Seat No.	

Set **P**

M.Sc. (Biotechnology) (Semester - I) (New) (NEP CBCS)
Examination: October/November - 2025
Biochemistry and Enzymology (2311101)

Day & Date: Wednesday, 29-10-2025 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) The citric acid cycle occurs in the ____ in eukaryotes.
a) cytoplasm b) golgi apparatus
c) mitochondrial matrix d) RER

2) Elevated levels of ____ is observed in myocardial infarction.
a) LDH1 b) LDH2
c) LDH3 d) LDH4

3) In competitive inhibition the inhibitor molecule binds to the ____.
a) Allosteric site b) Substrate
c) ES complex d) Active site

4) Which of the following is the precursor of glycogen?
a) Glycerol 3 phosphate b) GTP glucose
c) ATP glucose d) UDP glucose

5) The ratio of bound to unbound ligand concentration is plotted against bound ligand concentration in ____ Plot.
a) Eddie Hofstee b) Hanes
c) Hills d) Scatchard

6) Long chain Acyl COA traverses inner mitochondrial membrane through ____ shuttle mechanism.
a) malate aspartate b) carnitine
c) glyoxylate d) polynucleotide

7) The catalytic efficiency of two distinct enzymes can be compared based on which of the following factors?
a) Km b) Product formation
c) Size of the enzymes d) pH of optimum value

8) The catalytic site of ATP synthesis in ATP synthase enzyme is in the ____ subunit.
a) α b) β
c) γ d) δ

B) Write whether the following statements are TRUE/FALSE. **04**

a) Km is the measure of substrate concentration.
b) Alpha helix and Beta pleats are tertiary level protein structures.
c) Allosteric sites are used in competitive inhibition.
d) Double bonds are present in unsaturated fatty acids.

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

a) State clinical significance of any one enzyme.
b) Define enzyme activity.
c) Write function of lysozyme.
d) Draw a ring structure of any two monosaccharides.
e) Which are the general reactions of amino acid metabolism?
f) Draw a labelled diagram of the ultrastructure of chloroplast.
g) Write a note on the Rubisco enzyme.
h) What is meant by photosystem I and II, explain.

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

a) Write a note on Biosensors and their applications.
b) Write a note on properties of biomolecules favoring living conditions.
c) What is activation energy? Explain the mechanism of enzyme catalysis.
d) Differentiate between cyclic and noncyclic photophosphorylation.

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

a) Describe the biochemical pathway of glycolysis. Comment on its regulation.
b) Derive the Michalis Menten equation and state significance of Km and Vmax.
c) Describe source, biochemical role and deficiency disorders of fat-soluble vitamins.

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

a) Describe the structure of ATP synthase and mechanism ATP synthesis. Add a note on inhibitors and uncouplers.
b) Describe the reversible enzyme inhibition with respect to Lineweaver Burk plot.
c) Write an account on immobilization of enzymes.

SLR-HE-2

Seat No.	

Set P

M.Sc. (Biotechnology) (Semester - I) (New) (NEP CBCS)
Examination: October/November – 2025
Cell and Molecular Biology (2311102)

Day & Date: Friday, 31-10-2025 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 the correct alternative. (MCQ) 08

1) _____ are the packets of digestive Enzymes that are synthesized by the cell.
   a) Mitochondria b) Lysozymes
   c) Plastids d) Golgi bodies

2) _____ DNA can replicate but cannot transcribe to form RNA.
   a) Double stranded DNA
   b) Circular DNA
   c) Single stranded DNA
   d) Repetitive DNA

3) The analytical method used by M. Meselson and F.W Stahl was _____.
   a) Autoradiography
   b) Cscl density gradient centrifugation
   c) Ultracentrifugation
   d) Buoyant density

4) Ultraviolet radiation damages DNA by causing _____.
   a) Excision b) Thymine dimers
   c) Mismatch d) Primase-complex

5) The formation of mRNA from DNA is called _____.
   a) Replication b) Transcription
   c) Translation d) Reverse Transcription

6) The Translation start signal is _____.
   a) ATG b) ACT
   c) ACA d) AAT

7) Introns was discovered during studies of the Replication of _____.
   a) Bacteria b) Protozoa
   c) Adenovirus d) Fungi

8) _____ Bacteriophage was used by Hershey and chase.
   a) T_4 b) T_2
   c) P_{22} d) $\emptyset X174$

B) Write True or False: **04**

1) The Duplication process of DNA is called Replication.
2) Proteins that Facilitate the folding of other Proteins are called molecular chaperones.
3) The Direction of MRNA reading is $3^{11} \rightarrow 5^{1}$.
4) DNA polymerase was first identified by Arthur Korenberg in 1956.

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

a) Define Euchromatin.
b) Define Buoyant density.
c) Define cell adhesion.
d) Define Mutation.
e) Define G-Protein.
f) Define Reverse Transcription.
g) Define photo reactivation.
h) Define Genome.

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

a) Describe cell structure with Diagram.
b) Describe Models of Cell Membrane.
c) Describe Holliday Intermediate.
d) Describe Post Translational modification in proteins.

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

a) Explain organization of Eukaryotic Genome with labelled Diagram.
b) Explain Mechanism of DNA Replication in prokaryotes with labelled Diagram.
c) Explain the Enzymes involved in Transcription process.

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

a) Write in Detail the Renaturation Kinetics.
b) Write in Detail the structure and function of cytoplasmic membrane.
c) Write in Detail the DNA Repair mechanism of Nucleotide and Base Excision.

Seat No.	

Set | P

M.Sc. (Biotechnology) (Semester - I) (New) (NEP CBCS)
Examination: October/November – 2025
Biostatistics and Bioinformatics (2311107)

Day & Date: Monday, 03-11-2025 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) Number of students in a class is ____ data.
   a) Nominal data b) Continuous data
   c) Discrete data d) Random variable

2) ____ is the value that appears most often in a set of data.
   a) Mean b) Median
   c) Mode d) Standard deviation

3) Standard deviation _____.
   a) is the square root of variance
   b) is measured using the unit of the variable
   c) is measured using the squared unit of the variable
   d) has values generally comparable with the average value

4) Which of the following is not a measure of central tendency?
   a) Mode b) Variability
   c) Median d) Mean

5) ____ algorithm is used by Global alignment.
   a) Needleman and Wunsch b) Smith-Waterman
   c) BLAST d) PAM

6) ____ tool is used for phylogenetic analysis.
   a) Mega b) BLAST
   c) NCBI d) DIALIGN

7) Beta-sheets allowed region is present in which of the following quadrants of Ramachandran plot?
   a) First quadrant b) Third quadrant
   c) Fourth quadrant d) Second quadrant

8) Which of the following is an example of Homology and similarity tool?
   a) BLAST b) RasMol
   c) EMBOSS d) PROSPECT

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

1) PubMed is introduced by NCBI, a freely accessible bibliographic retrieval system to the entire MEDLINE database.
2) BLAST stands for the Basic Local Assignment Search Tool.
3) In statistics, the mean is one of the measures of central tendency, apart from the mode and median.
4) The term bioinformatics was coined by Paulien Hogeweg and Ben Hesper.

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

a) Enlist the methods used for Pairwise alignment.
b) What contents are available at PubMed?
c) Write a note on Entrez.
d) Write the applications of bioinformatics.
e) Write a note on Genomics.
f) Write about MEGA.
g) Explain about search engines.
h) Define Biostatistics.

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

a) Write a note on primary protein structure prediction.
b) Explain detail about tabulation and write down the advantages.
c) Define data and write down the classification with example.
d) Explain about BLAST.

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

a) Explain the methods of pairwise sequence alignment.
b) Explain any diagrammatic representation of data with advantage and disadvantage.
c) Write a brief note on NCBI.

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

a) Describe the character-based methods for phylogenetic tree construction.
b) Write a note on sequence submission tools.
c) Explain in brief about primary protein sequence databases.

SLR-HE-5

Seat No.	

Set P

M.Sc. (Biotechnology) (Semester - I) (New) (NEP CBCS) Examination: October/November - 2025
Plant breeding and Tissue Culture (2311109)

Day & Date: Monday, 03-11-2025 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) Which breeding method is commonly used for self-pollinated crops?
   a) Mass selection b) Pedigree method
   c) Recurrent selection d) Clonal selection

2) The genetic basis of heterosis is mainly explained by: ____.
   a) Mutation theory
   b) Dominance and over-dominance hypotheses
   c) Pure line theory
   d) Blending inheritance

3) Which of the following is not an abiotic stress?
   a) Heat b) Frost
   c) Insects d) Drought

4) Production of haploid plants is possible through: ____.
   a) Somatic embryogenesis b) Another culture
   c) Protoplast fusion d) Micropropagation

5) The fusion of protoplasts from two different species leads to: ____.
   a) Haploids b) Cybrids or somatic hybrids
   c) Gametoclones d) Polyploid

6) Hairy root cultures are induced by infection with: ____.
   a) Agrobacterium tumefaciens
   b) Agrobacterium rhizogenes
   c) Pseudomonas fluorescens
   d) Bacillus thuringiensis

7) ____ law states that closely related species and genera exhibit similar patterns of variation in their characteristics.
   a) Law of dominance
   b) Law of segregation
   c) Law of Homologous variation
   d) Law of purity of gametes

8) _____ are a series of pure-breeding organisms that are genetically identical, carrying two identical alleles for a given trait.

a) Heterozygous lines b) Homozygous lines
c) Hybrids d) Cybrids

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

1) Dominant alleles from parent lines mask the effects of harmful recessive alleles in the hybrid.
2) Vertical resistance in plants is usually polygenic.
3) Meristem culture is used to eliminate viruses from infected plants.
4) Cryopreservation is generally carried out using polyhouse.

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

a) State Law of Homologous variation.
b) What is heterosis?
c) What are Somatic hybrids?
d) Enlist molecular markers in stress resistance breeding.
e) Define Biotransformation.
f) Enlist biotic and abiotic stresses in plants.
g) Differentiate between somaclonal and gametoclonal variations.
h) Explain Ideotype breeding.

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

a) What is Single Seed Descent (SSD) method? Explain its applications in plant breeding.
b) What is biotransformation? Explain its applications in secondary metabolite production.
c) What is endosperm culture? How is it used for triploid production?
d) Write a note on Breeding for insect-pest resistance.

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

a) Define heterosis. Explain the genetic basis of heterosis.
b) Explain the role of molecular markers (MAS, MARS, MABB) in stress resistance breeding.
c) Explain the role of protoplast culture and fusion in producing somatic hybrids and cybrids.

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

a) Explain the principle and methods of cryopreservation of plant germplasm.
b) Discuss different breeding methods used in self-pollinated crops with advantages and limitations.
c) Write a note on Genetic and physiological basis of abiotic stress tolerance.

SLR-HE-6

Seat No.	

Set P

M.Sc. (Biotechnology) (Semester - I) (New) (NEP CBCS)
Examination: October/November - 2025
Research methodology (2311103)

Day & Date: Thursday, 06-11-2025 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) Descriptive research includes surveys and fact-finding enquiries so it is also called ____.
   a) Analytical research b) Ex-post facto studies
   c) Qualitative research d) Historical research

2) Bibliography given in a research report ____.
   a) Shows vast knowledge of the researcher
   b) Helps those interested in further
   c) Has no relevance to research
   d) All the above

3) The first step of research is ____.
   a) Selecting a problem b) Searching a problem
   c) Finding a problem d) Identifying a problem

4) A null hypothesis is ____.
   a) When there is no difference between the variables
   b) The same as research hypothesis
   c) Subjective in nature
   d) When there is difference between the variables

5) A subset that is chosen from large population is called ____.
   a) Parameter b) Variable
   c) Sample d) Statistic

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

7) The data acquired from the internet or medical record is ____ data.
   a) Primary b) Qualitative
   c) Ordinary d) Secondary

8) The sources used in research is ____.
   a) Sources b) References
   c) Literature d) Results

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

1) A short summary of technical report is called publication.
2) An unrecorded speech would not gain copyright protection.
3) ANOVA and Chi square can be used for statistical significance in any research,
4) Patent can be infringed by selling without permission.

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

a) Explain the fundamental research.
b) What is copyright?
c) What is meant by ANOVA.
d) What is IPR?
e) Define citation index.
f) What is research?
g) Explain hypothesis with an example.
h) Write significance of report writing.

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

a) Write a note on Audio visual aids in presentation.
b) Explain advantages and disadvantages of Plant Breeders Right.
c) Explain Variance and Correlation.
d) Write a note on Patent infringement.

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

a) Explain Primary and secondary data.
b) Explain Plagiarism and Referencing.
c) Explain scientific proposal writing for funding agencies.

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

a) What is sample size? Explain Steps in Sampling.
b) Explain in detail what is meant by IMRAD.
c) What is research? Explain types of research.

Seat No.	

Set P

M.Sc. (Biotechnology) (Semester - II) (New) (NEP CBCS)
Examination: October/November - 2025
Microbiology and Microbial Techniques (2311201)

Day & Date: Tuesday, 28-10-2025 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.
3) Draw neat labelled diagrams wherever necessary.

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

1) _____ is the smallest unit in the hierarchical system of classification.
a) Genus b) Division
c) Species d) Family

2) _____ have ability to withstand the high salt concentration.
a) Alkaliphiles b) Halophiles
c) Thermophiles d) Barophiles

3) The “Swan-necked flasks” was invented by _____.
a) Jenner b) Fleming
c) Pasteur d) Leeuwenhoek

4) _____ is the predominant normal microflora of the human skin.
a) *Staphylococcus epidermis* b) *Candida albicans*
c) *Lactobacillus lactis* d) *Escherichia coli*

5) _____ is a basic stain.
a) India ink b) Eosin
c) Nigrosine d) Crystal Violet

6) _____ is method of isolation of pure culture.
a) Pasteurization b) Streak plate method
c) Lyophilization d) Tyndalization

7) The phage which kills their host after infection is known as _____.
a) Temperature phage b) Virulent phage
c) Non-virulent phage d) Killer phage

8) _____ has single stranded DNA as genetic material.
a) $\theta \times 174$ virus b) λ phage
c) Rabies virus d) Influenza virus

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

a) NCBI is a microbial culture collection unit.
b) Unicellular fungus is known as Yeast.
c) MacConkey agar is a selective as well as differential bacterial culture medium.
d) Psychrophilic microbes like to grow at $55^{o}C$.

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

a) What is differential staining?
b) What is disinfection?
c) Enlist parameters required during the study colony characteristics.
d) What is bacteriophage?
e) What is niche?
f) What is Taxonomy?
g) What is species?
h) What is naked virus?

Q.3 Write short notes of the following. (Any Three) **12**

a) Culture collection units
b) Extremophiles
c) Industrial applications of microbes
d) Culture media

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

a) Explain in detail the maintenance and preservation of microbial cultures.
b) Describe in detail lysogenic life cycle of viruses with example.
c) Write in detail on various oxygenic and anoxygenic bacteria with examples.

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

a) Explain in detail on general outline of Numerical and Polyphasic Taxonomy.
b) Write in detail on Reproduction of fungi.
c) Describe in detail the Gram staining.

SLR-HE-8

Seat No.	

Set P

M.Sc. (Biotechnology) (Semester - II) (New) (NEP CBCS) Examination: October/November - 2025 Immunology and Immuno techniques (2311202)

Day & Date: Thursday, 30-10-2025 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) Iron-binding protein (lactoferrin) present in mucous has _____ ability.
   a) antigen presentation b) microbial growth inhibition
   c) immune suppression d) phygocytosis

2) _____ immunoglobulin shows polymeric type of structure.
   a) IgD b) IgE
   c) IgG d) IgM

3) _____ is an exaggerated immune response that causes damage to the individual.
   a) Cancer b) Phagocytosis
   c) Immunogenicity d) Hypersensitivity

4) _____ is a transplant of tissues, organs, or cells between individuals of different species.
   a) Autograft b) Allograft
   c) Xenograft d) Isograft

5) _____ is a group of serum proteins that lead to membrane attack complex on pathogen for recognition and elimination.
   a) Complement b) Cytokine
   c) MHC d) CAM

6) _____ cells are class II MHC restricted and display CD8 coreceptor.
   a) Macrophages b) B cells
   c) T_H cells d) RBCs

7) MHC molecules are absent on _____.
   a) Dendritic cells b) WBCs
   c) RBCs d) NK cells

8) _____ is a measure of the relative strength of an antiserum.
   a) Titer b) Affinity
   c) Avidity d) MAC

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

a) Macrophages are professional antigen presenting cells.
b) mIgM is a membrane bound immunoglobulin.
c) Grave's disease is a systemic autoimmune disorder.
d) All antigens are immunogenic but all immunogens are not antigenic.

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

a) What are cytokines? Give example.
b) Differentiate between immunogen and antigen.
c) Enlist primary and secondary lymphoid organs.
d) Write functions of B lymphocyte.
e) Define avidity of an antibody.
f) What are Tumor antigens?
g) What is tissue transplantation? Enlist types of graft.
h) Define humoral immunity.

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

a) Describe Structure and functions of lymph node.
b) Write in detail about Hypersensitivity.
c) Describe the structure and function of class I MHC molecule.
d) Write a comparative account on innate and adaptive immunity.

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

a) Give detailed account on ELISA.
b) Write a detailed account on vaccines.
c) Explain in detail structure and functions of antibodies.

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

a) Explain processing and presentation of exogenous antigen by endocytic pathway.
b) Discuss properties and function of Cytokine.
c) Explain mechanism of complement activation by classical pathway.

SLR-HE-9

Seat No.	

Set P

M.Sc. (Biotechnology) (Semester - II) (New) (NEP CBCS)
Examination: October/November – 2025
Inheritance Biology (2311207)

Day & Date: Saturday, 01-11-2025 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) After cross-fertilization of true-breeding tall and dwarf plants, the F1 generation was self- fertilized. The resultant plants have genotypes in the ratio ____.
   a) 1:2:1 (homozygous tall: heterozygous tall: dwarf)
   b) 1:2:1 (heterozygous tall: homozygous tall: dwarf)
   c) 3:1 (tall: dwarf)
   d) 3:1 (dwarf: tall)

2) Which of the following characteristics of pea plants was not used by Mendel in his experiments?
   a) seed color b) seed shape
   c) pod length d) flower position

3) Mendel took ____ contrasting characteristics of pea plants.
   a) eight b) seven
   c) six d) five

4) If both genotype and phenotype shows the same ratios of 1:2:1 in the F2 generation, it shows ____.
   a) incomplete dominance in monohybrid cross
   b) complete dominance in monohybrid cross
   c) dihybrid cross
   d) co-dominance

5) Test cross determines ____.
   a) whether two traits are linked or not
   b) the genotype of F2 plant
   c) whether the two species will breed successfully or not
   d) number of alleles in a gene

6) The genotype of dominant plant can be determined by ____.
   a) pedigree analysis b) back cross
   c) test cross d) dihybrid cross

7) Lack of independent assortment of two genes is due to ____.
   a) Recombination b) Cossing over
   c) Linkage d) Repulsion

8) The cross where the sources of gametes are reversed is called ____.
   a) reciprocal cross b) reverse cross
   c) dihybrid cross d) test cross

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

1) Gregor Mendel used the pea plant as a model plant for inheritance experiments
   a) True
   b) False
2) X-linked human genetic disorders are much more common in males than in females due to the X-linked inheritance pattern.
   a) True
   b) False
3) Hardy Weinberg equilibrium is stated as p2+q2+2pq=1.
   a) True
   b) False
4) Mendel's law of independent assortment states that the alleles of two or more different genes get sorted into gametes independently of one another.
   a) True
   b) False

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

a) Define genetic epistasis.
b) Explain what is meant by the c paradox value.
c) Explain what is meant by genome mapping.
d) Explain what is meant by sex-linked inheritance.
e) Define the term deletion.
f) Explain what is meant by the theory of evolution.
g) Explain what is meant by bacterial conjugation.
h) Explain what is meant by Neo-Darwinism.

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

a) Explain the structure of the X and Y sex chromosomes and state their importance.
b) Explain the terms aneuploidy, euploidy, and polyploidy with examples.
c) Explain what is meant by phenotypic ratio and genotypic ratio.
d) Draw a punnet square stating the example using the tall green and dwarf yellow pea stating its genotypic ratio and phenotypic ratio.

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

a) Explain the gene gun and micro injection methods of transformation.
b) Write in details about the F-plasmid.
c) Explain in details the Lamarck's theory of evolution.

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

a) Explain the terms complete dominance, co-dominance, and incomplete dominance with examples.

b) Explain what is meant by Hardy-Weinberg equilibrium.

c) Explain the role of chromosomes in heredity.

SLR-HE-12

Seat No.		Set	P

M.Sc. (Biotechnology) (Semester - III) (New) (NEP CBCS)
Examination: October/November - 2025
Industrial and Environmental Biotechnology (2311301)

Day & Date: Wednesday, 29-10-2025 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) Which of the following is a characteristic of a fed-batch fermentation process?
a) Continuous addition and removal of medium
b) No addition of medium after inoculation
c) Intermittent addition of substrate without removal of culture
d) Medium is added and removed at the same rate

2) Which method is NOT typically used for cell lysis?
a) Ultrasonication
b) Enzymatic digestion
c) Solvent extraction
d) High-pressure homogenization

3) Which of the following is a biological method used for the treatment of pharmaceutical industrial effluent?
a) Filtration b) Chemical precipitation
c) Activated sludge process d) Sedimentation

4) In downstream processing, which technique is commonly used for solid-liquid separation?
a) Gas chromatography b) Ultracentrifugation
c) Adsorption d) Crystallization

5) What is the primary goal of an Environmental Impact Assessment (ElA)?
a) To increase the cost of industrial projects
b) To enforce international trade policies
c) To predict environmental consequences of proposed projects
d) To grant patents for environmental technologies

6) What type of bioreactor utilizes gas lift without mechanical agitation for circulation?
a) Stirred tank reactor b) Air lift bioreactor
c) Packed bed reactor d) Photobioreactor

7) Which of the following is a non-conventional source of energy?
a) Coal b) Natural gas
c) Solar power d) Petroleum

8) The Environmental Protection Act (1986) in India was enacted in response to which major event?
a) Kyoto Protocol b) Chernobyl disaster
c) Stockholm Conference d) Bhopal Gas Tragedy

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

a) Research and Development (R&D) has no role in process innovation or product improvement.
a) True b) False

b) Standard Operating Procedures (SOPs) are written instructions that ensure consistency in routine operations.
a) True b) False

c) Microbial process is advantageous than chemical process.
a) True b) False

d) Quality Control (QC) ensures products meet required specifications by monitoring and testing during production.
a) True b) False

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

a) Define Bioremediation. Enlist the types of bioremediations.
b) Enlist applications of Riboflavin.
c) Explain shortly solvent extraction.
d) What are fermentation and inoculum medium?
e) Define the following terms:
i. Flocculation
ii. Sedimentation
f) What is downstream processing? Give names of 4 downstream processes.
g) What are antibiotics? Give any two applications of penicillin.
h) What are conventional & non-conventional energy sources explain with example.

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

a) Explain briefly purification by chromatography.
b) Explain in detail design of Air lift bioreactor.
c) Explain in short preservation of industrially important microorganisms.
d) Explain shortly chemical methods used for treatment of distillery effluent.

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

a) Explain briefly production of Citric acid.
b) Write a note on Environmental Impact Assessment.
c) Describe different types of fermenters.

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

a) Describe in detail Penicillin production.

b) Write a note on Strain improvement.

c) What is Quality Assurance (QA)? Explain different roles of QA.

SLR-HE-13

Seat No.	

Set P

M.Sc. (Biotechnology) (Semester - III) (New) (NEP CBCS)
Examination: October/November - 2025
Genetic Engineering (2311302)

Day & Date: Friday, 31-10-2025 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) Endonucleases, a group of enzymes cleave DNA _____.
   a) Externally b) Internally
   c) Both a and b d) Neither a nor b

2) The most popular and widely used engineered plasmid vector is _____.
   a) pBR 322 b) pUC18
   c) pSC101 d) pBR327

3) Introduction of DNA into cells by exposing to high voltage electric pulse is _____.
   a) Electrofusion b) Electroporation
   c) Electrofision d) Electrolysis

4) Which of the following restriction enzymes produce blunt ends?
   a) Hind III b) Xho
   c) Eco RV d) Sal I

5) Ti plasmid used in genetic engineering is obtained from _____.
   a) Bacillus thuringiensis
   b) Agrobacterium rhizogenes
   c) Agrobacterium tumefaciens
   d) Bacillus subtilis

6) _____ DNA duplex is obtained from one DNA duplex after 4 cycles of PCR.
   a) 4 b) 8
   c) 16 d) 32

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

8) A single strand of nucleic acid tagged with a radioactive molecule is called _____.
   a) Plasmid b) Probe
   c) selectable marker d) Vector

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

1) Gene cloning is an efficient way to produce many copies of a specific gene.
2) Restriction enzymes make a straight cut through both strands of DNA.
3) A ring of DNA in a bacterium is called as Plasmid.
4) Gene therapy is a form of genetic engineering.

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

a) Define Primers.
b) Write a note on Shuttle vector.
c) Define DNA chips.
d) Write note on Biolistic.
e) Write a note on DNA Sequencing.
f) Define Blotting.
g) Define Expression Vector.
h) Define Plasmid.

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

a) Write a note on colony hybridization.
b) Explain detail about DNA fingerprinting.
c) Write a note on restriction enzymes.
d) Explain in detail about DNA Microarray with application.

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

a) Describe DNA transfer method with respect to Microinjection.
b) Explain molecular diagnosis and detection of genetic diseases.
c) Write a brief note on RAPD.

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

a) Explain in details of the expression vectors used in the cloning?
b) Describe in details DNA sequencing methods.
c) Explain in brief about direct and indirect methods of screening.

Seat No.	

Set | P

M.Sc. (Biotechnology) (Semester - III) (New) (NEP CBCS)
Examination: October/November – 2025
Plant Biotechnology (2311306)

Day & Date: Monday, 03-11-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

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

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

1) What is plant biotechnology?
   a) Cell division and multiplication
   b) Creating thousands of plants through tissue culture
   c) Somatic Hybridization
   d) Introduction of desirable traits into the plant parts through genetic modification

2) Which of the following is not a method used to culture protoplast?
   a) Using soft agar matrix
   b) Dendritic culture method
   c) Hanging drop culture method
   d) Using micro culture chambers

3) Which of the following factor does not influence totipotency?
   a) Nonreduced nitrogen b) Relative humidity
   c) Light intensity d) Source of explant

4) Which hormone promotes flowering in long day plants?
   a) Ethylene b) Cytokinin
   c) Gibberellin d) Abscisic acid

5) The process of embryo development is called ____.
   a) endomitosis b) organogenesis
   c) organ culture d) embryogenesis

6) ____ is a micronutrient required for plant.
   a) Phosphorus b) Carbon
   c) Sulfur d) Iron

7) The term ‘Totipotency’ refers to the capacity of a ____.
   a) Cell to generate whole plant
   b) Bud to generate whole plant
   c) Seed to germinate
   d) Cell to enlarge in size

8) An enucleated protoplast is also called as _____.
   a) Hybrid b) Cybrid
   c) Cytoplast d) Tropoplast

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

1) Crown gall disease is caused by Agrobacterium tumefaciens.
2) Stomata are mostly found on the bark of trees.
3) Variations observed during tissue culture are somaclonal variations.
4) Unorganized proliferative mass of plant cells in tissue culture is called Callus.

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

a) Enlist the methods used for Direct DNA transfer.
b) Explain haploid plantlet production.
c) Write a note on Embryo rescue.
d) Write the applications of Plant Biotechnology in Biodiversity Conservation.
e) Write a note on Synthetic seeds.
f) Write about Micropropagation.
g) Explain about plant tissue culture media.
h) Define Plant Biotechnology.

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

a) Write a note on Organogenesis.
b) Explain detail about Protoplast Isolation and Culture.
c) Define cryopreservation and write down the methods for it.
d) Explain T-DNA transfer.

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

a) Explain the methods of direct DNA transfer.
b) Explain Agriculture Diseases resistant plants.
c) Write a brief note on gene silencing in Plant transformation.

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

a) Write a note on any Ri plasmid in detail.
b) Write a note on Soma clonal variations.
c) Explain in brief about Enhancement of nutritional value of crop Plants.

Seat No.		Set	P

M.Sc. (Biotechnology) (Semester - III) (New) (NEP CBCS)
Examination: October/November – 2025
Molecular Diagnostics (2311307)

Day & Date: Monday, 03-11-2025 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) In enzyme immunoassays, the solid phase is most commonly made of: _____.
   a) Glass slides b) Polystyrene microtiter plates
   c) Agar medium d) Nitrocellulose membranes

2) Which type of antibodies provides greater specificity in enzyme immunoassays?
   a) Polyclonal antibodies b) Monoclonal antibodies
   c) Humanized antibodies d) Abzymes

3) PCR is widely used in clinical microbiology for:_____.
   a) Bacterial staining b) Amplification of DNA
   c) Protein quantification d) Enzyme purification

4) The diffusion method for antimicrobial susceptibility testing is commonly known as: _____.
   a) ELISA test b) PCR test
   c) Kirby-Bauer test d) Immunofluorescence test

5) _____ is the set of antigenic determinants (idiotopes) characterizing a unique antibody or T-cell receptor.
   a) CDR b) Hypervariable
   c) Idiotype d) Antigenic drift

6) Which of the following techniques is used to detect antigen-antibody reactions using radioactivity?
   a) Radioimmunoassay b) Immunofluorescence
   c) ELISA d) PCR
   .

7) First aid in diagnostic laboratories is required mainly to:
   a) Save time during experiments
   b) Ensure safety in case of accidents
   c) Increase test sensitivity
   d) Improve accuracy of results

8) Disposal of biological waste in diagnostic laboratories should be done through: _____.
   a) Open dumping
   b) Autoclaving and incineration
   c) Storing in cold rooms
   d) Dilution with water

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

1) ELISA is an example of heterogeneous enzyme immunoassays.
2) Molecular markers are laboratory tests that use an enzyme-linked antibody to detect and quantify specific biological molecules.
3) Epitope design is a computational and bioinformatic process for identifying specific regions on antigens.
4) Random handling of chemicals is a part of Good Laboratory Practices

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

a) What are monoclonal antibodies?
b) Enlist Molecular markers.
c) Differentiate between Homogeneous and heterogeneous enzyme immunoassays.
d) How are the Good Lab Practices followed?
e) What do you mean by Antiidiotypes?
f) Give examples of Solid phases used in enzyme immunoassays.
g) Define diffusion.
h) Explain Queuing of Lab material

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

a) Explain the principle of PCR.
b) Write a note on Enzyme immuno histochemical techniques.
c) Explain plasmid finger printing in clinical microbiology.
d) Discuss Safety regulation in Handling of Instruments and Laboratory Management.

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

a) Write in detail about Epitope design and applications.
b) Explain Susceptibility tests: Micro-dilution and macro-dilution broth procedures.
c) Discuss protoplast isolation, culture, and its applications.

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

a) What are Good Lab Practices? Add a note on Quality control methods and maintenance of laboratory records.
b) Write a detailed account of radioimmunoassay and its applications in diagnostics.
c) Explain the different types of molecular markers (RFLP, RAPD, AFLP) with applications.

Seat No.	

Set **P**

M.Sc. (Biotechnology) (Semester - IV) (New) (NEP CBCS)
Examination: October/November - 2025
Advanced Analytical Techniques (2311401)

Day & Date: Tuesday, 28-10-2025 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) Which of the following centrifugation is used to separate certain organelles from whole cell?
a) Rate-zonal centrifugation
b) Normal centrifugation
c) Differential centrifugation
d) Isopycnic centrifugation

2) In size exclusion chromatography, solute molecules are separated based on ____.
a) Molecular geometry and size
b) Molecular composition
c) Molecular phase
d) Molecular formula

3) Which of the following is used as a carrier gas in gas chromatography?
a) Carbon dioxide b) Oxygen
c) Helium d) Methane

4) What does the electrophoresis apparatus consist of?
a) Gel. buffer chamber and fire pack
b) Buffer chamber and electrophoresis unit
c) Electrophoresis unit and gel separator
d) Power pack and electrophoresis unit

5) HPLC is an abbreviation for?
a) High Profit Liquid Chromatography
b) High Pressure Liquid Chromatography
c) Higher Performance Low Chromatography
d) Higher Profit Low Chromatography

6) Which of the following is used as a spraying reagent in paper chromatography for detection of amino acids?
a) conc. HCl b) NaCl solution
c) Ninhydrin solution d) $CuSO_4$ solution

7) In mass spectrometry, fragmentation of ions is achieved through ____.

a) Ionization b) Splitting
c) Solubilization d) Coupling

8) When the power of ocular lens is 10X and objective lens is 40X, then the magnification is ____.

a) 100 times b) 40 times
c) 400 times d) 10 times

B) Write True or False: **04**

a) The centrifugation is based on the principle of when a force is less than gravity desired.
b) In electrophoresis, rale of migration is directly proportional to current.
c) Southern blotting is a molecular biology technique used to detect specific DNA sequences within a complex DNA mixture.
d) The rate of decay of the nucleus is dependent on temperature and pressure.

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

a) Differentiate between Paper chromatography and TLC.
b) Define Chromatofocusing.
c) What is Capillary Electrophoresis?
d) Enlist different type of microscopy.
e) What is radioactive decay?
f) Explain Isoelectric focusing.
g) Write applications of Circular dichroism spectroscopy.
h) Write applications of centrifuge.

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

a) Write the principle and applications of gel permeation chromatography.
b) Write a note on Southern blotting.
c) Explain properties of electromagnetic radiation and write applications of UV spectroscopy.
d) Write a note on Scanning electron Microscopy.

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

a) Discuss methods of detection and measurement of Radioactivity based on gas ionization.
b) Explain Instrumentation and Applications of Colorimetry.
c) Explain basic principle of electrophoresis and add a note on theory and applications of agarose gel electrophoresis.

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

a) Give a detailed account on preparative and analytical ultracentrifuge.
b) Explain the principle and applications of High Performance Liquid Chromatography.
c) Explain Optical principles of Microscopy and add a note on compound microscope.

SLR-HE-18

Seat No.	

Set P

M.Sc. (Biotechnology) (Semester - IV) (New) (NEP CBCS)
Examination: October/November – 2025
Bio Nanotechnology (2311402)

Day & Date: Thursday, 30-10-2025 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.
3) Draw neat diagrams and give equations wherever necessary.

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

1) The size of atoms is nearly _____.
   a) 0.01 nm b) 0.1 nm
   c) 1 nm d) 10 nm

2) Nanotechnology, in other word, is _____.
   a) Carbon engineering b) Small technology
   c) Atomic engineering d) Microphysics

3) _____ nanomaterial is used for cutting tools.
   a) Fullerene b) Aerogel
   c) Tungsten Carbide d) Gold

4) Quantum dots can be used in _____.
   a) Crystallography b) Optoelectronics
   c) Mechanics d) Quantum physics

5) Typical precursor used in sol-gel are _____.
   a) Metal oxides b) Metal dioxides
   c) Metal alkoxides d) Metal fluorides

6) nanometer = _____ cm.
   a) 10^{-9} b) 10^{-7}
   c) 10^{-8} d) 10^{-6}

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

8) _____ of the following is the physico-chemical component of biosensors.
   a) Enzymes b) Anti-bodies
   c) Transducer d) Cells or tissues

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

a) The colour of the nano gold particles is _____.
b) _____ first used the term Nanotechnology.
c) The biological response of the biosensor is determined by _____.
d) Nano sized polymers built from branched units are called _____.

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

a) Define nanomaterial.
b) Define biosensor.
c) Define nanodot.
d) Define bottom up.
e) Define two-dimensional nanomaterial.
f) Give names of one-dimensional nanomaterial.
g) Define dendrimers.
h) Define Quantum dot.

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

a) Write a note on nanoscale.
b) Describe drug delivery by bio nanotechnology.
c) Explain characterization of nanoparticle by SEM.
d) Differentiation between Bio nanotechnology and Nanobiotechnology.

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

a) Describe milestone in nanotechnology.
b) What is biological nanoparticle synthesis? explain with using microorganisms.
c) Describe in details top down and top-down methods.

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

a) Describe application of bio nanotechnology in case of drug delivery.
b) Describe synthesis of metal nanoparticles.
c) Describe photodynamic therapy.

SLR-HE-19

Seat No.	

Set P

M.Sc. (Biotechnology) (Semester - IV) (New) (NEP CBCS)
Examination: October/November – 2025
Animal Biotechnology (2311405)

Day & Date: Saturday, 01-11-2025 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) ____ are cell lines derived from early embryos that have the potential to differentiate into all types of cells.
   a) Somatic cell b) Haploid cell
   c) Polyploid d) Embryonic Stem cell

2) ____ is a cell that results from the fusion of antibody producing myeloma cell and antigenically stimulated plasma cell.
   a) Hybridoma b) Hematopoietic Stem Cells
   c) Mesenchymal Stem Cells d) Embryonic Stem Cells

3) An isotonic solution of inorganic salts present in approximately the correct physiological concentrations known as ____.
   a) Serum b) Plasma
   c) Blood d) Balanced salt solution

4) A culture started from cells, tissues, or organs taken directly from an organism, and before the first subculture is known as ____ culture.
   a) Primary b) Secondary
   c) Immortal d) Tertiary

5) ____ stem cells are usually derived from bone marrow, with multipotent differentiation capacity.
   a) Embryonic b) Hematopoietic
   c) Mesenchymal d) Amniotic

6) ____ is a method wherebv cells are frozen, maintaining their viability. until they are defrosted months or years later.
   a) Cell culture b) Cryopreservation
   c) Hybridoma d) Tissue engineering

7) Inhibition of plasma membrane ruffling and cell motility when cells are in complete contact with other adjacent cells is termed as ____.
   a) Contact inhibition b) Enzyme induction
   c) Embryonic induction d) Explantation

8) A culture in which cells will multiply when suspended in growth medium is called as ____ culture.
   a) Suspension b) Callus
   c) Hybrid d) Mono

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

1) Immunotherapy is one of the treatment methods for cancer.
2) Bioprinting of organs and tissues is part of tissue engineering techniques.
3) Balanced salt solution contains serum.
4) Hybridoma technique is used to produce transgenic animals.

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

a) Differentiate between primary and secondary cell lines.
b) What are Extra cellular matrices?
c) Explain transgenic animals.
d) Enlist different types of stem cells.
e) Define cryopreservation.
f) Explain characteristics of cancer cells.
g) Explain morphogenesis.
h) What is a balanced salt solution?

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

a) Write a note on hybridoma technology.
b) Explain Immunoisolation Techniques.
c) Explain the concept of knock out animals.
d) Explain Cancer cell vs. Normal cell.

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

a) Write a note on Different types of cell culture media.
b) Explain in detail cryopreservation.
c) Explain Factors activating proto-oncogene.

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

a) Explain in detail Bioprinting of Organs and Tissues.
b) Discuss in detail treatment of cancer.
c) Write a note on tissue culture techniques-primary and secondary culture.

SLR-HE-20

Seat No.		Set	P

M.Sc. (Biotechnology) (Semester - IV) (New) (NEP CBCS) Examination: October/November – 2025
Medical Biotechnology (2311406)

Day & Date: Saturday, 01-11-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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

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

1) Which of the following characteristics of the microorganism does not help in causing infectious disease?
   a) must enter the host
   b) must metabolize in the host tissue
   c) must resist host defenses
   d) must not damage the host

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

3) Viruses do not contain ____.
   a) DNA b) RNA
   c) Cell wall d) Glycoproteins

4) Streptomycin is produced by which of the following organisms?
   a) *Stretomyces noursei* b) *Streptomyces nodosus*
   c) *Streptomyces fradiae* d) *Streptomyces griseus*

5) Nystatin is effective in curing ____.
   a) Deep mycoses b) Dermatophyte infections
   c) Systemic mycoses d) Candida infections

6) Which body part contains the largest microbial population?
   a) Stomach b) Small intestine
   c) Large intestine d) Mouth

7) Vibrio cholerae adheres to the epithelial cells of the small intestine by means of ____.
   a) Pili b) Proteins
   c) Hemagglutinin d) hydrogen bonds

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

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

1) ____ is when the pathogen benefits while the host gains nothing from the interaction.
2) ____ bacteria causes toxic shock syndrome.
3) ____ organism releases endotoxin that causes muscular paralysis.
4) Within ____ days after birth a stable flora develops.

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

a) Define antibiotics.
b) Define antiviral.
c) Define bactericidal.
d) Define drug resistance.
e) Define microbiota.
f) Define interferon.
g) Define vaccination.
h) Define sensitivity.

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

a) Write a note on antiviral agent.
b) Describe Industrial applications of biosensors.
c) Explain Molecular diagnosis of various diseases.
d) Explain routes of transmission of microbes in body.

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

a) Describe vaccination for prevention of diseases.
b) Describe application of phages in therapeutics.
c) Describe in details Antifungal drugs.

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

a) Describe in details malaria with symptoms, diagnosis and treatment.
b) Describe in details pathogenesis of HIV with symptoms, diagnosis and treatment.
c) Describe Infections in pregnancy and neonates.

Seat No.	

Set **P**

M.Sc. (Biotechnology) (Semester - III) (New) (CBCS) Examination: October/November – 2025
Advanced Pharmaceuticals (MSC33311)

Day & Date: Monday, 24-11-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

Q.1 A) Multiple choice questions. **10**

1) Minimum temp at which surfactant forms micelle is called as ____.
   a) Cloud point b) Kraft point
   c) Turbidity point d) Critical point

2) One micrometre is equal to: _____
   a) 10^{-6} centimetre b) 10^{-3} centimetre
   c) 10^{-6} meter d) 10^{-3} metre

3) Pycnometer is used to determine _____
   a) Density b) Angle of repose
   c) Refractive index d) Porosity

4) Hydroxypropyl methyl cellulose (HPMC) possesses one of the following.
   a) Amphiphillic ion b) Anionic
   c) Cationic d) Non-lonic

5) Coulter counter is used to determine ____.
   a) Refractive Index b) Surface Area
   c) Particle Size d) Partition Coefficient

6) _____ one of these is not a theory of Drug dissolution.
   a) Diffusion layer model
   b) Fick's law of diffusion
   c) Penetration or surface renewal theory
   d) Interfacial barrier model

7) Flocculated suspension exhibits the flow of a type ____.
   a) Dilatant b) Newtonian
   c) Plastic d) Pseudoplastic

8) Andreasen apparatus consists of ____.
   a) Balance b) Electrodes
   c) Hydrometer d) Pipette

9) _____ of the following does not falls under semi-solid drug formulation.
   a) Oral Preparations
   b) Sustained Release Preparations
   c) Topical Preparations
   d) Sublingual and Buccal Administration

10) Cool Place temperature is in between _____
   a) 10° C to 20^{o} C b) 8^{o} C to 25^{o} C
   c) 30^{o} C to 40^{o} C d) 2^{o} C to 8^{o} C

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

1) Solid drug formulations are easily absorbed within our body than other physical drug formulations.
   a) True b) false
2) The term drug formulation is frequently used while describing dosage forms.
   a) True b) false
3) Greater the surface area lesser is the dissolution.
   a) True b) false
4) Particle size be determined by coulter-counter method.
   a) True b) false
5) Polymer are used in pharmaceutical for controlled drugs.
   a) True b) false
6) Rheology studies the flowability of drugs
   a) True b) false

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

a) Explain physical testing of solution.
b) Explain handling of solids, pharm aceutical granulation
c) Explain Cyclodextrin inclusion complexes.
d) Explain concept of drug release.

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

1) What are Solid dispersions? Explain in details types, methods of preparation.
2) Explain Phase behaviour of surfactant in binary and ternary systems.

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

1) Define micellization and give a detail account on micelle structure.
2) Explain in details factors responsible for destabilization of pharmaceutical products

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

a) Explain in compression and compaction properties of binary mixtures.

b) Explain in details about thermodynamics and kinetics of micelle formation

Q.6 Answer the following. **16**

a) Explain lubricant sensitivity characterization of granules and compacts.

b) Write a note on Theory of dissolution and enhancement of dissolution rate

Q.7 Answer the following. **16**

a) What is dissolution? Explain its dosage forms along with factors affecting dissolution rate.

b) Define polymer, explain in details its types and application.