkage joins ____.
c) Chromosome structure can be observed best during ____.
d) Semi-conservative DNA replication was first demonstrated in ____.

Q.2 Answer the following questions. (Any Six) **12**

a) Replication.
b) Cell junctions.
c) Cell theory.
d) Topoisomerase.
e) Satellite DNA.
f) Membrane permeability.
g) Recombination Repair.
H) Reverse Transcription.

Q.3 Answer the following questions. (Any Three) **12**

a) Add a note on DNA polymerase in prokaryotes.
b) Discuss in details about Cell Cycle.
c) Explain Ultrasound and function of cell organelles.
d) What is Light induced signal transduction and explain general types of Ras pathway.

Q.4 Answer the following question. (Any Two) **12**

a) Explain in detail about Organization of eukaryotic genome.
b) Add a note on Structure and function of cytoskeletal.
c) Discuss in detail about base Excision repair system.

Q.5 Answer the following (Any two) **12**

a) Add a detail note on process of eukaryotic transcription.
b) Explain process of replication in prokaryotes in detail.
c) Discuss about translational proofreading and post translational modification.

Seat No.	

Set P

M.Sc. (Biotechnology) (Sem - I) (New) (NEP CBCS) Examination: March/April - 2025
Biostatistics and Bioinformatics (2311107)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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 A) Choose correct alternative (MCQ) **08**

1) The fundamental statistical indicators are ____.
a) Mean & standard deviation
b) Median
c) Variance
d) Mode

2) ____ is a measure of central tendency which is least affected by extreme values.
a) Mean
b) Mode
c) H.M
d) Median

3) The alignment procedure that tries to align the entire sequence is ____.
a) Multiple sequence alignment
b) Pair wise alignment
c) Global alignment
d) Local alignment

4) The comprehensive database for the study of human genetics and molecular biology is ____.
a) PDB
b) STAG
c) OMIM
d) PSD

5) ExPASy is developed by BIS, it is stands for ____.
a) External protein analysis
b) Expert protein analysis system
c) Exterior of protein system
d) None of the above

6) ____ tree is a tree in which a special (“labeled”) node is singled out.
a) Unrooted
b) Rooted
c) Guide
d) Dendrogram

7) ____ is a statistical test used to compare observed results with expected results.

a) z-test b) Mean
c) t-test d) Chi-square test

8) Which of the following is example of Nucleotide repository?

a) Gene Bank b) DDBJ
c) EMBL d) All of the above

B) Write true or false: **04**

a) BLAST stands for the Basic Local Alignment Search Tool.
   a) True
   b) False

b) Molecular phylogenetics is a branch of phylogeny that analyzes genetic, hereditary molecular differences, to gain information on an organism's evolutionary relationships.
   a) True
   b) False

c) Frequency distribution is a representation of the frequency of occurrence of each possible outcome of a variable.
   a) True
   b) False

d) There are two main methods for constructing phylogenetic trees: distance-based and character-based methods
   a) True
   b) False

Q.2 Answer the following questions. (Any Six) **12**

a) Define measures of central tendency.
b) Describe in short Scope and applications of Bioinformatics.
c) Site difference between Standard deviation & Standard error.
d) Explain shortly elements of phylogeny.
e) What is BLAST and give its variants.
f) Enlist tools used for visualization protein structure.
g) Give the relationship between mean median and mode.
h) Explain shortly Karl Pearson coefficient.

Q.3 Answer the following questions. (Any Three) **12**

a) State the basic assumption in ANOVA technique.
b) Write a note on Gene Bank.
c) Explain briefly about FASTA.
d) What is molecular docking? Highlight its significance.

Q.4 Answer the following question. (Any Two) **12**

a) Write a note on SWISS-PROT & TrEMBL.
b) Write a note on graphical presentation of data.
c) What is phylogeny? Explain phylogenetic analysis MEGA tool.

Q.5 Answer the following (Any two) **12**

a) Describe the character-based methods for phylogenetic tree construction.

b) Solve the problem:
In a cross between black and white coat color mice, individuals obtained in F2 generation are 787 black and 277 white coat color individuals. The expected ratio is 3:1, apply the chi-square test and comment weather data is accepted or not (P = 5%).

c) Enlist protein 3D structure visualization tools and explain any one visualization tool in detail.

Seat No.		Set	P

M.Sc. (Biotechnology) (Sem - I) (New) (NEP CBCS) Examination: March/April - 2025
Research methodology (2311103)

Day & Date: Saturday, 24-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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

Q.1 A) Choose correct alternative (MCQ) **08**

1) ____ is a sign capable of distinguishing the goods or services of one enterprise from those of other enterprises.
a) Copy rights b) Trademark
c) IG d) Patent

2) ____ is the framework of research methods and techniques chosen by a researcher to conduct a study.
a) Research design b) Hypothesis
c) Research Problem d) Research solution

3) ____ is a kind of bibliographic database, allowing the user to easily establish which later documents cite which earlier documents.
a) citation index **b)** Content
c) Appendix **d)** Reference

4) ____ is a long piece of writing on a particular subject that you do as part of a university degree
a) Thesis **b)** Hypothesis
c) Hyperthesis **d)** Code of conduct

5) ____ refers to creations of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce.
a) Biopiracy **b)** Hypothesis
c) Intellectual property **d)** Cyber crime

6) The ratio between experimental and observed results is represented by ____.
a) theta value b) chi- square
c) variance ratio d) correlation

7) Pearson correlation coefficient, denoted by r, measures ____.
- **a)** The scattering strength of data for a statistical series
- **b)** The strength of the correlation between the mean and median
- **c)** The strength of the correlation between two numerical parameters
- **d)** The tendency of simultaneous increase or decrease, or inverse evolution, for two numerical parameters

8) ____ is the classical form of research.

a) Experiment b) Case study
c) Grounded theory d) Narrative inquiry

B) Write true or false: **04**

1) Preliminary data collection is a part of the Exploratory research.
2) Survey is a list of sources used in a report and where they can be found.
3) The impact factor is a metric for evaluating the cumulative impact of an author's scholarly output and performance.
4) Sampling uses a representative part of a population.

Q.2 Answer the following questions. (Any Six) **12**

- **a)** Explain intellectual property with an example.
- **b)** What is research?
- **c)** What is a scientific proposal? Name the funding agencies in India.
- **d)** Explain hypothesis with an example.
- **e)** Define plagiarism.
- **f)** Explain Sampling theory.
- **g)** Differentiate between primary and secondary data.
- **H)** What is a correlation coefficient?

Q.3 Answer the following questions. (Any Three) **12**

- **a)** What are the characteristics of good research?
- **b)** Write a short note on the limitations and cautions in secondary data collection.
- **c)** Explain scientific proposal writing for funding agencies.
- **d)** Discuss advantages and disadvantages of PBR.

Q.4 Answer the following question. (Any Two) **12**

- **a)** Explain the steps involved in writing the thesis /dissertation.
- **b)** Give a detailed account on sampling.
- **c)** Explain the Criteria and procedure of patenting in India.

Q.5 Answer the following (Any two) **12**

- **a)** Define intellectual property and discuss forms of IP protection
- **b)** Write about Variance and Correlation.
- **c)** Explain in detail Presentation of a scientific paper.

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M.Sc. (Biotechnology) (Sem - II) (New) (NEP CBCS) Examination: March/April - 2025
Microbiology and Microbial Techniques (2311201)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

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

Q.1 A) Choose correct alternative (MCQ) **08**

1) ____ belongs to Archaebacteria.
a) Eubacteria b) Dinoflagellates
c) Slime moulds d) Methanogens

2) Bacteria cannot be stained with this stain ____.
a) Methylene blue b) Lactophenol Cotton blue
c) Methyl red d) Crystal violet

3) Bacterial cell wall consists of ____.
a) Pectin b) Cellulose
c) Peptidoglycan d) Xylose

4) ____ can is used to maintain Bacterial cultures.
a) Oxidation b) Normal Saline
c) Glycerol d) Distilled water

5) The locomotary organ of Bacteria is the ____.
a) Fimbriae b) Flagella
c) Pili d) Pseudopodia

6) Thiobacillus is an ____ organism.
a) Mesophilic b) Acidophilic
c) Alkalophilie d) Xerophilic

7) Father of Microbiology is ____.
a) Robert Brown b) Robert Koch
c) Joseph Lister d) Antony Von Leeuwenhoek

8) Bacteria store their food in the form of small granules called ____.
a) Globules b) Glycogen
c) Triglycerides d) Glucose

B) Write True/False. **04**

a) T-phages are a group of phages that infect *E.coli* bacteria.
b) Strain is a subspecies.
c) Normal flora are non pathogenic in nature.
d) Bergey's manual classifies Fungi.

Q.2 Answer the following questions. (Any Six) **12**

a) Write a note on applications of Algae.
b) Describe the process of Lysogeny.
c) What is Sterilization? Explain.
d) What is the significance of staining?
e) Write the general properties of Viruses.
f) Give the significance of Polyphasic taxonomy,
g) Write down the importance of culture media in bacteriology.
h) Write about reserve food material in prokaryotes.

Q.3 Answer the following questions. (Any Three) **12**

a) Discuss the general characters of thermophiles.
b) Differentiate between oxygenic and anoxygenic microbes.
c) Describe in detail the mechanism and significance of Lyophilization.
d) Explain the difference between Sterilization and Disinfection.

Q.4 Answer the following question. (Any Two) **12**

a) Write a note on history and scope of Microbiology.
b) Write the mechanism of Negative staining.
c) Discuss how the Acid Fast Bacterial staining is used to diagnose infections.

Q.5 Answer the following (Any Two) **12**

a) Discuss the general characters of Extremophiles.
b) Discuss the major bacterial culture collection units available.
c) Why is Structural staining important in Bacterial identification? Explain.

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M.Sc. (Biotechnology) (Sem - II) (New) (NEP CBCS) Examination: March/April - 2025
Immunology and Immuno Techniques (2311202)

Day & Date: Friday, 16-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

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

Q.1 A) Choose correct alternative (MCQ) **08**

1) Synonym of Native immunity is ____
a) innate b) naive
c) adaptive d) all of the above

2) ELISA full form is ____.
a) Enzyme assay
b) Enzyme linked immunosorbent assay
c) Limulus amebocyte lysate
d) all above

3) Complementarity-determining regions (CDRs) fall within areas of the ____ regions of antibodies.
a) V b) C
c) X d) All of these

4) Many of rapid diagnostic kits depend on ____ principles.
a) immunity b) chromatography
c) immunochromatography d) above all

5) NK cells produce IFN ____.
a) γ b) α
c) δ d) All

6) A ____ is a biological preparation that provides active acquired immunity to a particular infectious or malignant disease.
a) Injection b) Antisera
c) Vaccine d) All

7) The interaction between antibody and a particulate antigen results in visible clumping called ____.
a) Agglutinins b) Agglutination
c) Precipitation d) All

8) T-cell system eliminates ____ cells.

a) altered self- b) virus-infected
c) Tumor d) Above all

B) Write True/False. **04**

a) Some antibodies can cross epithelial layers by transcytosis.
b) Attenuated Viruses and Bacteria cause immunity without disease.
c) Humoral Immunity but not Cellular Immunity is transferred with antibody.
d) Hemagglutination is used in Blood Typing.

Q.2 Answer the following questions. (Any Six) **12**

a) Enlist some examples of innate immunity.
b) Explain briefly cross reactivity.
c) Explain briefly about active and passive immunization.
d) Explain the principle for Radioimmunoassay in short.
e) Write the immunological role of Immunoglobulin A (IgA).
f) Enlist three sequential signals required for generation of CTLs from CTL-Ps.
g) Classify the immunoglobulins and give one function of each.
h) Are hypersensitivity and allergy the same, justify?

Q.3 Answer the following questions. (Any Three) **12**

a) Discuss about the features of antigen-antibody interactions.
b) Describe basic structure of antibodies.
c) Explain briefly General Immunosuppressive Therapy.
d) Discuss the physiology and function of thymus.

Q.4 Answer the following question. (Any Two) **12**

a) Explain about AIDS.
b) Describe different types of ELISA.
c) Explain classical pathway of complement activation.

Q.5 Answer the following (Any two) **12**

a) Describe the Processing and presentation of exogenous and endogenous antigens.
b) Explain about *in vivo* reactions of antigen-antibody complex.
c) Discuss of Autoimmunity, its general mechanism and classification of autoimmune diseases.

Seat No.	

Set | P

M.Sc. (Biotechnology) (Sem - II) (New) (NEP CBCS) Examination: March/April - 2025
Inheritance Biology (2311207)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

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

Q.1 A) Choose correct alternative (MCQ) **08**

1) Observation of species on ____ heavily inspired Darwin's theory of evolution.

a) llha da Queimada Grande b) Guatemala
c) Faroe Islands d) Galapagos Islands

2) On the Origin of Species was written by____
a) Charles Darwin b) Ludmila Kuprianova
c) Mikhail A. Fedonkin d) None of the above

3) Which condition can be explained by Lamarckism?
a) How giraffes got their long neck
b) How humans lost their tail
c) How humans became bipedal
d) All of the above

4) The force that initiates evolution is ____.
a) Variation b) Mutation
c) Extinction d) Adaptation

5) If a hybrid expresses a character, it is called
a) Epistasis b) Dominant
c) Co-dominant d) Recessive

6) In most species, mitochondrial DNA is passed down from
a) DNA b) Mother and Father
c) Father d) Mother

7) A trait that "overpowers" and hide another trait is called____
a) Overpowering trait b) Complex trait
c) Recessive trait d) Dominant Trait

8) A cross between individuals with dominant and recessive phenotype is called ____.
a) Self cross b) Test cross
c) Back cross d) Allele cross

B) Fill in the blanks OR Write true/false. **04**

a) Sometimes, there is no dominant or recessive gene, or the trait is controlled by many alleles or genes.
   a) True
   b) False

b) One allele not completely dominant over the other is called incomplete dominance
   a) True
   b) False

c) Darwinism is a theory about the origin of life itself.
   a) True
   b) False

d) Speckled Chicken is an example of co-dominance
   a) True
   b) Flase

Q.2 Answer the following questions. (Any Six) **12**

a) Explain what is meant by genetic transformation.
b) Explain what is known as gene linkage and gene crossing over.
c) Define the term inheritance.
d) What is meant by extrachromosomal inheritance.
e) Define test cross and back cross.
f) Describe the difference between heterochromatin and euchromatin.
g) Explain what is meant by bacteriophage.
h) Describe what is meant by QTL mapping.

Q.3 Answer the following questions. (Any Three) **12**

a) Explain what is meant by incomplete dominance and co-dominance.
b) What is meant by chromosomal aberration and write about structural changes.
c) Explain what is maternal inheritance of mitochondria in humans
d) Distinguish between Euploidy and Aneuploidy.

Q.4 Answer the following question. (Any Two) **12**

a) Explain the artificial method of transformation by calcium chloride $CaCl_2$.
b) Explain what is meant by gene gun and microinjection.
c) Explain the life cycle of Saccharomyces cerevisiae.

Q.5 Answer the following (Any two) **12**

a) Explain the Hardy-Weinberg genetic principle.
b) Explain the Mendelian law of inheritance with example.
c) State the cause of changes in the gene frequency.

Seat No.	

Set P

M.Sc. (Biotechnology) (Sem - III) (New) (NEP CBCS) Examination: March/April - 2025
Industrial and Environmental Biotechnology (2311301)

Day & Date: Thursday, 15-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

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

Q.1 A) Choose correct alternative. **08**

1) Vitamin B12 is also known as _____.
a) Riboflavin b) Cyanocobalmin
c) Nicotinamide d) Carotene

2) The by-product of streptomycin production is _____.
a) Vitamin A b) Dextran
c) Xanthan d) Vitamin B12

3) Mechanical agitation is required only in _____.
a) Packed bed b) Airlift reactor
c) Stirred tank d) Bubble column

4) _____ of the following is correctly matched.
a) Stirrer- Maintains temperature
b) Sampling ports- for adding nutrients
c) Nutrient medium-nutrition for microbes
d) pH control system- Oxygen supply

5) Streptomycin is chemically _____.
a) B-lactam b) Quinilone
c) Polysaccharide d) Aminoglycoside

6) _____ is added as a precursor for vitamin B12 production.
a) Iron b) Cobalt
c) Phenylacetic acid d) Vitazyme

7) Bioremediation _____
a) Usage of microbes to create new organisms
b) Usage of anaerobic bacteria to create new antibiotics
c) Usage of microbes to destroy environmental pollutants
d) Usage of aerobic bacteria to create new vaccines

8) Citric acid finds application in _____.
a) Ink making b) Printing
c) Soft drinks d) all the above

B) Write True/ False **04**

1) Total solids in a wastewater consist of insoluble solids alone.
   a) True b) False
2) Airlift reactors generally do not provide better mixing than bubble columns.
   a) True b) False
3) Bio-fuels are products of fermentation.
   a) True b) False
4) Settling tank is also called as sedimentation tank.
   a) True b) False

Q.2 Answer the following question (Any Six) **12**

a) What are antibiotics? Give any two applications of streptomycin.
b) What is fermentation? Enlist types of fermenters.
c) Define the following terms:
   1) Chromatography
   2) Crystallization
d) Enlist applications of citric acid.
e) Explain shortly solvent extraction.
f) Define Bioremediation. Enlist the types of bioremediations.
g) What is downstream processing. Give names of 4 downstream processes.
h) What are fermentation and inoculum medium?

Q.3 Answer the following question (Any Three) **12**

a) What is downstream process? Write a note on filtration.
b) Explain in brief the recovery of Streptomycin after its production.
c) Explain in short preservation of industrially important microorganisms.
d) Explain shortly biological methods used for treatment of distillery effluent.

Q.4 Answer the following question (Any Two) **12**

a) Write a note on importance of Scale up in industrial management.
b) Explain in detail about the Environmental monitoring in industry.
c) Write a note on Quality assurance.

Q.5 Answer the following question (Any Two) **12**

a) Describe in detail Vitamin B12 production.
b) Explain different types of cell lysis methods used in downstream processing.
c) Write a note on Strain improvement.

Seat No.		Set	P

M.Sc. (Biotechnology) (Sem - III) (New) (NEP CBCS) Examination: March/April - 2025
Genetic Engineering (2311302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

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

Q.1 A) Choose correct alternative (MCQ) **08**

1) This was the first restriction endonuclease that was discovered
a) *BamHI* b) *EcoRI*
c) *HindIII* d) *HindII*

2) An example for plasmid vector is ____.
a) M13 b) pBR322
c) BAC d) YAC

3) Chain termination is type of ____.
a) Sequencing b) Vector generation
c) Antibiotic production d) Gene manipulation

4) What are the fundamental requirements of a PCR reaction?
a) DNA polymerase b) DNA template
c) Primers d) All of the above

5) What is chromosome walking?
a) Hybridization technique b) Sequencing technique
c) Genetic marker d) Chemical degradation technique

6) What does RFLP stand for?
a) Restriction Fragment Length Polymorphism
b) Recognition Fragment Length Polymorphism
c) Random Fragment Linear Polymorphism
d) Redundant Enzyme Loci Polymorphism

7) Genomic library construction is concerned with ____.
a) Gene isolation b) Protein production
c) Antibiotics d) Regeneration

8) In which of this method electric field is applied for gene transfer?

a) Microinjection b) Sonoporation
c) Electroporation d) Particle bombardmment

B) Write true/false: **04**

1) Yep 13 is a shuttle vector.
   a) True b) False
2) Genetic engineering is the artificial manipulation, modification, and recombination of DNA or other nucleic acid molecules.
   a) True b) False
3) RAPD stands for Random Amplified Polymorphic DNA.
   a) True b) False
4) Restriction endonucleases cannot recognize palindromic sequences.
   a) True b) False

Q.2 Answer the following questions. (Any Six) **12**

a) Enlist the different names of enzymes involved in genetic engineering.
b) Define cosmids and phagemids.
c) What are the different applications of genetic engineering?
d) Explain the term Microarray.
e) What are the different methods of transformation.
f) Explain the term shuttle vectors.
g) What are the different properties of plasmids.
h) Explain the term RAPD.

Q.3 Answer the following questions. (Any Three) **12**

a) Write a note on RFLP.
b) Write a short note on Probe.
c) Write in brief about BAC
d) Write a note on the cDNA library.

Q.4 Answer the following question. (Any Two) **12**

a) Write a short note on Restriction endonucleases.
b) Explain in detail about DNA fingerprinting.
c) Describe in detail about PCR.

Q.5 Answer the following (Any two) **12**

a) Write a note on Construction and screening of Genomic library.
b) Describe in detail about DNA sequencing.
c) Write a note on production of Insulin.

Seat No.	

Set **P**

M.Sc. (Biotechnology) (Sem - III) (New) (NEP CBCS) Examination: March/April - 2025
Plant Biotechnology (2311306)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

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

Q.1 A) Choose correct alternative (MCQ) **08**

1) The study of how plants obtain and use mineral nutrients is called ____.

a) ethnobotany b) mineral nutrition
c) nutrient assimilation d) photosynthesis

2) The first set of genes to be up-regulated in response to cytokinin are ____ genes.

a) *Arabidopsis* response regulators
b) Auxin releasing protein
c) Auxin binding protein
d) Stress response

3) ____are artificial seeds which include encapsulated somatic embryos, shoot buds, cell aggregates, or any other meristematic tissue having potential to regrow after storage conditions.

a) Protoplasts b) Synthetic seeds
c) Micropropagules d) Explants

4) ____ is one of the chemical fusagen used for protoplast fusion.

a) Polyethylene glycol b) NaOH
c) DMSO d) Glycerol

5) ____ causes hairy-root disease in plants.

a) *Agrobacterium tumefeciens* b) *Agrobacterium rhizogenes*
c) Viral vectors d) *Rhizobium spp.*

6) ___ is a novel phenomenon that has the potential to become an extremely powerful tool for gene silencing in any organism.

a) Position-dependent silencing
b) Sequence-dependent silencing
c) Homology-dependent gene silencing
d) RNA interference

7) Bt cotton is a genetically modified pest resistant cotton variety, which produces an insecticide to combat ____.

a) blight b) drought
c) silkworm d) bollworm

8) ____ are a potential alternative to traditional vaccines that are created by genetically modifying plants to produce antigens that trigger an immune response when consumed.

a) Edible vaccines b) Plantibodies
c) Bioplastics d) Subunit vaccines

B) Write true/false: **04**

1) Crown gall disease is caused by *Agrobacterium tumefaciens.*
2) According to the recommendations of the International Association for Plant Physiology, micromol per liter should be used for expressing the concentration of macronutrients.
3) Homozygous lines are obtained by diploidization of haploids.
4) Introduction of foreign genes into plant cells using micropipettes is electroporation.

Q.2 Answer the following questions. (Any Six) **12**

a) What are single cell clones?
b) Enlist Microelements and micronutrients for plant nutrition.
c) Differentiate between embryogenesis and embryo culture.
d) How are the Homozygous lines produced?
e) Enlist genetic markers.
f) Explain hairy-roots.
g) Explain Biodegradable plastics with an example.
h) Explain Applications of Plant Biotechnology in Biodiversity conservation.

Q.3 Answer the following questions. (Any Three) **12**

a) Discuss Initiation and Maintenance of callus
b) Explain Particle bombardment for gene transfer in plants.
c) Discuss Basics of Tumor formation in plants.
d) Write the principle of Somatic Embryogenesis.

Q.4 Answer the following question. (Any Two) **12**

a) Give a detailed account on Lab setup of Plant Tissue Culture laboratory.
b) Explain purification strategies by oleosin partitioning technology.
c) Describe Cryopreservation for germ plasma Conservation.

Q.5 Answer the following (Any Two) **12**

a) Write about Mechanism of T-DNA transfer.
b) Discuss Applications of plant biotechnology for Biotic stress resistant plants.
c) Write the principle of Protoplast Isolation and Culture.

Seat No.	

Set | **P**

M.Sc. (Biotechnology) (Sem - III) (Old) (CBCS) Examination: March/April - 2025
Genetic Engineering (MSC33302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) All questions are compulsory
2) Attempt any three questions from Q.no 3 to Q.No.7.
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative (MCQ) **10**

1) A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using ____.
a) Taq polymerase b) Polymerase III
c) Ligase d) Eco RI

2) Introduction of DNA molecules into the recipient organism is termed as ____.
a) Transformation b) Translation
c) Transduction d) Transcription

3) Phagemid vectors are ____.
a) Combination of phages and cosmid
b) Combination of plasmid and phage λ
c) Phages carrying properties of plasmids
d) AII of the above

4) What are YAC vectors?
a) Yeast Artificial Vectors
b) Yeast Aggregative Vectors
c) Yeast Artificial Chromosomes
d) Yeast Aggregative Chromosomes

5) The dideoxy method is also known as ____.
a) Maxam and Gilbert method
b) Autosequencing
c) Sanger's enzymatic sequencing
d) Pyrosequencing

6) Annealing temperature in PCR depends on ____.
a) Taq polymerase b) Primer
c) template DNA d) Buffer

7) Which of the following is not required for DNA sequencing?
a) Restriction digestion b) Electrophoresis
c) Cloning d) Polymerase chain reaction

8) Excision and insertion of a gene is called ____.
a) Biotechnology b) Genetic engineering
c) Cytogenetics d) Gene therapy

9) Which of the following is not an application of genetic engineering in plants?
a) Nitrogen fixation
b) DNA vaccines
c) Resistance to glyphosate
d) Production to insecticidal proteins in plants

10) A person with the hereditary disease can be cured with the help of____
a) Gene therapy b) Cloning
c) Dialysis d) Chemotherapy

B) Write true/false: **06**

a) End labeled DNA sequencing is known as dideoxy method of sequencing.
b) Restriction enzymes are called as molecular scissors.
c) AFLP stands for Amplified Fragment Length Polymorphism.
d) *Saccharomyces cerevisiae* organism was used to produce recombinant insulin.
e) Annealing is the initial and most significant step in the polymerase chain reaction.
f) Genomic library construction is concerned with Gene isolation.

Q.2 Write short Notes. **16**

a) Write a note on BAC.
b) Explain about RFLP.
c) Write a note on properties of plasmid.
d) Write a short note on Probe.

Q.3 Answer the following questions. **(10+6)**

a) Explain in brief about the construction and screening of genomic library.
b) Write a note on RAPD technique with its applications.

Q.4 Answer the following questions. **(10+6)**

a) Explain in detail about transformation method.
b) Write a note on Screening of Recombinant Cell.

Q.5 Answer the following **(10+6)**

a) Explain in brief about methods of DNA sequencing.

b) Write a note on Colony hybridization.

Q.6 Answer the following **(10+6)**

a) Describe in detail about PCR and its types.

b) Write a note on DNA fingerprinting.

Q.7 Answer the following **(10+6)**

a) What are the different applications of genetic engineering and explain in detail about production of recombinant product insulin.

b) Write a note on restriction endonuclease.

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Seat No.	

Set | **P**

M.Sc. (Biotechnology) (Sem - III) (Old) (CBCS) Examination: March/April - 2025
Plant Biotechnology (MSC33306)

Day & Date: Monday, 19-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos.1 and 2 are compulsory.
2)Attempt any Three questions from Q. No. 3 to Q. No. 7
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative (MCQ) **10**

1) The study of how plants obtain and use mineral nutrients is called

a) Ethnobotany b) mineral nutrition
c) nutrient assimilation d) Photosynthesis

2) The first set of genes to be up-regulated in response to cytokinin are ____ genes.
a) *Arabidopsis* response regulators
b) Auxin releasing protein
c) Auxin binding protein
d) Stress response

3) ____ are artificial seeds which include encapsulated somatic embryos, shoot buds, cell aggregates, or any other meristematic tissue having potential to regrow after storage conditions.
a) Protoplasts b) Synthetic seeds
c) Micropropagules d) Explants

4) The process of embryo development is called ____.
a) Endomitosis b) Organogenesis
c) organ culture d) Embryogenesis

5) ____ is one of the chemical fusagen used for protoplast fusion.
a) Polyethylene glycol b) NaOH
c) DMSO d) Glycerol

6) The genes responsible for T-DNA transfer are located in a separate part of the Ti plasmid called the ____.
a) Conjugation principle b) border sequences
c) vir region d) Transformation principle

7) Bt cotton is a genetically modified pest resistant cotton variety, which produces an insecticide to combat_____.

a) Blight b) Drought
c) Silkworm d) Bollworm

8) ____ are a potential alternative to traditional vaccines that are created by genetically modifying plants to produce antigens that trigger an immune response when consumed.

a) Edible vaccines b) Plantibodies
c) Bioplastics d) Subunit vaccines

9) ____ causes hairy-root disease in plants.

a) *Agrobacterium tumefeciens*
b) *Agrobacterium rhizogenes*
c) Viral vectors
d) *Rhizobium spp.*

10) ____ have been used as the explant to produce gynogenic haploids.

a) Pollen b) Anther
c) Meristem d) Ovule

B) Write true/false: **06**

a) Crown gall disease is caused by *Agrobacterium tumefaciens.*
b) According to the recommendations of the International Association for Plant Physiology, micromol per liter should be used for expressing the concentration of macronutrients.
c) Homozygous lines are obtained by diploidization of haploids.
d) Introduction of foreign genes into plant cells using micropipettes is electroporation.
e) Unorganized proliferative mass of plant cells in tissue culture is called tumor.
f) Variations observed during tissue culture are somaclonal variations.

Q.2 Write short Notes. **16**

a) Tissue culture Media
b) Embryogenesis
c) Particle bombardment
d) Micropropagation

Q.3 Answer the following questions.

a) Give a detailed account on Lab setup of Plant Tissue Culture laboratory. **10**
b) Explain Microinjection for gene transfer in plants. **06**

Q.4 Answer the following questions.

a) Discuss Basics of Tumor formation in plants **08**

b) Explain purification strategies by oleosin partitioning technology **08**

Q.5 Answer the following

a) Write the principle of Protoplast Isolation and Culture **10**

b) Discuss Initiation and Maintenance of callus **06**

Q.6 Answer the following

a) Write about Mechanism of T-DNA transfer **08**

b) Write about production of Haploid Plants and Homozygous lines **08**

Q.7 Answer the following

a) Write the principle of Somatic Embryogenesis and describe Synthetic seeds production. **08**

b) Discuss Applications of plant biotechnology for Biotic stress resistant plants. **08**

Seat No.	

Set **P**

M.Sc. (Biotechnology) (Sem - IV) (New) (NEP CBCS) Examination: March/April - 2025
Advanced Analytical Techniques (2311401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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

Q.1 A) Choose correct alternative. **08**

1) Which technique separates charged particles using electric field?
a) Hydrolysis b) Electrophoresis
c) Protein synthesis d) Protein denaturing

2) Ion exchange chromatography is based on _____.
a) Electrostatic attraction
b) Electrical mobility of ionic species
c) Partition chromatography
d) Adsorption chromatography

3) Signal splitting in NMR arises from _____.
a) Shielding effect b) Spin-spin decoupling
c) Spin-spin coupling d) Deshielding effector

4) Which of the following techniques would be most useful to identify as well as quantify the presence of a known impurity in a sample?
a) NMR b) MS
c) IR d) HPLC

5) At what speed do you centrifuge blood to separate cells?
a) 2200-2500 RPM b) 3000-3200 RPM
c) 1000-1500 RPM d) 500 RPM

6) Which of the following lights is suitable for getting maximum resolution?
a) Red b) Blue
c) Green d) Black

7) The standard unit for measuring radioactive decay is _____.
a) Swedberg b) Centimorgan
c) Becquerel d) Nanometer

8) _____ is a method of measuring radioactivity based on Excitation.
a) Ionization Chamber b) Proportional Counters
c) GM Counters d) Solid and Liquid Scintillation

B) Write True/False. **04**

1) Chromatofocusing is a protein separation technique based on protein isoelectric point.
2) Southern blotting is a molecular biology technique used to detect protein in a mixture.
3) Electromagnetic radiation is a form of energy that is generated when electrically charged particles move through matter or a vacuum.
4) Optical principles of Microscopy involve ionization.

Q.2 Answer the following question (Any Six) **12**

a) Differentiate between preparative and analytical ultracentrifuge.
b) What is an isoelectric point?
c) What is blotting? Enlist blotting techniques.
d) Define resolution power and optical length.
e) Write Safety measures in radioactivity measurement.
f) Write the full abbreviation of MALDI TOF and write its application.
g) Write applications of IR Spectroscopy.
h) Explain stationary phase and mobile phase in TLC.

Q.3 Answer the following question (Any Three) **12**

a) Write the principle and applications of ion exchange chromatography.
b) Write a note on Northern blotting.
c) Explain Properties of electromagnetic radiation and write instrumentation of Colorimetry.
d) Write a note on Transmission electron Microscopy.

Q.4 Answer the following question (Any Two) **12**

a) Explain Nature of Radioactivity and add a note on GM counter.
b) Explain Instrumentation and Applications of UV spectroscopy.
c) Explain Basic principle of electrophoresis and add a note on theory and applications of Native PAGE.

Q.5 Answer the following. (Any Two) **12**

a) Write the principle of centrifugation and add a note on High speed refrigerated centrifuges.
b) Explain Optical principles of Microscopy and add a note on compound microscope.
c) Explain the Principle and applications of High Performance Liquid Chromatography.

Seat No.	

Set P

M.Sc. (Biotechnology) (Sem - IV) (New) (NEP CBCS) Examination: March/April - 2025
Bio nanotechnology (2311402)

Day & Date: Friday, 16-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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

Q.1 A) Choose correct alternative. **08**

1) _____ is the typical size range of nanoparticles.
   a) 1 to 100 millimeters b) 1 to 100 micrometers
   c) 1 to 100 nanometers d) 1 to 100 picometers

2) A material with one dimension in Nano range and the other two dimensions are large is called _____.
   a) Micro-material b) Quantum wire
   c) Quantum well d) Quantum dot

3) Nano crystalline materials synthesized by sol-gel technique results in a foam like structures called _____.
   a) Gel b) Aerosol
   c) Foam d) Aerogel

4) The first talk about nano-technology was given by _____.
   a) Albert Einstein b) Newton
   c) Gordon E. Moore d) Richard Feynman

5) CNTs stands for _____
   a) Carbon Nanotubes
   b) Carbon Nanotechnology
   c) Carbon Nanoscience and technology
   d) Carbon Nine technology

6) _____ is the procedure in Top-down fabrication method.
   a) Nano-particles -> Powder -> Bulk
   b) Powder -> Bulk - > Nano-particles
   c) Bulk -> Powder - > Nano-particles
   d) Nano-particle - > Bulk -> Powder

7) The biological response of the biosensor is determined by _____.
   a) biocatalytic membrane b) physio-chemical membrane
   c) chemical membrane d) artificial membrane

8) Nano sized polymers built from branched units are called _____.
   a) Dendrimers b) Composites
   c) Carbon-based materials d) Metal-based materials

B) Fill in the blank. **04**

1) The most important properly of nanomaterials is _____.
2) The width of a typical DNA molecule is _____nm.
3) _____ is the physico-chemical component of biosensors.
4) Nanotechnology, in other word, is _____.

Q.2 Answer the following. (Any Six) **12**

a) Explain nanomaterial Based Biosensors.
b) Explain nanotube.
c) Define dendrimers.
d) Define Quantum dot.
e) Define nanotechnology.
f) Define bioremediation.
g) Define Biochip.
h) Write a short note on photodynamic therapy.

Q.3 Answer the following. (Any Three) **12**

a) Write a note on size of matter.
b) Differentiation between Bio nanotechnology and Nanobiotechnology.
c) Describe cleaning of environment by bio nanotechnology.
d) Explain characterization of nanoparticle by TEM.

Q.4 Answer the following. (Any Two) **12**

a) What is biological nanoparticle synthesis explain with plant extract.
b) Describe in details lop down and bottom up methods.
c) Describe milestone in nanotechnology.

Q.5 Answer the following. (Any Two) **12**

a) Describe application of bio nanotechnology in case of biosensor.
b) Describe synthesis of nanoparticle by sol-gel method.
c) Describe Scanning Electron Microscopy.

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Seat No.	

Set P

M.Sc. (Biotechnology) (Sem - IV) (New) (NEP CBCS) Examination: March/April - 2025
Animal Biotechnology (2311405)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All Questions are compulsory.
3) Figures to the right indicates full marks.

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

1) Hematopoietic stem cells are primarily found in _____.
   a) Liver b) Bone marrow
   c) Skin d) Brain

2) The term used to preserve cells at very low temperature is called _____.
   a) Refrigeration b) Pasteurization
   c) Cryopreservation d) Incubation

3) _____ is Tumor suppressor gene.
   a) Myc b) Ras
   c) P53 d) S&C

4) The Technique used to produce monoclonal antibodies is _____.
   a) ELISA b) PCR
   c) Hybridoma d) Electro Poration

5) Fetal stem cells can be taken from _____.
   a) Neurospheres b) Umbilical cord blood
   c) Hematopoietic cells d) Adipocytes

6) _____ stage occurs after fertilization of 4-5 days.
   a) Blastula b) Morula
   c) Implantation d) Gastrula

7) Each cycle of sub culturing as called _____.
   a) Proliferation b) Pluripotent
   c) Passage d) Cell line

8) _____ is called Father of stem cells.
   a) Hayflick b) Carrel
   c) Andre Gernez d) White J.

B) Write True/False **04**

1) Tissue culture includes in-Vitro culturation of organs, Tissues and cells.
2) Anchorage dependent cells attach to substratum.
3) Trypsin is proteolytic enzyme which hydrolysis fats and oils.
4) Storage of cells in liquid nitrogen is done at- 4 ^{0}c.

Q.2 Answer the following. (Any Six) **12**

a) Define primary cell culture
b) Define pluripotency
c) Define Balances salt solution
d) Define oncogene
e) Define Hybridoma
f) Define cell line
g) Define cryopreservation
h) Define chemotherapy

Q.3 Answer the following. (Any three) **12**

a) Write short notes on Embryonic stem cells.
b) Write a note on types of cell culture media.
c) Write a note on normal cells and cancer cells.
d) Write a note on oncogenes and proto oncogenes.

Q.4 Answer the following. (Any Two) **12**

a) Explain direct methods of cell counting and estimation of cell Number.
b) Explain in detail the cryopreservation techniques in animal cell culture.
c) Explain Hybridoma Technology.

Q.5 Answer the following. (Any Two) **12**

a) Discuss the types of stem cells with neat diagram.
b) Discuss the methods to identify and characterize cell lines.
c) Discuss in detail the important properties of stem cells which distinguish them from other cells.

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Seat No.	

Set P

M.Sc. (Biotechnology) (Sem - IV) (New) (NEP CBCS) Examination: March/April - 2025
Medical Biotechnology (2311406)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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

Q.1 A) Multiple Choice Question: **08**

1) Enterococci is found in which part of the intestine?
a) Duodenum
b) Jejunum
c) Ileum
d) Large intestine

2) Which type of toxin is tetanus toxin?
a) Enterotoxin
b) Neurotoxin
c) Cytotoxin
d) Endotoxin

3) ____ is a genius of Gram-positive bacteria.
a) Escherichia coli
b) Pseudomonas aeruginosa
c) Chlamydia trachomatis
d) Staphylococcus

4) Which of the following pathogens cause cholera in humans?
a) Fungi
b) Bacteria
c) Virus
d) Protozoan

5) ____ substances inhibit microbial growth.
a) Bacteriocidal
b) Bacteriostatic
c) Both a & b
d) None of these

6) Which of the following is the example of Gram-negative bacteria?
a) Lactobacillus
b) Eschericia coli
c) Staphylococcus aureus
d) Bacillus subtilis

7) ____ is not a Gram-positive bacilli.
a) Bacteroides
b) Eubacterium
c) Lactobacillus
d) Bifidobacterium

8) Which of the following does not affect the activity of penicillin?
a) Bile
b) Hydrochloric acid
c) Cysteine
d) Sodium hydroxide

B) Fill in the blank **04**

1) Vibrio cholerae adheres to the epithelial cells of the small intestine by_____.
2) _____ produces colicins in the intestine.
3) Nystatin is effective in curing _____.
4) Gas gangrene is caused by _____.

Q.2 Answer the following (Any Six) **12**

a) Define biosensor
b) Define disease
c) Define Epidemiology
d) Define pathology
e) Define diagnosis
f) Define meningitis
g) Define Infection
h) Write a short note on Micrococcois

Q.3 Answer the following (Any three) **12**

a) Write a note on biosensors in medical diagnostics.
b) Describe in details drug resistance and sensitivity.
c) Describe in details Ameobiosis
d) Describe in details the mode of action of streptomycin.

Q.4 Answer the following (Any two) **12**

a) Describe in details pathogenesis of *salmonella typhi* with diagnosis and treatment.
b) Describe in details normal microbiota.
c) Describe in details laboratory diagnosis of common infective syndromes.

Q.5 Answer the Following (Any two) **12**

1) Describe in details the mode of action of Penicillin.

2) Describe in details concept of molecular diagnosis.

3) Explain in details host-microbe interactions.

Seat No.		Set	P

M.Sc. (Biotechnology) (Sem - IV) (Old) (CBCS) Examination: March/April - 2025
Animal Biotechnology and Stem Cell technology (MSC33401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figures to right indicate full mark.
4) Draw neat diagrams and give equations whenever necessary.

Q.1 A) Choose correct alternative (MCQ) **10**

1) ____ is used to avoid contamination in cell culture.
a) Antibiotics b) Anticoagulants
c) Antipyretics d) Antiseptics

2) Transgenic animals have ____.
a) foreign protein b) foreign gene
c) foreign lipid d) foreign amino acid

3) ____ consists of a vessel replaced by a multi layered bag.
a) Single Use bioreactors b) Perfusion bioreactors
c) Airlift bioreactor d) Tower bioreactor

4) Embryonic stem cells are ____.
a) pluripotent b) small
c) large d) medium-sized

5) After the first subculture, the primary culture is called ____.
a) clone b) daughter cells
c) cell debris d) cell Line

6) Transgenic animals can be designed to study the change in ____.
a) Serum b) Urine
c) Gene d) Saliva

7) ____ is the process by which stem cells divide to make more stem cells.
a) Self-renewal b) Propagation
c) Thrombopoiesis d) Migration

8) ____ refers to the varying ability of stem cells to differentiate into specialized cell types.
a) Cell potency b) Cell viability
c) Cell-therapy d) Cell-regeneration

9) ____ are the stem cells that give rise to other blood cells.
a) Mesodermal cells
b) Ectodermal cells
c) Endodermal cells
d) Hematopoietic stem cells (HSCs)

10) ____ are the most well-known type of pluripotent stem cell.
a) Red Blood cells b) Adherent cells
c) Embryonic Stem cells d) Carcinoma cells

B) Write true/false: **06**
a) Inducible promoters do not respond to chemicals.
b) Transgenic animals are used to produce biological products.
c) Stem cells are unspecialized.
d) Embryonic stem cells cannot be grown in the laboratory.
e) Hematopoietic stem cells are found in the lungs of adults.
f) Hematopoietic stem cells cannot be isolated as a pure population.

Q.2 Write short Notes. **16**
What is stem cell? Explain in detail its types with examples.

Q.3 Answer the following questions.
a) What is cell culture? Describe in details primary cell culture. **10**
b) Describe in details Mechano-chemical regulation of cell behaviour. **06**

Q.4 Answer the following questions.
a) Describe in details stem cell cultures in production of transgenic animals. **10**
b) Describe in details Regeneration of Bone and Cartilage. **06**

Q.5 Answer the following
a) Explain strategies to produce transgenics and knock out animals. **10**
b) Describe in details stem Cells in Eye Diseases and Disorders. **06**

Q.6 Answer the following
a) Explain Islet Cell transplantation and Bioartificial Pancreas. **10**
b) Describe balanced salt solution. **06**

Q.7 Answer the following
a) Define hybridoma technology and explain its steps in detail. **10**
b) Describe metabolism of estimation of cell number. **06**

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Seat No.	

Set | **P**

M.Sc. (Biotechnology) (Sem - IV) (New/Old) (CBCS) Examination: March/April - 2025
Advanced Analytical Techniques (MSC33402)

Day & Date: Friday, 16-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figures to right indicate full mark.

Q.1 A) Choose correct alternative (MCQ) **10**

1) Who invented mass spectrometers?
a) J.J Thompson b) Goldstein
c) Nikola Tesla d) Aston

2) Tracking dye in SDS PAGE is
a) Bromophenol Blue b) Ethidium bromide
c) both a and b d) none of the above

3) During TEM, a vacuum is created inside the _____
a) room of operation b) specimen
c) column d) ocular system

4) Resolving power of light microscope is
a) 2mm b) 0.2mm
c) 0.1mm d) 1 mm

5) Centrifugation based on which of the following law?
a) Pascal's law b) Stokes law
c) Stain law d) Patrick's law

6) Mass spectrometer separates ions on the basis of which of the following?
a) Mass b) Charge
c) Molecular weight d) Mass to charge ratio

7) Which radiation has longer wavelength?
a) Radio wave b) Ultraviolet
c) Microwave d) Gamma rays

8) Isotopes of an element have a different number of
a) Proton b) Neutron
c) Electron d) Atom

9) The difference between the incident and scattered frequencies in the Raman spectrum is called

a) Raman frequency b) Anti-Stoke's line
c) Stoke's line d) P-branch

10) Which of the following are considered to be the lowest form of Electromagnetic radiation?

a) IR radiation b) Micro waves
c) UV radiation d) Radio waves

B) Write True or False: **06**

1) No two molecules will be fragmented and ionized in exactly the same manner.

a) True b) False

2) Chemical shift allows a chemist to obtain the idea of how atoms are joined together

a) True b) False

3) NMR is used to study the physical, chemical, and biological properties of matter.

a) True b) False

4) Gamma-ray spectrometry, is used for quantitative spectrum measurement of the uranium decay.

a) True b) False

5) Pulsed-field gel electrophoresis (PFGE) is a technique NOT used for the separation of large DNA fragments.

a) True b) False

6) An Atom/Element gets ionized when it gains/losses electrons

a) True b) False

Q.2 Answer the following. **16**

a) What are the factors affecting electrophoretic mobility?
b) What is TLC? Give its application.
c) What is Northern blot? Mention its application.
d) What is ultracentrifuge? Discuss the uses.

Q.3 Answer the following questions. **(8+8)**

a) Explain the application, working of Agarose gel electrophoresis.
b) Explain the construction and working of a Southern blot.

Q.4 Answer the following questions. **(10+6)**

a) What is MALDI TOF? Explain its working.
b) What are the properties of electromagnetic radiation?

Q.5 Answer the following. **(8+8)**

a) Explain the instrumentation and application of colorimeter

b) Discuss in detail about application and instrumentation of UV-Vis Spectroscopy.

Q.6 Answer the following. **(10+6)**

a) Explain the theory and application of SDS PAGE.

b) Explain in detail 2-D gel electrophoresis.

Q.7 Answer the following. **(8+8)**

a) What is chromatography? Explain working and applications of Column Chromatography.

b) Discuss the construction of compound microscope

SLR-ZE-28

Seat No.	

Set | **P**

M.Sc. (Biotechnology) (Sem - IV) (New/Old) (CBCS) Examination: March/April - 2025
Research Methodology and Intellectual property Rights (IPR) (MSC33403)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question Nos. 1 and 2 are compulsory.
2)Attempt any three questions from Q. No. 3 to Q. No. 7.
3)Figures to right indicate full mark.

Q.1 A) Choose correct alternative (MCQ) **10**

1) ____ sampling is a way of selecting a sample where the sampling frame is first divided into intervals.
a) Random b) Systematic
c) Asystematic d) Neutral

2) The sampling frame, depending upon the sample size, is first divided into a number of segments called ____
a) population b) distribution
c) intervals d) random numbers

3) ____ is a procedural plan that is adopted by the researcher to answer questions validly, objectively, accurately and economically.
a) Research outcome b) Patent
c) Rights d) Research design

4) ____ are specific statements of goals that you set out to be achieved at the end of your research journey.
a) Research objectives b) Research problem
c) Tradesercet d) Copyright

5) ____ format refers to a paper that is structured by four main sections of thesis writing.
a) DBT b) ICAR
c) ICMR d) IMRAD

6) ____ IP is related to its geographical origin.
a) Copyright b) Trademark
c) Geographical indications d) Trade secrets

7) ____ is the practice of commercial exploitation of biochemicals or genetic materials which occur naturally.

a) Biopiracy b) IP infringement
c) Bioterrorism d) Biotourism

8) ____ is a right that allows breeders to use protected varieties in breeding programs without any obligation to the party holding the PBR title.

a) Sampling b) Breeder's exemption
c) Biopiracy d) ANOVA

9) ____ is related to number of publications for which an author has been cited by other authors with number of times.

a) citation index b) h-index
c) ISSN d) ISBN

10) ____ is the original text of an author's work, handwritten or now usually typed, that is submitted to a publisher.

a) Citation b) Sample
c) Manuscript d) Essay

B) Write true/false: **06**

1) Author is a person who writes a book.
2) Survey is one of the methods of data collection in research.
3) Histogram is not useful for presentation of research in a conference.
4) Copyright is related to its geographical origin.
5) Research is one of the ways of finding answers to your professional and practice questions.
6) Table is another way of representing data graphically.

Q.2 Write short Notes. **16**

a) Research Design
b) Variances and Correlation Coefficient
c) Concept of plagiarism
d) Breeders exemption

Q.3 Answer the following questions. **16**

a) Give a detailed account on Thesis writing
b) Discuss Computer and internet application in Research

Q.4 Answer the following questions. **16**

a) Discuss Scientific proposal writing for funding agencies
b) Write in detail about sampling.

Q.5 Answer the following. **16**

a) Define Intellectual property and discuss in detail about forms of IP protection.

b) Write a note on Technology transfer.

Q.6 Answer the following **16**

a) Discuss in detail about manuscript writing.

b) Explain the Criteria and procedure of patenting

Q.7 Answer the following **16**

a) Explain in detail Presentation of a scientific paper

b) Discuss in detail about Parametric Tests

Seat No.	

Set **P**

M.Sc. (Biotechnology) (Sem - IV) (New/Old) (CBCS) Examination: March/April - 2025: Medical Biotechnology and Bio nanotechnology (MSC33406)

Day & Date: Thursday, 22-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figures to the right indicate full marks.
4) Draw neat diagrams and give equation wherever necessary.

Q.1 A) Choose correct alternative (MCQ) **10**

1) ____ immunity is protective against infection by *S.pyogenes.*
   a) cell-mediated immunity b) antigen-antibody immunity
   c) humoral immunity d) no cure present

2) Interferons can be used to treat all the following, EXCEPT ____.
   a) Cancer b) muscular dystrophy
   c) viral infections d) hepatitis C

3) ____ viruses are termed as ‘orphan’ viruses.
   a) Retroviruses b) Echoviruses
   c) Coxsackieviruses d) Adenoviruses

4) ____ is a pathogen benefits while the host gains nothing from the interaction.
   a) Mutualism b) Parasitism
   c) Commensalism d) None of these

5) Carbon nanotubes are poor transmitters of electromagnetic radiations due to their ____.
   a) High conductivity b) Large surface area
   c) High porosity d) Chemical Stability

6) ____ bacteria cause toxic shock syndrome.
   a) *Staphylococcus epidermidis*
   b) *Staphylococcus aureus*
   c) *Staphylococcus intermedius*
   d) *Bacillus cereus*

7) Nanoscale Aluminium Oxide increases the ____.
   a) Conductivity b) Resistance
   c) Ductility d) Stability

8) Which of the following does not affect the activity of penicillin?
   a) bile b) hydrochloric acid
   c) cysteine d) sodium hydroxide

9) ____ inhibits protein synthesis by combining with the 50S subunit ribosome.
   a) Streptomycin b) Tetracycline
   c) Chloramphenicol d) Penicillin

10) Which of these biosensors use the principle of heat released or absorbed by a reaction?
   a) Potentiometric biosensor b) Optical biosensors
   c) Piezo-electric biosensors d) Calorimetric biosensors

B) Fill in the blank of following question: **06**

1) The first talk about nanotechnology was given by____ .
2) Bacteria causes toxic shock syndrome ____.
3) Nystatin is effective in curing ____.
4) Nano meter =____ cm.
5) ____ body part contains the largest microbial population.
6) ____ molecular methods of viral genome detection.

Q.2 Write short Notes. **16**

Describe in details the principles of chemotherapy along with Mode of action of various antibiotics.

Q.3 Answer the following questions. **16**

a) Explain in detail pathogenesis of HSV with symptoms, Diagnosis, and treatment.
b) Describe in details Industrial applications of biosensors.

Q.4 Answer the following questions. **16**

a) Describe in details Functionalization of nanoparticles for biological applications and add note on recent trends in bio nanotechnology.
b) Describe in details Antifungal drugs (Nystatin)

Q.5 Answer the following **16**

a) Explain in details cause of Ameobiosis with symptoms, Diagnosis, and treatment
b) Explain the synthesis of nanostructures with Pyrolysis method.

Q.6 Answer the following **16**

a) Explain in detail cause of UTI with symptoms, Diagnosis, and treatment.
b) Describe in details Biosensors, separation of cells and cell Organelles.

Q.7 Answer the following **16**

a) Describe in details laboratory diagnosis of parasites.

b) Describe in details Infection and infectious process.