

Seat No.	
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M.Sc. (Semester - I) (New) (NEP CBCS) Examination: March/April-2024
BIOTECHNOLOGY
Biochemistry and Enzymology (2311101)

Day & Date: Friday, 10-05-2024
Time: 03:00 AM To 05:30 PM

Max. Marks: 60

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

Q.1 A) Choose correct alternative. 08

- 1) Which of the following vitamins helps in blood clotting?
a) Vitamin A b) Vitamin C
c) Vitamin D d) Vitamin K
- 2) Which is the leading cause of blindness in children worldwide?
a) Glaucoma b) Color blindness
c) Cataracts d) Vitamin A
- 3) Which of the following Vitamin deficiency causes Beri Beri?
a) Vitamin B1 b) Vitamin B6
c) Vitamin B2 d) Vitamin B12
- 4) This hormone is not secreted by the hypothalamus.
a) PRH b) FSH
c) CRH d) TRH
- 5) Zymogen is _____.
a) Enzyme poison b) Enzyme modulator
c) Enzyme precursor d) Enzyme inhibitor
- 6) The enzyme responsible for converting pectin into pectic acid is
a) Pectinase
b) Proto pectinase
c) Pectic methyl esterase
d) Polygalacturonase
- 7) Proteins that act like catalysts for some biochemical reactions is called _____.
a) Hormone b) Enzyme
c) Protein d) Lipids
- 8) Name of the coenzymes of riboflavin B2
a) NAD or NADP b) FAD and FMN
c) Coenzyme A d) Thiamine pyrophosphate.

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

- 1) Maximum photosynthesis occurs in blue light.
a) True b) False
- 2) Emerson has proposed the two-pigment system theory of photosynthesis.
a) True b) False
- 3) Electron transport system (ETS) is present in the Inner membrane parts of mitochondria.
a) True b) False
- 4) Ubiquinone transfers its electrons to Cyt C.
a) True b) False

- Q.2 Answer the following. (Any Six) 12**
- a) What are amino acids and explain their types.
 - b) Give two uses of ascorbic acid.
 - c) What is meant by epimerization?
 - d) Elucidate the structure of glucose.
 - e) What are carbohydrates and mention their classification.
 - f) What are hormones? Give examples of at least two human hormones.
 - g) Explain what is meant by monosaccharides.
- Q.3 Answer the following. (Any Three) 12**
- a) Mention in brief clinical significance of enzymes.
 - b) Write a note on the synthesis of sucrose and starch.
 - c) Explain what is meant by multiple enzyme complex.
 - d) Explain the proximity and orientation effects.
- Q.4 Answer the following. (Any Two) 12**
- a) Explain the pathway of lipid biosynthesis.
 - b) What are enzymes, explain the term competitive, non-competitive inhibition?
 - c) Explain what is meant by activation energy and mention the transition state theory
- Q.5 Answer the following. (Any Two) 12**
- a) What is meant by the Michaelis-Menten equation and its form and give its derivatives.
 - b) Explain the process of photosynthesis and write a note on photosystem I and II.
 - c) Explain in detail the Decarboxylation, transamination, deamination.

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Set P

M.Sc. (Semester - I) (New) (NEP CBCS) Examination: March/April-2024
BIOTECHNOLOGY
Cell And Molecular Biology (2311102)

Day & Date: Monday, 13-05-2024
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

Q.1 A) Choose correct alternative.

08

- 1) The structure of the cell that controls all the activities of the cell is _____.
a) Nucleus b) Cytoplasm
c) Ribosomes d) Golgi body
- 2) _____ protein does not function in cell-cell interaction.
a) Integrin b) Cadherin
c) N-CAM d) Cytochrome c
- 3) _____ is the correct definition of excision repair.
a) Repair of a single damaged nucleotide
b) Repair of a damaged oligonucleotide
c) Removal of a single damaged nucleotide
d) Removal of a damaged oligonucleotide
- 4) _____ is an exogenous agent that damage DNA.
a) Oxidation b) Alkylation
c) Ionizing radiation d) Hydrolysis
- 5) Minisatellites are prominent in the _____ region.
a) Euchromatin b) Centromeres
c) RNA d) Protein
- 6) _____ is used for estimation of kinetic complexity of genome.
a) RNA analysis b) Cot curve
c) Gene analysis d) Denaturation analysis
- 7) The intermediate filament present in nuclear membrane is _____.
a) Desmin b) nestin
c) lamin d) vimentin
- 8) Termination of transcription is triggered by _____.
a) RNA polymerase b) Rho
c) SSB d) Tur protein

B) Write True or False.

04

- 1) Histones have a high content of negatively charged amino acids.
- 2) Cell organelle mitochondrion is called a suicidal bag.
- 3) The Rec BCD pathway involves the use of ligases.
- 4) Mutagens can cause permanent damage to genetic material.

- Q.2 Answer the following. (Any Six) 12**
- a) Write note on repetitive DNA.
 - b) Describe the process of transcription termination.
 - c) What is Klenow fragment? Explain.
 - d) What are cell junctions?
 - e) What is photoreactivation?
 - f) Give the significance of Glycosylation in eukaryotes.
 - g) Write down the stages of Cell cycle.
 - h) What is the function of receptor tyrosine kinases?
- Q.3 Answer the following. (Any Three) 12**
- a) Write a note on prokaryotic gene structure.
 - b) Differentiate between Euchromatin and Heterochromatin.
 - c) Describe in detail the mechanism of eukaryotic translation.
 - d) Explain in detail the mechanism of DNA replication in prokaryotes.
- Q.4 Answer the following. (Any Two) 12**
- a) Write the steps of Signal transduction pathway.
 - b) Write the mechanism of regulation of translation.
 - c) Write a note on the structure and function of cytoskeleton.
- Q.5 Answer the following. (Any Two) 12**
- a) Explain different types of mutations.
 - b) Discuss the significance of experiment performed by Hershey and Chase.
 - c) What are cell adhesion molecules? Explain with an example.

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M.Sc. (Semester -I) (New) (NEP CBCS) Examination: March/April - 2024
BIOTECHNOLOGY
Biostatistics and Bioinformatics (2311107)

Day & Date : Wednesday, 15-05-2024
 Time: 03:00 PM To 05:30 PM

Max. Marks: 60

Instructions: 1) All Questions are compulsory.
 2) Figure to right indicate full marks.

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

08

- 1) Ramachandran plot is used for _____.
 a) identifying errors in the backbone conformation
 b) analyzing the quality of protein structures
 c) show values of ϕ & ψ angles
 d) All of the above
- 2) _____ was the first website of the life sciences and among the first 150 websites in the world.
 a) Equity
 b) Equinox
 c) Equi join
 d) Expasy
- 3) _____ is the most recent Clustal type?
 a) Clustal X
 b) Clustal Y
 c) Clustal Omega
 d) All of these
- 4) _____ is a file format which can be used for further analysis.
 a) FASTA
 b) MASS
 c) BLAST
 d) All
- 5) Protein structures are provided by _____.
 a) PDB
 b) Pubmed
 c) DBP
 d) All
- 6) _____ is the NIH genetic sequence database, an annotated collection of all publicly available DNA sequences.
 a) Omega
 b) BLAST
 c) PDB
 d) GenBank
- 7) _____ is the value that appears most often in a set of data.
 a) Mode
 b) Median
 c) Mean
 d) All
- 8) _____ in statistics refers to the likelihood or chance of an event occurring.
 a) Standard deviation
 b) Probability
 c) Presumption
 d) All

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

- 1) The term bioinformatics was coined by Paulien Hogeweg and Ben Hesper to describe "the study of informatic processes in biotic systems.
- 2) NCBI introduces PubMed, a freely accessible bibliographic retrieval system to the entire MEDLINE database.
- 3) Standard deviation is a measure of how much the values in a set of data vary or deviate from the mean.
- 4) Phylogenetic analysis is the study of the evolutionary development and relationships of a species, a group of organisms, or a characteristic of an organism.

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

- a) Discuss the Ramachandran plot for Glycine.
- b) What is difference between Global and local alignments?
- c) How to do Proximity searching on Pubmed?
- d) Discuss the Objectives of Bioinformatics.
- e) Discuss the advantages of Search Engine.
- f) Write note on Elements of molecular phylogeny.
- g) What are Primary Protein sequence databases?
- h) Enlist the methods used for Pairwise alignment.

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

- a) Write a note on Dot-matrix method used in Pairwise alignment.
- b) What is Frequency Distribution?
- c) Pairwise sequence analysis using BLAST and FASTA.
- d) Define Sample and give note on sampling methods.

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

- a) Write a brief note DDBJ.
- b) Calculate Standard error for below.
 - 1) The population standard deviation is 10 and the sample size is 25.
 - 2) The sample standard deviation is 15 and the sample size is 36.
- c) Write a note on Nucleic acid structure prediction.

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

- a) Write a note on steps in Homology modeling
- b) Write note on Ramachandran plot.
- c) Write note Genomics.

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Set P

M.Sc. (Semester - I) (New) (NEP CBCS) Examination: March/April-2024
BIOTECHNOLOGY
Research Methodology (2311103)

Day & Date: Friday, 17-05-2024
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

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

08

- 1) A common test in research demands much priority on
 - a) Reliability
 - b) Useability
 - c) Objectivity
 - d) All of the above
- 2) Published information in a particular subject area is discussed in?
 - a) Journals
 - b) Research proposal
 - c) Literature review
 - d) Bioethics
- 3) A Research is a _____.
 - a) Lab experiment
 - b) systematic and scientific inquiry
 - c) Report
 - d) procedure
- 4) Which of the following is the first step of designing a questionnaire?
 - a) Identify the goal of a questionnaire.
 - b) Choose a question type or types.
 - c) Identify a target demographic.
 - d) Restrict the length of your questionnaire.
- 5) Common ways to distribute questionnaires are:
 - a) using the mail
 - b) Conduct face-to-face interviews.
 - c) using the telephone
 - d) All of the above
- 6) A subset that is chosen from large population?
 - a) Parameter
 - b) Variable
 - c) Sample
 - d) Statistic
- 7) The appropriation of another person's ideas, processes, results or words without giving appropriate credit is called _____.
 - a) Falsification
 - b) Fabrication
 - c) Publication
 - d) Plagiarism

- 8) A research scholar is guided by a trained scholar or _____.
 a) Pharmacist b) Supervisor
 c) Parents d) Colleagues

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

- 1) The Step-by-step & and proper method is called non systematic approach
 a) True b) False
- 2) Unstructured or semi-structured techniques & and non-statistical analysis is part of qualitative research
 a) True b) False
- 3) One should start your questionnaire with a question that is more relevant to topic.
 a) True b) False
- 4) Developing the hypothesis is an objective of analytical study.
 a) True b) False

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

- a) What is ANNOVA?
- b) Write a short note on plagiarism.
- c) Explain what is webliography.
- d) Explain what is an abstract.
- e) Mention the characters of a report.
- f) What is an IPR?
- g) What is an impact factor?
- h) What is a correlation coefficient?

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

- a) Explain what audiovisuals and how they are implemented in research.
- b) What are the characteristics of good research.
- c) Explain the farmer's rights in India.
- d) Explain what is meant by hypothesis, null hypothesis, and alternative hypothesis.

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

- a) Explain what is sampling and describe the types of sampling.
- b) What are the plant breeders' advantages and disadvantages?
- c) Explain how to write a manuscript.

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

- a) Explain the meaning of research and mention all the different types of research.
- b) Write in details on review on literature.
- c) Explain the procedure of applying for a patent in India.

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M.Sc. (Semester - I) (Old) (CBCS) Examination: March/April-2024
BIOTECHNOLOGY
Microbiology (MSC33101)

Day & Date: Friday, 10-05-2024
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- 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. 10

- 1) _____ is not able to grow in artificial media.
 - a) Mycobacterium leprae
 - b) Catalase
 - c) Oxidase
 - d) Hydroxylase
- 2) The organisms that can grow in low water Environment is known as _____.
 - a) *Plasmodium vivax*
 - b) Xerophiles
 - c) Piezophiles
 - d) *Entamoeba histolytica*
- 3) Algae and fungi have a symbiotic relationship called _____.
 - a) Antifungal
 - b) Slime mould
 - c) Lichen
 - d) Mycology
- 4) _____ reproduces by fragmentation, Budding and production of spores.
 - a) Fungi
 - b) Algae
 - c) Yeast
 - d) Bacteria
- 5) The microbes that can grow and reproduce in low temperatures are called as _____.
 - a) Psychrophiles
 - b) Piezophiles
 - c) Osmophiles
 - d) Halophiles
- 6) _____ uses a general phylogeny derived from 16s rRNA sequence analysis to frame the classification.
 - a) Numerical Taxonomy
 - b) Taxonomic rank
 - c) Polyphasic Taxonomy
 - d) Bergey's Manual
- 7) _____ is a stain used to observe Fungi.
 - a) Methylene blue
 - b) Lactophenol Cotton blue
 - c) Methyl red
 - d) Crystal violet
- 8) MTCC stands for _____.
 - a) Microbiology Type Culture Collection
 - b) Medicinal Type Culture Collection
 - c) Microbial Type Culture Collection
 - d) Magnetic Type Culture Collection
- 9) Primitive bacteria are also known as _____.
 - a) Eubacteria
 - b) Photobacterium
 - c) Archaeobacteria
 - d) Halobacterium
- 10) _____ is an uncultivable bacterium.
 - a) Lactobacillus
 - b) Pseudomonas
 - c) Virus
 - d) Treponema pallidum

- B) Write true or false:** **06**
- 1) Hepatitis B has ssDNA.
 - 2) Lamda phages follow Lysogenic cycle.
 - 3) Slime mould are saprophytic and feed on dead and decaying organic matter.
 - 4) Unculturable bacteria have slow growth rates.
 - 5) Polio viruses have + stranded ssRNA.
 - 6) Mycology is study of plants.
- Q.2 Answer the following.** **16**
- a) Define Thermophiles and give its application in genetic engineering.
 - b) What is lyophilization? Give its importance in Bacteriology.
 - c) Define Phycology and give its significance.
 - d) Describe the role of Methanogenic archaeobacteria.
- Q.3 Answer the following.**
- a) Differentiate between oxygenic and anoxygenic Photosynthetic microbes **08**
based on their general characters.
 - b) Discuss the principle & mechanism of Simple and differential staining. **08**
- Q.4 Answer the following.**
- a) Enlist the different types of extremophiles and write their details. **08**
 - b) Discuss how isolation and cultivation of microbes from soil can be performed. **08**
- Q.5 Answer the following.**
- a) Comment on the various methods of Isolation of microorganism. **08**
 - b) Discuss the role of human micro flora. **08**
- Q.6 Answer the following.**
- a) With the help of a neat labeled diagram explain the structure of a Virus. **10**
Give the general properties of Viruses.
 - b) Discuss the importance of Sterilization and Disinfection. **06**
- Q.7 Answer the following.**
- a) Write the Principle of Electron microscopy. Differentiate between SEM & TEM. **10**
 - b) Discuss the general characteristics of Sub-viral particles, viroids and prions. **06**

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M.Sc. (Semester - I) (Old) (CBCS) Examination: March/April-2024
BIOTECHNOLOGY
Concept of Biochemistry (MSC33102)

Day & Date: Monday, 13-05-2024
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- 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 the correct alternatives from the options.

10

- 1) The pleated sheets in secondary structure of protein are stabilized by _____ bonding between beta strands.
 - a) peptide
 - b) disulfide
 - c) glycosidic
 - d) hydrogen
- 2) An agent that dissociates two integrated series of chemical reactions is known as an _____.
 - a) inhibitor
 - b) initiator
 - c) operator
 - d) uncoupler
- 3) During synthesis of cAMP, the cyclization of ATP molecule occurs in presence of _____ enzyme.
 - a) Invertase
 - b) ATP synthase
 - c) Adenylate cyclase
 - d) Phosphokinase
- 4) Dihydro-orotate and orotate are the ring structures formed during biosynthesis of _____.
 - a) purines
 - b) pyrimidines
 - c) peptones
 - d) histones
- 5) Glycolysis and gluconeogenesis are regulated mainly under the action of hormones _____.
 - a) estrogen and progesterone
 - b) thyroxin and oxytocin
 - c) FSH and ACTH
 - d) insulin and glucagon
- 6) Macromolecules are constructed from simple precursors according to hierarchy of _____.
 - a) increasing structural complexity
 - b) decreasing structural complexity
 - c) without structural complexity
 - d) functional diversity
- 7) The plant growth hormone Auxin _____.
 - a) affects root growth and differentiation
 - b) stimulates stem elongation
 - c) promotes seed germination
 - d) promotes fruit ripening

- 8) Hypoglycemia is the condition with _____ blood glucose concentration.
 - a) high
 - b) low
 - c) moderate
 - d) no
- 9) Coris and Pomes diseases are disorders of _____ storage.
 - a) starch
 - b) cellulose
 - c) peptidoglycan
 - d) glycogen
- 10) In cyclic photophosphorylation, there is participation of _____ photosystems.
 - a) One
 - b) Two
 - c) Three
 - d) Four

B) Fill in the blanks OR Write true/false. 06

- 1) Synthesis of glucose from non-carbohydrate precursor is known as _____.
- 2) Beta oxidation of fatty acids occurs in _____ of a cell.
- 3) _____ hormones are secreted into the blood through ducts.
- 4) RUBISCO enzyme catalyzes the carboxylation of _____.
- 5) Glycogen is a _____ polysaccharide.
- 6) The measurement of degree of randomness of a thermodynamic system is known as it's _____.

Q.2 Answer the following. 16

- a) Define the terms: Carbohydrate, Protein and Lipid.
- b) Describe levels of organization in the protein structure.
- c) Draw the biochemical pathway and energetics of TCA cycle.
- d) Define nutrition. What is BMR?

Q.3 Answer the following. 10

- a) Describe nutritional disorders of protein. 10
- b) Describe structure of ATP synthase with labeled diagram. 06

Q.4 Answer the following. 10

- a) Describe the hormonal control of spermatogenesis. 10
- b) Describe structure and function of RUBISCO enzyme. 06

Q.5 Answer the following. 10

- a) Describe reactions, and regulation of pentose phosphate pathway. 10
- b) State laws of thermodynamics. Comment of concept or the free energy. 06

Q.6 Answer the following. 16

- a) Describe mechanism of Oxidative phosphorylation. Comment on its inhibitors and uncouplers. 16
- b) Describe hormones of pancreas.

Q.7 Answer the following. 16

- a) Write an account on structure and classification of carbohydrates.
- b) Describe any two plant growth hormones.

B) Fill in the blanks.

06

- 1) Chromatin is composed at _____.
- 2) Alteration in _____ chromosome causes Down's syndrome.
- 3) _____ evolution is slow, gradual and continuous process.
- 4) _____ chromosomal aberration shows pseudodominance.
- 5) The cross shaped structure observed in non sister chromatids is called _____.
- 6) Allele is an alternative form of _____.

Q.2 Answer the following.

16

- a) Write a note on Hardy Weinberg law.
- b) Write a note on polytene chromosome.
- c) Write a note on law of co-dominance.
- d) Write a note on structure of sex chromosome.

Q.3 Answer the following.

16

- a) Explain Genetic code and its properties.
- b) Explain Lampbrush chromosome with diagram.

Q.4 Answer the following.

16

- a) Explain sex linked inheritance with example.
- b) Explain transformation.

Q.5 Answer the following.

16

- a) Write a note on significance of population genetics.
- b) Explain Lamarckism

Q.6 Answer the following.

16

- a) Explain conjugation process with "u" tube experiment.
- b) Explain numerical chromosomal aberration.

Q.7 Answer the following.

16

- a) Explain Drosophila as an Eukaryotic Model.
- b) Explain Gene mapping in prokaryotes.

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Set P

M.Sc. (Semester - II) (New) (NEP CBCS) Examination: March/April-2024
BIOTECHNOLOGY
Microbiology and Microbial Techniques (2311201)

Day & Date: Thursday, 09-05-2024
 Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

Q.1 A) Choose correct alternative. 08

- 1) The organisms that can grow in low water Environment is known as _____.
 - a) *Plasmodium vivax*
 - b) Xerophiles
 - c) Piezophiles
 - d) *Entamoeba histolytica*
- 2) Autoclave works on the principle of _____ sterilization.
 - a) chemical
 - b) gaseous
 - c) moist heat
 - d) dry heat
- 3) Algae and fungi have a symbiotic relationship called _____.
 - a) Antifungal
 - b) Slime mould
 - c) Lichen
 - d) Mycology
- 4) _____ reproduces by fragmentation, Budding and production of spores.
 - a) Fungi
 - b) Algae
 - c) Yeast
 - d) Bacteria
- 5) _____ stain is not used in bacterial cell wall staining.
 - a) Safranin
 - b) Methylene blue
 - c) Crystal violet
 - d) Lactophenol Cotton Blue
- 6) _____ is an uncultivable bacterium.
 - a) *Lactobacillus*
 - b) *Pseudomonas*
 - c) Virus
 - d) *Mycobacterium leprae*
- 7) Peptidoglycan is a component of _____.
 - a) flagella
 - b) cell membrane
 - c) cell wall
 - d) capsule
- 8) _____ uses a general phylogeny derived from 16s rRNA sequence analysis to frame the classification.
 - a) Numerical Taxonomy
 - b) Taxonomic rank
 - c) Polyphasic Taxonomy
 - d) Bergey's Manual

B) Write True/False. 04

- 1) *Escherichia coli* is found in the intestines of humans as normal flora.
- 2) The counter stain used in Grams staining is Safranin.
- 3) Magnetotactic bacteria have magnetic properties.
- 4) In negative staining the dye penetrates into the cell.

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

- a) Explain pathogenesis.
- b) Write the importance of culture media in microbiology.
- c) Write a note on Animal Viruses.
- d) Give the significance of Nomenclature.
- e) Write the morphological characters of Fungi.
- f) What is a bacteriophage?
- g) Write the difference between a broth and Agar.
- h) Give the role of components used in Gram's staining procedure.

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

- a) Give the general characters of oxygenic bacteria.
- b) Explain the process of symbiosis in protozoans.
- c) How can cultivation and Enumeration of Bacteriophages be done?
- d) Explain the role of Methanogens in the nature.

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

- a) Write a note on reproduction in fungi.
- b) Give the industrial applications of Algae.
- c) Discuss the general characters of Extremophiles.

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

- a) Discuss how isolation and cultivation of microbes from soil can be performed.
- b) Write a note on history and scope of Microbiology.
- c) Discuss the general characteristics of Sub-viral particles, viroids and prions.

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Set **P**

M.Sc. (Semester - II) (New) (NEP CBCS) Examination: March/April-2024
Biotechnology
Immunology and Immuno techniques (2311202)

Day & Date: Saturday, 11-05-2024
 Time: 11:00 AM To 1:30 PM

Max. Marks: 60

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

Q.1 A) Choose the correct alternatives from the options.**08**

- 1) Host defenses that are mediated by B cells and T cells following exposure to antigen known as _____.
 - a) Adaptive immunity
 - b) Native immunity
 - c) Innate immunity
 - d) MALT
- 2) _____ is secondary lymphoid organ where peripheral antigens are trapped.
 - a) Thymus
 - b) Bone marrow
 - c) Spleen
 - d) lymph node
- 3) _____ is the strength of antigen-antibody binding when multiple epitopes on an antigen interact with multiple binding sites of an antibody.
 - a) Affinity
 - b) Avidity
 - c) Complement fixation
 - d) ADCC
- 4) _____ is a group of genes encoding cell-surface molecules that are required for antigen presentation to T cells and for rapid graft rejection.
 - a) MHC
 - b) CD
 - c) FADD
 - d) FAS
- 5) _____ is the complex of complement components C5-C9, which mediates cell lysis by creating a membrane pore in the target cell.
 - a) C3 convertase
 - b) Lysozyme
 - c) Isozyme
 - d) MAC
- 6) The attribute of a given single cytokine with different biological effects on different target cells is known as _____.
 - a) Pleiotropy
 - b) redundancy
 - c) Synergy
 - d) antagonism
- 7) _____ is a hypersensitivity reaction that can include hay fever, asthma, serum sickness.
 - a) Allergy
 - b) Anergy
 - c) Energy
 - d) Enthalpy

8) _____ is a highly sensitive technique for measuring antigen or antibody that involves competitive binding of radiolabeled antigen or antibody.

- a) ELISA
- b) FACS
- c) Radioimmunoassay
- d) Widal

B) State True or False: 04

- 1) Thymus is a secondary lymphoid organ.
- 2) An epitope of an antigen interacts with the FAB region of the antibody structure.
- 3) Grave's disease is an organ specific autoimmune disorder.
- 4) Particulate antigen is involved in precipitation reaction.

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

- a) Define autoimmunity and enlist autoimmune disorders.
- b) Explain tumor antigens.
- c) Explain immunodeficiency with an example.
- d) Differentiate between active and passive immunization.
- e) Write about ADCC.
- f) Define immunogen and enlist properties of immunogen.
- g) Explain skin as a first line of defenses.
- h) Define cross reactivity.

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

- a) Describe Structure and functions of primary lymphoid organ Thymus.
- b) Explain properties of cytokines.
- c) Explain Principles of antigen-antibody interaction.
- d) Write a short note on Hybridoma Technology for monoclonal antibody production.

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

- a) Write in detail about Hypersensitivity.
- b) Discuss in detail principle of ELISA.
- c) Explain Processing and presentation of exogenous antigen by endocytic pathway.

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

- a) Write a comparative account on Traditional and New Trend vaccines.
- b) Explain Second line of Defense.
- c) Explain mechanism of allograft rejection.

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M.Sc. (Semester - II) (New) (NEP CBCS) Examination: March/April-2024
BIOTECHNOLOGY
Inheritance Biology (2311207)

Day & Date: Tuesday, 14-05-2024
 Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

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

08

- 1) The smallest autosomal chromosome is _____.
 a) Chromosome 22 b) Chromosome 19
 c) Chromosome 1 d) Chromosome 10
- 2) Rhanphanus brassica [Radocabbage] is an example for _____.
 a) Euploidy b) Aneuploidy
 c) Allopolyploidy d) Autopolyploidy
- 3) Trisomy of chromosome 21 results in _____.
 a) Edward syndrome b) Down's syndrome
 c) Patau's syndrome d) Turner's syndrome
- 4) Yeast mitochondria DNA is about _____ James largely than human mitochondria DNA.
 a) 5 b) 6
 c) 7 d) 8
- 5) In _____ the Infectious Transfer Part is called the Resistance Transfer Factory.
 a) Col Plasmid b) PUCI 8
 c) R Plasmid d) F Plasmid
- 6) To determine whether a population is in hardy Weinberg proportion can be compared by _____ test.
 a) T-Test b) ANOVA Test
 c) Chi square test d) Standard deviation
- 7) The term organic evolution was coined by _____.
 a) H. Spencer b) A.I. Oparin
 c) Aristotle d) Plato
- 8) One centimorgan is equal to _____ recombination's.
 a) 1% b) 10%
 c) 100% d) 0.1%

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

04

- 1) The leaf appears green because of the presence of the chlorophyll pigment.
a) True b) False
- 2) The unit of measurement for genetic linkage is centimorgan.
a) True b) False
- 3) In 1946 Joshua Lederberg and Edward L. Tatum discovered that E. coli cells can exchange genetic material through the process of transduction.
a) True b) False
- 4) Darwin sailed aboard the HMS Beagle, a ship that led him to suggest the “Theories of Evolution”.
a) True b) False

Q.2 Answer the following. (Any Six)

12

- a) Define Test cross.
- b) Define Inversion.
- c) Define Hfr
- d) Define Crossing over.
- e) Define Heteroplasmy.
- f) Define Gene Frequency.
- g) Define Genetic Mosaics.
- h) Define Bacteriophage.

Q.3 Answer the following. (Any Three)

12

- a) Write in detail about extra chromosomal inheritance in chloroplast with neat labelled diagram.
- b) Describe Electroporation in detail.
- c) Describe the Life cycle of *saccharomyces cerevisiae* with neat labelled diagram.
- d) Write in detail about Supplementary Gene Interaction.

Q.4 Answer the following. (Any Two)

12

- a) Explain the structural changes in chromosome.
- b) Explain *Drosophila* as an Eukaryotic Model.
- c) Explain Griffith's Transformation Experiment with neat labelled diagram.

Q.5 Answer the following. (Any Two)

12

- a) Explain ABO blood groups in humans in accordance to Allelic Interaction.
- b) Explain Generalized and Specialized Transduction.
- c) Explain Hardy Weinberg genetic equilibrium with examples.

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M.Sc. (Semester - II) (Old) (CBCS) Examination: March/April-2024
BIOTECHNOLOGY
Cell Biology (MSC33201)

Day & Date: Thursday, 09-05-2024
 Time: 11:00 AM To 02:00 PM

Max. Marks: 80

- Instructions:** 1) Question no. 1 and 2 are compulsory.
 2) Attempt any three questions from Q. No. 3 to Q. No. 7.
 3) Figure to right indicate full marks.

Q.1 A) Choose correct alternative.

10

- 1) The organelle functions to package and deliver proteins:
 - a) lysosome
 - b) Proteosome
 - c) mitochondrion
 - d) Golgi apparatus
- 2) This organelle is responsible for destroying worn-out cell parts:
 - a) lysosomes
 - b) mitochondrion
 - c) Golgi apparatus
 - d) ribosomes
- 3) Meiosis results in _____.
 - a) 2 haploid daughter cells
 - b) 4 haploid daughter cells
 - c) 2 diploid daughter cells
 - d) 4 diploid daughter cells
- 4) Crossing-over occurs during:
 - a) anaphase 1
 - b) metaphase 1
 - c) prophase 1
 - d) prophase 2
- 5) Spindle fiber is a specialized form of _____.
 - a) Microtubule
 - b) Centriole
 - c) Centrosome
 - d) Chromosome
- 6) _____ is a type of diffusion in which an ion or molecule crossing a membrane moves down its electrochemical or concentration gradient.
 - a) Active transport
 - b) Active diffusion
 - c) Inactive transport
 - d) Passive transport
- 7) Which of the following transports across plasma membrane doesn't require energy?
 - a) osmosis
 - b) active transport
 - c) group transport
 - d) phagocytosis
- 8) During cleavage, what is true about cells?
 - a) nucleocytoplasmic ratio remains unchanged.
 - b) size does not increase.
 - c) there is less consumption of oxygen.
 - d) the division is like meiosis.
- 9) Termination of gastrulation is indicated by _____.
 - a) obliteration of blastocoel
 - b) obliteration of archenteron
 - c) closure of blastopore
 - d) closure of neural tube
- 10) Which of the following is a component of MAP kinase signal transduction pathway?
 - a) IP3
 - b) ERK
 - c) Protein kinase B
 - d) JAK kinase

- B) Write True or False.** **06**
- 1) Autocrine is a signaling mechanism in which a cell produces a signaling molecule (e.g., growth factor) and then binds and responds to it.
 - 2) Chaperons help in degradation of proteins into short peptides.
 - 3) Exocytosis is the uptake of extracellular material by invagination of the plasma membrane.
 - 4) Calmodulin is a Calcium binding protein.
 - 5) Blastopore is the first opening that forms during embryogenesis of bilaterally symmetric animals, which later becomes the gut.
 - 6) Caspases is a class of vertebrate proteases that function in apoptosis.
- Q.2 Write short note on the following.** **16**
- a) Ultrastructure & function of ribosomes
 - b) Fluid mosaic model of cell membrane
 - c) Desmosomes and Hemidesmosomes
 - d) Bacterial chemotaxis and quorum sensing
- Q.3 Answer the following.**
- a) Define cell cycle and give a detailed account on meiosis. **10**
 - b) Write a comparative account on Cell Structure and organization of prokaryotic and eukaryotic cells. **06**
- Q.4 Answer the following.**
- a) Define cell senescence and explain programmed cell death mechanism. **08**
 - b) Explain signal transduction pathway in regulation of Glucose levels. **08**
- Q.5 Answer the following.**
- a) Define Cytoplasmic Membrane and discuss in detail about Membrane permeability. **10**
 - b) Describe structure of gametes. **06**
- Q.6 Answer the following.**
- a) Write comparative account on Cell-cell interactions and cell-matrix interaction. **08**
 - b) Write in detail about Ultrastructure & function of Golgi apparatus **08**
- Q.7 Answer the following.**
- a) Explain embryonic development in frog. **08**
 - b) Explain Ras- MAP Kinase pathway. **08**

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M.Sc. (Semester - II) (Old) (CBCS) Examination: March/April-2024
BIOTECHNOLOGY
Enzyme Technology (MSC33202)

Day & Date: Saturday, 11-05-2024
 Time: 11:00 AM To 02:00 PM

Max. Marks: 80

- Instructions:** 1) Q. No. 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. 10

- 1) Tryptophan synthetase is an example of _____.
 - a) abzyme
 - b) ribozyme
 - c) catmab
 - d) multienzyme complex
- 2) The _____ is the numerical classification scheme for enzymes.
 - a) IUB
 - b) IU
 - c) EC number
 - d) Trival name
- 3) The practice to optimize genetic & regulatory processes of cells for production of a certain substance is _____.
 - a) covalent modification
 - b) metabolic engineering
 - c) allosteric regulation
 - d) feedback control
- 4) The _____ are the antibodies raised against transition state analogues.
 - a) ribocats
 - b) catmabs
 - c) transabs
 - d) abalogues
- 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) International unit of an enzyme is generally expressed in _____.
 - a) micromoles per min
 - b) millimoles per min
 - c) moles per min
 - d) moles per hour
- 7) The concept of steady state was introduced by _____.
 - a) Bohr and Hill
 - b) Jacob and Monad
 - c) Buchner and Summer
 - d) Briggs and Haldane
- 8) The _____ enzyme is responsible for initiation of pyrimidine biosynthesis
 - a) aspartate transcarbamoylase
 - b) carboxypeptidase
 - c) ribonuclease
 - d) creatine kinase
- 9) In competitive inhibition the inhibitor binds with _____.
 - a) substrate
 - b) active site
 - c) allosteric site
 - d) ES complex
- 10) Na⁺-K⁺ ATPase pumps _____ Na⁺ outside cytosole and _____ K⁺ inside the cytosole.
 - a) 3,3
 - b) 2,2
 - c) 3,2
 - d) 2,3

B) Fill in the blank/Definition/One sentence answer/One word answer/Give the name/Predict product/match the following. 06

- 1) Specific activity of an enzyme is the activity per _____ of protein content.
- 2) What is an allosteric site?
- 3) State the Michaelis Menten equation.
- 4) What are abzymes?
- 5) State clinical significance of any one enzyme.
- 6) Define enzyme activity.

Q.2 Answer the following. 16

- a) Write a note on transition state theory.
- b) Describe the mechanism of acid base catalysis.
- c) Write a note on scatchard plot.
- d) Describe 'methods to study fast enzymatic reactions'.

Q.3 Answer the following.

- a) Write an account on 'Classification of Enzymes', with two examples of each class **10**
- b) Describe effect of pH, temperature and substrate concentration on enzyme activity. **06**

Q.4 Answer the following.

- a) Describe various methods of enzyme immobilization. **10**
- b) Describe in detail 'clinical aspects of enzymology'. **06**

Q.5 Answer the following.

- a) Derive Michaelis Menten equation. State significance of V_{max} and K_m . **10**
- b) Explain a multienzyme complex with suitable example. **06**

Q.6 Answer the following. 16

- a) Describe graphical procedures in enzymology with mathematical equation.
- b) Explain catalysis by Na-K ATPases on the basis of structure function relationship.

Q.7 Answer the following. 16

- a) Describe types of reversible enzyme with its kinetics with respect to Lineweaver Burk plot.
- b) Write an account on application of enzymes as biosensors.

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**M.Sc. (Semester - II) (Old) (CBCS) Examination: March/April-2024
BIOTECHNOLOGY
Molecular Cell Processing (MSC33206)**

Day & Date: Tuesday, 14-05-2024
Time: 11:00 AM To 02:00 PM

Max. Marks: 80

- 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) Multiple Choose Question choose correct alternative. (MCQ) 10

- 1) Association of DNA and Histone is mediated by _____.
a) Covalent Bond
b) Hydrogen Bond
c) Hydrophobic Bond
d) Vander waals Interaction
- 2) _____ is the relaxed state of DNA
a) Linear DS DNA
b) Covalent DS DNA
c) Closed circular DNA
d) Covalent circular DNA
- 3) The unwinding of DNA produces single stranded region which is stabilized by _____.
a) DNA polymerase
b) Topoisomerase
c) SSB proteins
d) DNA Helicase
- 4) The higher-level packaging of chromatin requires _____.
a) H1 protein
b) Nucleosome
c) Non Histone Protein
d) Histone Protein
- 5) The Two strands of DNA are composed of simpler monomeric units called _____.
a) Nucleotides
b) Nucleosides
c) Nucleoids
d) Nucleic acid
- 6) Cot curve analysis is the technique based on the principle of _____.
a) DNA Hybridization
b) DNA denaturation
c) DNA Renaturation
d) DNA Hybridization & denaturation
- 7) Due to excessive DNA damage _____ occurs.
a) Apoptosis Initiates
b) Apoptosis inhibited
c) Mutation Initiation
d) Cancer Initiation
- 8) Base excision repair is important for _____.
a) Removing damaged bases.
b) Removing damaged purine bases
c) Removing damaged pyrimidine bases
d) Removing damaged amino acid Residue
- 9) Enzyme which regulates the level of supercoiling of DNA molecule is _____.
a) DNA ligase
b) DNA polymerase
c) DNA topoisomerases
d) DNA Helicases

- 10) Mismatch repair system is present in _____.
a) Only muscle cells b) Nerue cells
c) Endothelial cells d) All of these

B) Fill in the blanks **06**

- 1) Central Dogma was proposed by _____.
- 2) _____ is Aceidiamalogue of thymine.
- 3) _____ is the chemical agent which produces mutation.
- 4) The _____ region of t RNA molecule interacts with the m RNA.
- 5) The Sulphur containing amino acid in protein part of DNA is _____.
- 6) 1Gb is equal to _____.

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

- a) Write note on Satellite DNA.
- b) Explain DNA proof Reading activity.
- c) Write note on Types of Mutation.
- d) Explain central Dogma of life.

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

- a) Explain Lac operon.
- b) Explain nucleotide and base excision repair.

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

- a) Explain post translational modification in proteins with neat labelled diagram.
- b) Explain Tryptophane operon.

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

- a) Explain DNA Replication in Prokaryotes with neat labelled diagram.
- b) Explain Arabinose operon.

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

- a) Explain Transcription in Prokaryotes with labelled diagram.
- b) Explain Photoreactivation.

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

- a) Explain DNA Replication in Eukaryotes with neat labelled diagram.
- b) Explain Regulation of Translation.

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M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2024
BIOTECHNOLOGY

Industrial and Environmental Biotechnology (MSC33301)

Day & Date: Friday, 10-05-2024

Max. Marks: 80

Time: 11:00 AM TO 02:00 PM

- Instructions:** 1) Question no. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figure to right indicate full marks.

Q.1 A) Choose correct alternative.

10

- 1) The production of enzyme is mostly carried out by?
 - a) Batch fermentation
 - b) Continuous fermentation
 - c) Fed-batch fermentation
 - d) Semi-batch fermentation
- 2) Antibiotics are used to treat infections by _____.
 - a) Bacterial
 - b) Virus
 - c) Fungi
 - d) All of the Above
- 3) After the fermentation process, penicillin is recovered as _____.
 - a) Penicillin
 - b) Sodium Penicillin
 - c) Calcium Penicillin
 - d) Potassium Penicillin
- 4) A completely mixed continuous stirred-tank reactor for the cultivation of cells is called?
 - a) Electrostatic
 - b) Chemostat
 - c) Haemostat
 - d) Thermostat
- 5) Which of the following is a downstream process?
 - a) Screening
 - b) Product recovery
 - c) Media formulation
 - d) Sterilization of media
- 6) Which of the following species is used for producing tetracycline?
 - a) *S. erythraeus*
 - b) *S. venezuelae*
 - c) *S. aureofaciens*
 - d) All of the above
- 7) Which of the following type of fermentation is observed in yeasts?
 - a) Acrylic fermentation
 - b) Alcohol fermentation
 - c) Lactic Acid fermentation
 - d) Citric acid fermentation
- 8) Which type of chromatography depends on the principle of size of particles?
 - a) Affinity chromatography
 - b) Gel- filtration chromatography
 - c) Ion- exchange chromatography
 - d) Multimodal chromatography
- 9) Which among the following is not a vegetable or fruit-based fermented product?
 - a) Vinegar
 - b) Wine
 - c) Sauerkraut
 - d) All of the above
- 10) What do you mean by the term "Trace elements"?
 - a) Very small amount
 - b) Medium amount
 - c) High amount
 - d) Very high amount

- B) Fill in the blanks OR write True/ False. 06**
- 1) For high viscous fluids, air-driven reactors are preferred over stirred vessels.
 a) True b) False
 - 2) Baffles are not needed in Up and down agitation bioreactor.
 a) True b) False
 - 3) Coagulation and flocculation are different.
 a) True b) False
 - 4) Microbial process is advantageous than chemical process.
 a) True b) False
 - 5) Citric acid is a weak organic acid.
 a) True b) False
 - 6) Glucose and corn syrup is the same thing in accordance to sweeteners.
 a) True b) False

Q.2 Answer the following. 16

- a) Add a note on upstream process of citric acid with its application.
- b) Add a short note on Bioaccumulation.
- c) What are Bioindicators?
- d) Add a short note on Energy Sources.

Q.3 Answer the following.

- a) Discuss in detail the process of filtration and flocculation. 08
- b) Discuss the type of fermentation process and kinetics with respect to Batch and Continuous process. 08

Q.4 Answer the following.

- a) In brief discuss about Fermentation media preparation and sterilization. 10
- b) In detail explain construction and types of Bioreactor. 06

Q.5 Answer the following.

- a) Explain UN Declaration and discuss the concept of clean environment. 08
- b) What is Environmental impact assessment? State different Environment protection laws. 08

Q.6 Answer the following.

- a) Discuss the Isolation and Preservation of industrially important microorganism. 06
- b) What are antibiotics? In detail state the large-scale production of Penicillin. 10

Q.7 Answer the following.

- a) What is Upstream processing? Explain ethanol fermentation. 08
- b) What are xenobiotic? Mention different controlling measure of air pollution. 08

Seat No.	
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M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2024
BIOTECHNOLOGY
Genetic Engineering (MSC33302)

Day & Date: Monday, 13-05-2024
 Time: 11:00 AM To 02:00 PM

Max. Marks: 80

- Instructions:** 1) Question no. 1 and 2 are compulsory.
 2) Attempt any four questions from Q. No. 3 to Q. No. 7.
 3) Figure to right indicate full marks.

Q.1 Multiple Choice Questions choose correct alternative.

10

- 1) For the production of a DNA copy, the enzyme which uses RNA is called _____.
 a) DNA polymerase b) RNA polymerase
 c) DNA ligase d) Reverse transcriptase
- 2) _____ selection system is used in the Puc8 plasmid.
 a) Antibiotic selection
 b) Lactose selection
 c) Auxotrophic mutant selection
 d) Plaque morphology selection
- 3) Genomic library construction is concerned with _____.
 a) Gene isolation b) Protein production
 c) Antibiotics d) Regeneration
- 4) The set of DNAs generated by using random primers is _____.
 a) RAPD b) RFLP
 c) AFLP d) in-situ hybridization
- 5) _____ happens due to point mutation.
 a) Sickle cell anaemia b) Down's syndrome
 c) Night blindness d) Thalassemia
- 6) Type I restriction endonuclease cuts _____.
 a) Within the recognition sequence
 b) On either side of the recognition sequence
 c) 25 to 30 bp away from the recognition sequence
 d) 1000 bp away from the recognition sequence
- 7) Probe is _____.
 a) Chemically synthesized DNA
 b) Purified DNA
 c) Fragmented DNA duplex
 d) Either purified or synthesized single stranded DNA
- 8) _____ DNA duplex are obtained from one DNA duplex after 4 cycles of PCR.
 a) 4 b) 8
 c) 16 d) 32
- 9) Transgenic models exist for _____ disease.
 a) cold b) cough
 c) HIV d) cancer

- 10) _____ acts on the DNA after its entry into the cell.
- a) Ligases
 - b) Endonucleases
 - c) Deoxyribonucleases
 - d) Exonucleases

Q.2 State whether the following statement is True or False. 06

- 1) pBR327 is a conjugative plasmid.
- 2) SV4 is used as cloning vector.
- 3) Restriction endonucleases cannot recognize palindromic sequences.
- 4) PCR is a DNA amplifying in vitro method.
- 5) Manipulation of DNA to change its structure is called genetic engineering.
- 6) DNA polymerase enzyme is used only for DNA replication and not for DNA repair.

Q.3 Answer the following. 16

- a) Describe in brief about classification and properties of restriction endonucleases.
- b) Describe about structure and properties of plasmid and cosmid.

Q.4 Answer the following. 16

- a) How is DNA isolated and purified?
- b) Describe in detail about any two methods of screening of recombinant cells.

Q.5 Answer the following. 16

- a) Write a brief account on microarray techniques.
- b) How are recombinant vaccines produced?

Q.6 Answer the following. 06

- a) Write a brief account on molecular probes. 06
- b) Write a detail account on application of genetic engineering in plants. 10

Q.7 Answer the following. 06

- a) How is gene of interest assembled with vector DNA? 06
- b) Write in detail about methods of direct transformation. 10

Seat
No.

M.Sc. (Semester-III) (New) (CBCS) Examination: March/April - 2024
BIOTECHNOLOGY
Plant Biotechnology (MSC33306)

Day & Date: Wednesday, 15-05-2024
 Time: 11:00 AM To 02:00 PM

Max. Marks: 80

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

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

- 1) According to Mengel and Kirkby, _____ is a mineral nutrient that is part of carbon compounds.
 - a) Zinc
 - b) Nitrogen
 - c) Manganese
 - d) Copper
- 2) Laminar air flow has a number of small blower motors to blow air which pass through a number of _____ filters.
 - a) HPLC
 - b) HP-TLC
 - c) HEPA
 - d) NFT
- 3) Genes whose expression is stimulated by the activation of preexisting transcription factors are called _____.
 - a) secondary response genes
 - b) late genes
 - c) primary response genes
 - d) Noncoding genes
- 4) A nonsexual developmental process that produces a bipolar embryo with a closed vascular system from somatic tissues of a plant is called _____.
 - a) embryo culture
 - b) organogenesis
 - c) somaclonal variation
 - d) somatic embryogenesis
- 5) Long-term culture results in genetic instability and heterogeneity, thereby the accumulation of mutations, known as _____.
 - a) somatic embryogenesis
 - b) clonal propagation
 - c) somaclonal variation
 - d) micropropagation
- 6) _____ is one of the reasons proposed for the escape of the meristem from virus invasion.
 - a) Absence of the vascular system in the meristem
 - b) Meristem forms antibodies against viruses
 - c) Absence of auxin in the meristem
 - d) Low metabolic rate in meristematic cells
- 7) _____ are substances added to the freezing mixtures to protect cells from the effect of freeze-drying.
 - a) Cryoprotectants
 - b) Osmoticum
 - c) Plasmolyticum
 - d) Fusagens
- 8) _____ treatment is recommended to diploidized the pollen plants.
 - a) Thauthing
 - b) Colchicine
 - c) DMSO
 - d) Alginate

- 9) Introduction of foreign genes into plant cells using micropipettes is _____.
a) Electroporation b) Chemical - mediated gene transfer
c) Microinjection d) Particle gun
- 10) _____ vaccine is when the antigen is expressed in the edible part of the plant.
a) Covax b) Polio
c) Attenuated d) Edible

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

- 1) A part of plant used for tissue culture is known as an explant.
- 2) Synthetic seeds are prepared by encapsulation of somatic embryos.
- 3) Crown gall disease caused due to the infection of *Agro bacterium rhizogenes* to plants.
- 4) Haploid plants are produced by culturing somatic cells.
- 5) Iron content in transgenic plants can be increased by over expressing monellin.
- 6) Most commonly used solidifying agent in PTC media is agar.

Q.2 Write short note on the following.**16**

- a) Plant Nutrition
- b) Embryo Culture
- c) Microinjection
- d) Therapeutic proteins: edible vaccines

Q.3 Answer the following.

- a) Give a detailed account on Lab setup of Plant Tissue Culture laboratory. **10**
- b) Write about Initiation and Maintenance of Suspension culture. **06**

Q.4 Answer the following.

- a) Write the principle and applications of Shoot tip culture. **08**
- b) Describe Purification strategies by oleosin partitioning technology. **08**

Q.5 Answer the following.

- a) Write in detail about *Agrobacterium* - mediated gene transfer. **10**
- b) Explain principle of Organogenesis. **06**

Q.6 Answer the following.

- a) Write about Protoplast Fusion and Selection of Hybrid Cells. **08**
- b) Discuss Applications of plant biotechnology for Abiotic stress resistant plants. **08**

Q.7 Answer the following.

- a) Explain Production of Haploid Plants and Homozygous lines. **08**
- b) Explain Metabolic engineering in Plant for secondary metabolites. **08**

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Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024
BIOTECHNOLOGY
Animal Biotechnology and Stem Cell Technology (MSC33401)

Day & Date: Thursday, 09-05-2024

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 equations whenever necessary.

Q.1 A) Choose the correct alternatives from the options.**10**

- 1) Induced pluripotent stem cells are _____ in nature thus minimizing the chances of immune rejection.
a) autologous b) proliferative
c) differentiating d) adherent
- 2) _____ is a type of graft surgery involving the transplantation of skin.
a) Regeneration b) Skin grafting
c) Endodermal replacement d) Mucosal layer
- 3) The name of the first transgenic cow was _____.
a) Dolly b) Mary
c) Elle d) Rosie
- 4) Mesenchyme is derived from _____.
a) mesoderm b) adherent cells
c) ectoderm d) endoderm
- 5) _____ is the most frequently utilized source of Mesenchymal stem cells.
a) Adrenal glands b) Bone Marrow
c) Brain d) Kidney
- 6) _____ is the method of maintaining a whole embryo or organ excised from the host organism in an artificial medium.
a) Organ culture b) Explant culture
c) Horticulture d) Cell culture
- 7) _____ are also known as somatic stem cells.
a) Adult stem cells b) Cancer cells
c) Endometrial cells d) Epithelial cells
- 8) Hematopoietic cells are an example of _____.
a) suspension cells b) adherent cells
c) stem cells d) living cells

Seat
No.

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024
Biotechnology
Advanced analytical Techniques (MSC33402)

Day & Date: Saturday, 11-05-2024
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) Question no. 1 and 2 are compulsory.
 2) Attempt any three questions from Q. No. 3 to Q. No. 7.
 3) Figure to right indicate full marks.

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

- 1) Electrophoresis was developed by:
 - a) Tswett
 - b) Tsvedberg
 - c) Tiselius
 - d) Sanger
- 2) Which radiation has longer wavelength?
 - a) Radio wave
 - b) Ultraviolet
 - c) Microwave
 - d) Gamma rays
- 3) The resolving power of TEM is derived from _____.
 - a) electrons
 - b) specimens
 - c) power
 - d) ocular system
- 4) 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
- 5) Mass spectrometer separates ions on the basis of which of the following?
 - a) Mass
 - b) Charge
 - c) Molecular weight
 - d) Mass to charge ratio
- 6) Centrifugation based on which of the following law?
 - a) Pascal's law
 - b) Stokes law
 - c) Stain law
 - d) Patrick's law
- 7) Radioactive decay is _____.
 - a) the emission of energy
 - b) the transformation of energy
 - c) decomposition of element
 - d) none of above
- 8) The difference between the incident and scattered frequencies in the Raman spectrum is _____.
 - a) Raman frequency
 - b) Anti-Stoke's line
 - c) Stoke's line
 - d) P-branch
- 9) Isotopes of an element have a different number of _____.
 - a) Proton
 - b) Neutron
 - c) Electron
 - d) atom
- 10) Resolving power of light microscope is _____.
 - a) 2mm
 - b) 0.2mm
 - c) 0.1mm
 - d) 1 mm

B) Fill in the blanks OR Write True / False **06**

- 1) An Atom/Element gets ionized when it gains/losses electrons.
 - a) True
 - b) False
- 2) Gamma-ray spectrometry, is used for quantitative spectrum measurement of the uranium decay.
 - a) True
 - b) False
- 3) X- or gamma rays are the source of ionizing radiation in ionization chamber.
 - a) True
 - b) False
- 4) Pulsed-field gel electrophoresis (PFGE) is a technique used for the separation of large DNA fragments.
 - a) True
 - b) False
- 5) Chemical shift allows a chemist to obtain the idea of how atoms are joined together.
 - a) True
 - b) False
- 6) NMR is used to study the physical, chemical, and biological properties of matter.
 - a) True
 - b) False

Q.2 Answer the following **16**

- a) What is ultracentrifuge? Discuss the uses.
- b) What is column chromatography? Give its application?
- c) What is western blot? Mention its application.
- d) What are the factors affecting electrophoretic mobility.

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

- a) Explain the application, working of Agarose gel electrophoresis.
- b) What are the properties of electromagnetic radiation?

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

- a) Explain the application, working of preparative centrifuge.
- b) Explain the instrumentation and application of colorimeter.

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

- a) Explain the construction and working of a Southern blot?
- b) Discuss in detail about application and instrumentation of UV-Vis Spectroscopy.

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

- a) Discuss the construction of compound microscope.
- b) Explain in detail 2-D gel electrophoresis.

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

- a) What is chromatography? Explain working and applications of TLC.
- b) Explain the theory and application of SDS PAGE.

Seat
No.

**M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024
BIOTECHNOLOGY**

Research Methodology and Intellectual property Rights (IPR) (MSC33403)

Day & Date: Tuesday, 14-05-2024

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) Figure to right indicate full marks.

Q.1 A) Choose correct alternatives. (MCQ) 10

- 1) _____ is not an Indian funding agency for research and development.

a) UGC	b) CSIR
c) DBT	d) UNESCO
- 2) _____ 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
- 3) _____ 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
- 4) UPOV stands for _____.

a) United Property of Victoria
b) World Intellectual Property Organization
c) International Union for the Protection of New Varieties of Plants
d) Union Pollution Control Board
- 5) _____ 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
- 6) _____ 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
- 7) _____ is an Indian government department, under the Ministry of Science and Technology responsible for administrating development and commercialization in the field of modern biology and biotechnology in India.

a) DST	b) CSIR
c) ICMR	d) DBT
- 8) _____ is the practice of commercial exploitation of biochemicals or genetic materials which occur naturally.

a) Patent	b) Biopiracy
c) Plagiarism	d) Copy right

- 9) _____ 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
- 10) _____ are intellectual property (IP) rights on confidential information which may be sold or licensed.
- a) Patent
 - b) Copyright
 - c) Trade secrets
 - d) Trademark

B) Write true/false 06

- 1) A hypothesis is the concluding remark of a research.
- 2) t test is a statistical test that is used to compare the means of two groups.
- 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.
- 5) Plagiarism is an offense against the author.
- 6) ANOVA is analysis of variance.

Q.2 Write short answers of the following. 16

- a) Discuss intellectual property with example.
- b) Write in short about research.
- c) What is a scientific proposal? Name the funding agencies in India.
- d) Explain hypothesis with an example.

Q.3 Answer the following.

- a) Give a detailed account on Manuscript writing. 10
- b) Explain in detail Steps in Research. 06

Q.4 Answer the following.

- a) Discuss Plant variety protection in India and Farmer's right 08
- b) Explain in detail Presentation of a scientific paper. 08

Q.5 Answer the following.

- a) Give a detailed account on Thesis writing. 10
- b) Write about Intellectual property Infringement. 06

Q.6 Answer the following.

- a) Write about Variance and Correlation. 08
- b) Discuss in detail Technology transfer. 08

Q.7 Answer the following.

- a) Explain Scientific proposal writing for funding agencies. 08
- b) Define intellectual property and discuss forms of IP protection. 08

Seat No.	
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**M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April - 2024
BIOTECHNOLOGY**

Medical Biotechnology and Bionanotechnology (MSC33406)

Day & Date: Thursday, 16-05-2024

Max. Marks: 80

Time: 03:00 PM To 06:00 PM

- Instructions:** 1) Q.No.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 diagram and give equations whenever necessary.

Q.1 A) Choose correct alternative.

10

- 1) _____ is the physico-chemical component of biosensors.
 - a) Enzymes
 - b) Anti-bodies
 - c) Transducer
 - d) Cells or tissues
- 2) Viruses are _____.
 - a) Obligate intracellular parasites
 - b) May divide by binary fission
 - c) Have their own metabolism
 - d) May have an envelope
- 3) Following are toxin released by *S. aureus* EXCEPT: _____.
 - a) Botulinum
 - b) Alpha
 - c) Leucocidin
 - d) Enterotoxin
- 4) Carbon nanotubes are poor transmitters of electromagnetic radiations due to their _____.
 - a) High conductivity
 - b) Large surface area
 - c) High porosity
 - d) Chemical Stability
- 5) _____ bacteria are negative to catalase test.
 - a) *Enterobacter*
 - b) *Pseudomonas*
 - c) *Corynebacterium*
 - d) *Streptococci*
- 6) _____ is the predominant urogenital flora present during newborn female infants.
 - a) *Candida albicans*
 - b) *Lactobacillus acidophilus*
 - c) *Escherichia coli*
 - d) *Neisseria gonorrhoea*
- 7) _____ is a tetanus toxin.
 - a) Enterotoxin
 - b) Neurotoxin
 - c) Cytotoxin
 - d) Endotoxin
- 8) _____ cocci shaped bacteria is usually seen in pairs.
 - a) *Klebsiella spp*
 - b) *Neisseria spp*
 - c) *Pseudomonas spp*
 - d) *Clostridium spp*

- 9) Nanotechnology, in other word, is _____.
- a) Carbon engineering b) Small technology
c) Atomic engineering d) Microphysics
- 10) _____ is the common normal flora of upper respiratory tract.
- a) *Lactobacillus spp* b) *Staphylococcus spp*
c) *Vibrio spp* d) None of the above

B) Fill in the blank of following question. 06

- 1) The first talk about nanotechnology was given by _____.
- 2) _____ is a major virulence factor of *Streptococcus pneumoniae*.
- 3) *Vibrio cholerae* adheres to the epithelial cells of the small intestine by means of _____.
- 4) _____ body part contains the largest microbial population.
- 5) Outer covering of viruses called _____.
- 6) Nano meter = _____ cm.

Q.2 Answer the following. 16

Explain in details the host-microbe interactions add a detail note on Normal microbiota.

Q.3 Answer the following.

- a) Describe in details the molecular diagnosis of various diseases. 10
- b) Explain the mode of action of Penicillin and Streptomycin. 06

Q.4 Answer the following.

- a) Describe in details biosensors in medical diagnostics. 08
- b) Describe drug resistance and sensitivity add a note on drug resistance in bacteria. 08

Q.5 Answer the following.

- a) What is Bio-nanotechnology? Explain its concept and add a note on nanotube. 10
- b) Explain laboratory diagnosis of common infective syndromes. 06

Q.6 Answer the following.

- a) Explain the pathogenesis of salmonella with symptoms, Diagnosis, and treatment. 10
- b) Explain the synthesis of nanostructures with bio-based method. 06

Q.7 Answer the following.

- a) Explain in detail pathogenesis of HIV with symptoms, Diagnosis, and treatment. 10
- b) Explain in detail the application of nanotechnology viz. drug delivery and gene therapy. 06