R1929	Sub. Code
	501101

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

First Semester

Biotechnology

BIOCHEMISTRY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Choose which of the below gases Miller and Urey took along with H_2O and CH_4 to prove the origin of life (CO1, K1)

   (a) N_2 and H_2

   (b) CH_4 and N_2

   (c) CO_2 and NH_3

   (d) NH_3 and H_2

2. What is called the solution of the weak acid with its salt and a strong base? (CO1, K1)

   (a) Acid-base solution

   (b) Buffer

   (c) Saline

   (d) Solution

3. Which of the following is an imino acid? (CO2, K2)

(a) Proline (b) Alanine

(c) Serine (d) Glycine

4. Which of the following is true about intrinsic membrane proteins? (CO2, K2)

(a) They are Loosely bound to the bilayer surface

(b) They serve only a structural role in membranes

(c) They are usually transmembrane proteins

(d) They lack tertiary structure

5. Blocking of an enzyme action by blocking its active site is called as (CO3, K1)

(a) Feedback inhibition

(b) Competitive inhibition

(c) Non-competitive inhibition

(d) Allosteric inhibition

6. Koshland proposed which model (CO3, K1)

(a) Fluid mosaic model

(b) Lock and key model

(c) Induced fit model

(d) Reflective index model

7. Which of the following factor is not responsible for the actual change in free energy? (CO4, K1)

(a) pH

(b) Temperature

(c) Pressure

(d) The initial concentration of reactant and products

8. What is the standard free energy change of ATP? (CO4, K1)

(a) Small and positive

(b) Large and positive

(c) Small and negative

(d) Large and negative

9. The glycerol phosphate shuttle functions in (CO5, K2)

(a) Aerobic glycolysis to transport NADH equivalents resulting from glycolysis into mitochondria

(b) Anaerobic glycolysis for the regeneration of NAD

(c) Lipid catabolism

(d) Triglyceride synthesis

10. Which of the following cycle shows amphibolic pathway? (CO5, K1)

(a) Glycolysis

(b) Glyoxylate

(c) Citric acid cycle

(d) Lipid metabolism

Part B ($5 \times 5 = 25$)

Answer **all** questions not more than 500 words each.

11. (a) Describe the properties of water and its role in life on earth. (CO1, K1)

Or

(b) Define pH and describe the maintenance of blood and gastric juice pH. (CO1, K1)

12. (a) Compare biological function of polysaccharides; glycogen, amylose and cellulose (CO2, K2)

Or

(b) Explain the classification of amino acids based on polarity of side chain with examples. (CO2, K2)

13. (a) Write the characteristics of enzyme catalysis. (CO3, K1)

Or

(b) What is Michaelis Menton constant? Mention its significance. (CO3, K1)

14. (a) Describe the organization of electron carriers in mitochondrial electron transport chain diagrammatically. (CO4, K1)

Or

(b) Discuss in detail about oxidative and substrate level phosphorylation. (CO4, K2)

15. (a) Discuss the de nova synthesis pyrimidine nucleotides and its regulation. (CO5, K2)

Or

(b) Illustrate malate — aspartate shuttle system. (CO5, K2)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1,000 words each

16. (a) Describe the chemistry of NAD+ and FAD. (CO1, K1)

Or

(b) Explain first law of thermodynamics and the importance of second law of thermodynamics. (CO1, K2)

17. (a) Define glycolipids? Briefly discuss the major properties and significance of the lipids. (CO2, K2)

Or

(b) Discuss about the fluid mosaic model of biological membranes. (CO2, K2)

18. (a) Define enzymes. Explain in detail about how do enzymes operate? (CO3, K1)

Or

(b) Explain specificity constant. Illustrate Lineweaver Buck plot. (CO3, K2)

19. (a) Explain in detail about oxidative phosphorylation and the complexes involved in it. (CO4, K1)

Or

(b) Define Gibb's free energy. Describe the mechanism of free energy change for ATP. (CO4, K1)

20. (a) Explain in detail about the formation and structure of cholesterol and fatty acid oxidation (CO5, K2)

Or

(b) Elaborate Embden-Meyerhof pathway of glycolysis with flowchart. (CO5, K2)

———————

R1930

Sub. Code
501102

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

First Semester

Biotechnology

CELL AND MOLECULAR BIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Which organelle is involved in maintaining the shape and provide structural support to the cell? (CO1, K1)

   (a) Cytoskeleton

   (b) Endoplasmic Reticulum

   (c) Lysosome

   (d) Peroxisome

2. Lysosomes are called the suicidal bags of the cell because: (CO1, K2)

   (a) They digest foreign materials

   (b) When the cells are damaged, the lysosomes burst and the enzymes digest their own cells

   (c) They contain digestive enzymes

   (d) They promote cell death

3. How long are the solenoids after folding into super-coiled loops? (CO2, K2)

(a) 100 nm

(b) 500 nm

(c) 350 nm

(d) 700 nm

4. Which of the following plays a vital role in prokaryotic replication? (CO2, K2)

(a) DNA polymerase I

(b) DNA polymerase II

(c) DNA polymerase III

(d) DNA polymerase δ

5. Choose the CORRECT order of transport of protein in a secretory pathway. (CO3, K3)

(a) Protein synthesized in the cytoplasm → SER lumen → RER lumen → cis golgi → median golgi → trans golgi → vesicles → fusion of vesicles with plasma membrane → exocytosis

(b) Protein synthesized in the cytoplasm → RER lumen → cis golgi → median golgi → trans golgi → vesicles → fusion of vesicles with plasma membrane → exocytosis

(c) Protein synthesized in the cytoplasm → vesicles → SER → RER lumen → cis golgi → median golgi → trans golgi → vesicles → fusion of vesicles with plasma membrane → exocytosis

(d) Protein synthesized in the cytoplasm → RER lumen → trans golgi → median golgi → cis golgi → vesicles → fusion of vesicles with plasma membrane → exocytosis

6. Nuclear localization signal that ensures transport of a protein to nucleus is rich in ———— (CO3, K3)

(a) Lysine and arginine

(b) Glutamine and asparagine

(c) Serine and threonine

(d) Tryptophan and histidine

7. Which stage of plant growth is represented by root and shoot apex? (CO4, K4)

(a) Maturation (b) Elongation

(c) Meristematic (d) Elevation

8. Indole-3-acetic acid belongs to ———— class of phytohormone. (CO4, K4)

(a) Gibberellin (b) Auxin

(c) Ethylene (d) Cytokinin

9. Normally DNA molecule has A-T, G-C pairing. However, these bases can exist in alternative valency status, owing to rearrangements called ———— (CO5, K5)

(a) Point mutation

(b) Frameshift mutation

(c) Analogue substitution

(d) Tautomerization mutation

10. Which of the following DNA repair mechanism is known as the cut and patch mechanism? (CO5, K5)

(a) Photoreactivation

(b) Nucleotide excision repair

(c) Base excision repair

(d) Mismatch repair

Part B (5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Write a detailed note on lysosomes. (CO1, K1)

Or

(b) Describe the structural organization of the chloroplast. (CO1, K1)

12. (a) Explain the process of mRNA flow through nuclear envelope into cytoplasm. (CO2, K2)

Or

(b) Outline and illustrate the universal genetic code. (CO2, K2)

13. (a) Explain the molecular mechanism of membrane transport. (CO3, K3)

Or

(b) Describe the check points for the regulation of cell cycle. (CO3, K3)

14. (a) Elucidate about the structural organization of plant cell wall. (CO4, K4)

Or

(b) Give a detailed note on the organization of root apical meristem. (CO4, K4)

15. (a) What are the methods employed for detecting mutation? (CO5, K5)

Or

(b) Write the steps involved during the recombinational repair mechanism. (CO5, K5)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Write a detailed account on types of cytoskeletons? Mentions its functions. (CO1, K3)

Or

(b) Describe about the structure and organization of a eukaryotic cell. (CO1, K4)

17. (a) Why transcriptional factors are known as activators and repressors? (CO2, K3)

Or

(b) Describe about protein translation machinery. (CO2, K4)

18. (a) Write in detail about the regulation of intracellular protein transport across mitochondria. (CO3, K3)

Or

(b) Discuss about intracellular vesicular trafficking from ER to lysosomes. (CO3, K3)

19. (a) Define morphogenesis and write its mechanism in plants. (CO4, K4)

Or

(b) Elaborate about the process involved in shoot and root development in plants. (CO4, K4)

20. (a) Illustrate and explain about the lytic life cycle of a bacteriophage. (CO5, K5)

Or

(b) Describe about the mechanism involved during heat shock response in bacteriophage. (CO5, K5)

———————

R1931

Sub. Code
501103

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

First Semester

Biotechnology

PLANT AND ANIMAL BIOTECHNOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Batch cultures are type of suspension culture where (CO1, K1)

   (a) medium is continuously replaced

   (b) medium is loaded only at the beginning

   (c) no depletion of medium occurs

   (d) cellular wastes are continuously removed and replaced

2. The formation of embryoids from the pollen grains in the tissue culture medium is due to (CO1, K1)

   (a) Organogenesis

   (b) Test tube culture

   (c) Double fertilization

   (d) Cellular totipotency

3. The golden rice includes gene from (CO2, K3)

(a) daffodils (b) carnation

(c) tuberose (d) rose

4. Which of the following is a commonly used method for introducing foreign genes into bacterial cells? (CO2, K3)

(a) Electroporation

(b) Microinjection

(c) Agrobacterium-mediated transformation

(d) Protoplast fusion

5. What is molecular mapping in the context of genetics? (CO3, K4)

(a) Studying the physical characteristics of organisms

(b) Identifying and locating genes on a chromosome

(c) Analyzing protein structures in cells

(d) Investigating the effects of environmental factors on gene expression

6. Marker Assisted Selection (MAS) is so popular with plant breeders today because ————. (CO3, K4)

(a) it allows the breeder to select for traits that cannot be easily, or cheaply, selected based on phenotype

(b) it allows breeders to immediately patent genes

(c) it does not involve PCR

(d) it relies exclusively on morphological markers

7. Bar eye character of Drosophila is due to ————————. (CO4, K4)

(a) duplication in region of 16A of X chromosome

(b) deletion in region of 16A of X chromosome

(c) due to presence of additional X chromosome

(d) due to a point mutation in eye-locus

8. Today transgenic model exists for disease like ———————— (CO4, K4)

(a) cold (b) fatigue

(c) cystic fibrosis (d) fever

9. The first vaccine developed from the animal cell culture (CO5, K5)

(a) hepatitis B vaccine

(b) influenza vaccine

(c) small pox vaccine

(d) polio vaccine

10. Which of the following is the characteristics of a normal cell? (CO5, K5)

(a) Anchorage independent

(b) Continuous cell lines

(c) Dependent on external growth factor

(d) No contact inhibition

Part B (5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Mention the types of cell suspension culture. How are these used in plant biotechnology? (CO1, K1)

Or

(b) Write a short note on biodiversity conservation. (CO1, K1)

12. (a) Give a short note on plasmid-based vectors for plant transformation. (CO2, K3)

Or

(b) Explain about electroporation and microinjection. (CO2, K3)

13. (a) Discuss the key processes and factors involved in animal reproductive biology. (CO3, K4)

Or

(b) Explain the challenges and future prospectus of vaccinology. (CO3, K4)

14. (a) Define the term "transgenic animals' and explain the primary purpose of creating transgenic organisms. (CO4, K4)

Or

(b) Write a short note on production of transgenic proteins. (CO4, K4)

15. (a) Explain about cell culture media and reagents. (CO5, K5)

Or

(b) What are the applications of animal viral vaccines, and how do they contribute to disease prevention? (CO5, K5)

Part C ($5 \times 8 = 40$)

Answer **all** questions not more than 1000 words each.

16. (a) Write the principle, methods and applications of Cryopreservation. (CO1, K1)

Or

(b) What are molecular markers and how it is used for analysis genetic diversity? (CO1, K1)

17. (a) Give a detailed note on Agrobacterium mediated genetic transformation. (CO2, K3)

Or

(b) Explain about abiotic stress responsive genes in plants. (CO2, K3)

18. (a) Describe the primary objectives of the Arabidopsis Genome Initiative (AGI) and explain why *Arabidopsis thaliana* was chosen as a model organism for this genomic research. (CO3, K4)

Or

(b) Explain Marker-Assisted Selection (MAS) and explain how it differs from traditional breeding methods. (CO3, K4)

19. (a) Explain about the methods for the construction of recombinant animal vectors for gene transfer into cell lines. (CO4, K4)

Or

(b) Write about the physical methods of gene transfer. (CO4, K4)

20. (a) How is the culture of mammalian cells, tissues, and organs conducted in laboratory settings for research and applications? (CO5, K5)

Or

(b) How is the testing of the toxicity of environment pollutants conducted using cell culture methods? (CO5, K5)

———————

R1932	Sub. Code
	501104

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

First Semester

Biotechnology

MICROBIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. According to the Whittaker's Five Kingdom Classification, bacteria are classified in the kingdom; (CO1, K1)

   (a) Monera

   (b) Protista

   (c) Fungi

   (d) Plantae

2. In what year was the first edition of Bergey's Manual of Systematic Bacteriology published? (CO1, K1)

   (a) 1903

   (b) 1984

   (c) 1943

   (d) 1963

3. Disinfection aims to eliminate which of the following? (CO2, K2)

(a) All forms of microbial life, including spores

(b) Only bacterial spores

(c) Only vegetative forms of microorganisms

(d) Both vegetative forms and spores of microorganisms

4. Which of the following is not an antibiotic drug? (CO2, K3)

(a) Penicillin

(b) Ampicillin

(c) Oseltamivir

(d) Tetracycline

5. What is the primary constituent of the bacterial cell wall? (CO3, K2)

(a) Cellulose

(b) Peptidoglycan

(c) Chitin

(d) Glycogen

6. What type of disease is Bovine Spongiform Encephalopathy (BSE)? (CO3, K4)

(a) Viral disease

(b) Bacterial disease

(c) Prion disease

(d) Fungal disease

7. Which of the following fungi is commonly associated with nosocomial infections? (CO4, K4)

(a) *Penicillium* sp. (b) *Aspergillus* sp.

(c) *Rhizopus* sp. (d) *Cryptococcus* sp.

8. Which genus is the most well-known and abundant in the oral cavity? (CO4, K3)

(a) *Clostridium* sp.

(b) *Bacteroides* sp.

(c) *Streptococcus* sp.

(d) *Lactobacillus* sp.

9. Which of the following describes mutualistic microbial interactions? (CO5, K2)

(a) Competition for resources between two bacterial species

(b) Predation of one bacterial species by another

(c) Exchange of nutrients beneficial to both microbial partners

(d) Parasitic relationship where one microbe benefits at the expense of another

10. Which type of extremophile thrives in low temperature? (CO5, K1)

(a) Thermophiles

(b) Halophiles

(c) Acidophiles

(d) Psychrophiles

Part B (5 × 5 = 25)

Answer **all** questions, not more than 500 words each.

11. (a) Discuss the scope of microbiology. (CO1, K2)

Or

(b) Explain Haeckel's three kingdom system of classification. (CO1, K2)

12. (a) Explain the principle, instrumentation and applications of hot air oven. (CO2, K2)

Or

(b) What is the difference between sterilization and disinfection? Provide examples of each. (CO2, K2)

13. (a) Explain the stages of a bacterial growth curve. (CO3, K3)

Or

(b) Define prions and outline their basic properties. (CO3, K3)

14. (a) Describe the following: Invasion and colonization, Toxins. (CO4, K3)

Or

(b) What is normal microflora? Name two normal microflora found in the skin, gastrointestinal tract and respiratory tract. (CO4, K4)

15. (a) Outline the steps involved in beer production. (CO5, K3)

Or

(b) Difference between prebiotics and probiotics. (CO5, K4)

Part C ($5 \times 8 = 40$)

Answer **all** questions, not more than 1,000 words each.

16. (a) Define microbiology? Summarize the history of microbiology. (CO1, K2)

Or

(b) Explain Whittaker's five kingdom system of classification. (CO1, K2)

17. (a) Explain antiviral and antifungal drugs. (CO2, K3)

Or

(b) Explain various physical methods used to control microorganisms. (CO2, K3)

18. (a) Define virus? Explain the steps involved in viral replication. (CO3, K3)

Or

(b) Explain in detail about the morphology and structure of bacteria. (CO3, K2)

19. (a) Explain different types of pathogen transmission routes. (CO4, K3)

Or

(b) Explain the mechanisms of drug resistance in microbial pathogens. (CO4, K4)

20. (a) Describe the process of making wine from grapes. (CO5, K2)

Or

(b) Explain in detail about quorum sensing and its inhibition mechanism. (CO5, K4)

———————

R1933	Sub. Code
	501105

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

First Semester

Biotechnology

GENETICS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Alternative forms of the same gene that influences the same trait and produces a wide variety of phenotypic traits. (CO1, K3)

   (a) Multiple allele

   (b) Transposons

   (c) Idiomorph

   (d) Epialleles

2. The common mammalian start codon codes for ————————. (CO1, K3)

   (a) Methionine

   (b) Hisitidine

   (c) Pseudo amino acid

   (d) Cysteine

3. Which of the following are the reasons for daughter cells to differ from parent cells and also each other after meiosis is (CO1, K3)

(I) Segregation

(II) Crossing over

(III) Independent assortment

(a) (I) and (III) and not (II)

(b) (II) and (III)

(c) (I) and not (II) and (III)

(d) (I), (II) and (III)

4. Of the following, which one of the individuals will NOT necessarily carry the allele responsible for the mentioned trait? (CO2, K4)

(a) A woman in a family where an autosomal dominant trait is segregating and her mother and son are affected

(b) A daughter of a man who is affected by an X-an autosomal recessive trait

(c) A father of a child who is affected with an autosomal recessive trait

(d) A father of a boy affected with X-linked recessive trait

5. In a genetic test 9:7 ratio in F2 generation represents (CO2, K4)

(a) Epistasis

(b) Co-dominance

(c) Incomplete dominance

(d) Complete dominance

6. If inheritance of disease to next generation is only possible through females. The probable inheritance is (CO2, K3)

(a) Sex-linked (b) Medeleian

(c) Organellar (d) Autosomal

7. Higher the genetic variation or gene pool within a breeding population, the less likely it is to suffer from ————————. (CO2, K4)

(a) Genetic variation

(b) In-breeding depression

(c) Loss of recessive advantageous phenotypes

(d) Ecological restoration

8. Genetic drift can be defined as ————————. (CO2, K3)

(a) Gene frequencies change over time because of random effects due to a large population size

(b) Gene frequencies change over time because of random effects due to a small population size

(c) Gene frequencies stay the same over time because of random effects due to a small population size

(d) Gene frequencies change over time because of predicted effects due to a small population size

9. In a region of DNA associated with a specific phenotype or trait that varies within a population? (CO3, K2)

(a) 1:1 (b) 1: 3

(c) 3:1 (d) 2:1

10. An offspring is heterotic if its traits are ———————— as a result of mixing the genetic contributions of its parents. (CO3, K2)

(a) Suppressed (b) Unchanged

(c) Inferior (d) Enhanced

Part B (5 × 5 = 25)

Answer **all** the questions not more than 500 words each.

11. (a) Write a note on Linkage maps. How recombination frequencies are historically used to build linkage maps? (CO1, K3)

Or

(b) Give an account on the structure of a eukaryotic gene with a clear diagram. (CO1, K4)

12. (a) Write an essay on Multiple Alleles and its inheritance. (CO1, K4)

Or

(b) Write an essay on Mendel's Laws of Inheritance with suitable examples. (CO2, K3)

13. (a) Write a note on Genetic recombination. How are chimeric alleles produced during meiosis? (CO2, K3)

Or

(b) Explain genetic mosaicism and list and describe the various types of mosaicism. (CO3, K3)

14. (a) Give a detailed note on random genetic drift and explain the two main types of genetic drift and how do they differ each other. (CO2, K3)

Or

(b) Give an account on "Gene pyramiding". Narrate the objectives of gene pyramiding. (CO6, K2)

15. (a) What type of selection practice is done in vegetatively reproducing plant? Write down the procedure and merits of this process. (CO6, K2)

Or

(b) Discuss different methods of germplasm maintenance. (CO3, K2)

Part C ($5 \times 8 = 40$)

Answer **all** the questions not more than 1000 words each.

16. (a) Elaborate genetic recombination in bacteria. (CO1, K3)

Or

(b) Write short notes on the following with appropriate examples (CO1, K4)

(i) Lethal genes

(ii) Split genes

(iii) Overlapping gene

17. (a) Write an essay on pattern of inheritance that does not follow Mendel's laws with proper example. (CO2, K4)

Or

(b) What are the mating cell types in haploid yeasts? Write a note on Mating type switching and their mechanism. (CO2, K3)

18. (a) What are the tools available for couples to identify if they are carriers of a heredity disease? (CO2, K3)

Or

(b) Give an account on Epistasis. Add a note on their causes and classifications. (CO3, K3)

19. (a) State and explain Hardy-Weinberg principle. What are the assumptions underlying Hardy-Weinberg equilibrium and the consequence of violations of the assumptions. (CO4, K2)

Or

(b) Write an essay on gene flow and spatial patterns and add a note on how it is measured and the barriers associated? (CO4, K2)

20. (a) What are Quantitative traits and what is the importance of mapping Quantitative Trait Loci (QTL)? How is QTL used in investigating the genetic determinism of yeast? (CO5, K2)

Or

(b) Write a note on the model plants for genetic studies in plant. Describe at least two methods used in genetic engineering of plants. (CO6, K2)

———————

R1934	Sub. Code
	501106

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

First Semester

Bio-Technology

BASICS OF MATHEMATICS AND STATISTICS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 1 = 10)$

Answer **all** the following objective type questions by choosing the correct option.

1. Which form of a linear equation is useful for constructing linear models in biological systems? (CO1, K2)

   (a) Slope-intercept form

   (b) Standard form

   (c) Point slope form

   (d) General form

2. What is the degree of the polynomial $3x^2 - 2x + 1$? (CO1, K2)

   (a) 0 (b) 2

   (c) 3 (d) 1

3. The derivative of $x^2 \cos x$ is ————. (CO2, K2)

(a) $2x \sin x - x^2 \sin x$

(b) $2x \cos x - x^2 \sin x$

(c) $2x \sin x - x^2 \cos x$

(d) $\cos x - x^2 \sin x \cos x$

4. $\lim_{x \to \pi} \frac{(\sin x)}{(x - \pi)}$ is equal to ————. (CO2, K2)

(a) 1 (b) 2

(c) –1 (d) –2

5. If a population has an age structure pyramid with a broad base, what does it suggest about the population?

(CO3, K1)

(a) Stable population

(b) Declining population

(c) Growing population

(d) Aging population

6. The term for the maximum number of individuals an environment can support over the long term ————.

(CO3, K1)

(a) Carrying capacity

(b) Birth rate

(c) Death rate

(d) Population density

7. $E(X) = \mu$ and $V(X) = \sigma^2$ is for which distribution?

(CO4, K1)

(a) Bernoulli's

(b) Binomial

(c) Poisson's

(d) Normal

8. If $P(x) = 0.5$ and $x = 4$, then $E(x) =$ ———— ?

(CO4, K2)

(a) 1 (b) 0.5

(c) 4 (d) 2

9. A table with all possible value of a random variable and its corresponding probabilities is called ————.

(CO4, K1)

(a) Probability Mass Function

(b) Probability Density Function

(c) Cumulative distribution function

(d) Probability Distribution

10. Let there be two newly launched phones A and B. The probability that phone A has good battery life is 0.7 and the probability that phone B has good battery life is 0.8. Then find the probability that a phone has a good battery life. (CO4, K2)

(a) 0.65 (b) 0.75

(c) 0.85 (d) 0.45

Part B (5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Define the discriminant of a quadratic equation with an example. (CO1, K2)

Or

(b) Determine the slope and y-intercept of the line $y = -2x + 4$. (CO1, K3)

12. (a) Use integration by parts to evaluate $\int x\cos(x)dx$.

(CO2, K5)

Or

(b) Define the limit of a function with examples.

(CO2, K2)

13. (a) Describe about the developmental patterns.

(CO3, K2)

Or

(b) Explain the modeling chemical reaction networks.

(CO3, K2)

14. (a) In a deck of cards, what is the probability of drawing a red card given that the card is a face card? (CO4, K5)

Or

(b) Discuss the importance of random sampling in statistical studies. (CO4, K2)

15. (a) Discuss the concept of error propagation. (CO4. K2)

Or

(b) Define a continuous random variable with example. (CO4, K2)

Part C $(5 \times 8 = 40)$

Answer **all** questions not more than 1000 words each.

16. (a) Discuss in detail about Pythagorean theory. (CO1, K2)

Or

(b) Explain the form of two variable linear equations. (CO1, K2)

17. (a) State and prove the Fundamental Theorem of Calculus. (CO2, K2)

Or

(b) Evaluate $\lim_{x \to 0} \frac{x - \sin x}{x^3}$ by the L'Hospital's rule. (CO2, K5)

18. (a) Explain the concept of circadian rhythms in population dynamics. (CO3, K2)

Or

(b) Describe about the oscillations in population dynamics. (CO3, K2)

19. (a) Distinguish between the populations and samples. (CO4, K2)

Or

(b) Explain the concept of conditional probability. (CO4, K2)

20. (a) Write a detailed note about one way ANOVA. (CO4, K2)

Or

(b) Explain the steps involved in performing a simple linear regression analysis. (CO4, K2)

———————

R1935

Sub. Code
501107

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

First Semester

Biotechnology

BASICS OF CHEMISTRY AND PHYSICS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Which of the following is a physical quantity that has a magnitude but no direction? (CO1, K2)

   (a) Vector (b) Scalar

   (c) Resultant (d) Both (a) and (b)

2. The law which states that within elastic limits strain produced is proportional to the stress producing it is known as ————————. (CO1, K4)

   (a) Bernoulli's law (b) Stress law

   (c) Hooke's law (d) Newton's law

3. What is the set of ultrafine water particles or ice crystals floating in the air? (CO1, K2)

   (a) Fog (b) Cloud

   (c) Dew (d) Smog

4. Which of the following thermodynamic law gives the concept of enthalpy? (CO1, K4)

(a) First law of thermodynamics

(b) Second law of thermodynamics

(c) Third law of thermodynamics

(d) Fourth law of thermodynamics

5. In which of the following cases the Ohm's law is not applicable? (CO1, K2)

(a) Electrolytes

(b) Vacuum ratio values

(c) Arc lamps

(d) Insulators

6. Which of the following possess a positive charge? (CO2, K4)

(a) Protons (b) Atom

(c) Neutrons (d) Electron

7. What does the unit 'mmole/kg' represent? (CO2, K2)

(a) Molarity (b) Molality

(c) Molar mass (d) Milli molarity

8. In which state of matter the mass spectroscopy is being performed? (CO2, K4)

(a) Solid (b) Liquid

(c) Gaseous (d) Plasma

9. The amino acids are linked together by which of the following bonds? (CO2, K5)

(a) Disulfide bond (b) Hydrogen bond

(c) Ionic bond (d) Peptide bond

10. In Alkenes the Carbon atoms are connected to each other by (CO2, K5)

(a) Single bond (b) Double bond

(c) Triple bond (d) Not connected

Part B ($5 \times 5 = 25$)

Answer **all** the questions not more than 500 words each.

11. (a) Define vectors and scalars. Explain the difference between a vector and a scalar quantity, providing two examples of each. (CO1, K2)

Or

(b) Describe power and energy in the context of physics. Provide equations for calculating each of these quantities and briefly explain their physical significance. (CO1, K4)

12. (a) Briefly discuss the characteristics and differences between transverse and longitudinal waves with an example. (CO1, K2)

Or

(b) Describe the Doppler effect and its impact on the observed frequency and wavelength of waves. (CO1, K4)

13. (a) Explain Maxwell's demon thought experiment and its implications for the second law of thermodynamics. (CO1, K2)

Or

(b) Define atom, atomic weight and atomic number with an example. (CO2, K5)

14. (a) Explain how Avogadro's number relates to the mole concept, the atomic and molecular scale. (CO2, K4)

Or

(b) Discuss the fundamentals of chemical reactions, reaction stoichiometry and the factors influencing reaction rates and rate constants. (CO2, K5)

15. (a) Write short mote on the phenomenon of bioluminescence in organisms. Explain its biochemical significance. (CO2, K4)

Or

(b) Describe the different states of matter and their properties with suitable examples. (CO2, K5)

Part C $(5 \times 8 = 40)$

Answer **all** questions not more than 1000 words each.

16. (a) State and define the three fundamental kinematic equations that describe the motion of an object with constant acceleration. Explain under what conditions these equations are applicable. (CO1, K2)

Or

(b) Derive the expressions for the final velocities of two objects after an elastic collision in one dimension. Discuss the conservation laws that are applied and explain the significance of these results. (CO1, K4)

17. (a) State and explain the three Newton's laws of motion. Provide examples for each law. (CO1, K2)

Or

(b) Discuss the application of the first and second laws of thermodynamics in biological systems. Illustrate your explanation with examples of how energy is converted and utilized in living organisms.(CO1, K4)

18. (a) Explain Coulomb's Law and derive its mathematical expression. Discuss its similarities and differences with Newton's law of gravitation. (CO1, K2)

Or

(b) Elucidate the principles, components and applications of mass spectrometry. (CO2, K4)

19. (a) Give an account on the components of the Arrhenius equation, factors influencing reaction rates and how temperature affects reaction kinetics. (CO2, K5)

Or

(b) Explain the principles underlying the Boltzmann distribution, factors influencing it and its application in understanding temperature, energy distribution and equilibrium in physical systems. (CO2, K4)

20. (a) Discuss the principles of chemical thermodynamics, including key concepts such as energy, entropy, Gibbs free energy and their significance in understanding chemical reactions and equilibrium. (CO2, K2)

Or

(b) Discuss the mechanisms of ATP production and dissipation across biological membranes. How ATP is transported across membranes in living organisms? (CO2, K5)

———————

R1936	Sub. Code
	501108

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

First Semester

Biotechnology

LAB I : BIOCHEMISTRY AND ANALYTICAL TECHNIQUES

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. ———————— is defined as the number of gram equivalent weights of solute dissolved per litre of the solution. (CO1, K2)

   (a) Molality (b) Normality

   (c) Molarity (d) Mole fraction

2. Estimate the molarity of a solution containing 5g of NaOH in 450 ml solution. (CO1, K6)

   (a) 0.278×10^{-3} M (b) 0.278 M

   (c) 2.78×10^{-3}M (d) 2.78M

3. Select which of the following is true for the equivalence point of a strong acid/weak base titration? (CO2, K5)

(a) pH pK_a (b) pH = 7

(c) pH < 7 (d) pH > 7

4. Show which of the following is true regarding the Henderson-Hasselbalch equation. (CO2, K2)

(i) The pH of the solution is always greater than the pKa of the solution.

(ii) As the ratio of conjugate base to acid increases, the pH increases.

(iii) The hydrogen ion concentration can never equal the acid dissociation constant.

(a) I only (b) I and II

(c) II only (d) II and III

5. Choose which of the following is not true about Absorption spectroscopy? (CO3, K6)

(a) It involves transmission

(b) Scattering is kept minimum

(c) Reflection is kept maximum

(d) Intensity of radiation leaving the substrate is an indication of an concentration

6. Select which type of Quantum Transition takes place in Ultra Violet and Visible spectroscopy? (CO3, K6)

(a) Rotation of molecules

(b) Nuclear

(c) Bonding electrons

(d) Spin of nuclei in a magnetic field

7. Ion exchange chromatography is based on the (CO4, K1)

(a) Electrostatic attraction

(b) Electrical mobility of ionic species

(c) Adsorption chromatography

(d) Partition chromatography

8. The speed of migration of ions in electric field depends upon (CO4, K1)

(a) Shape and size of molecule

(b) Magnitude of charge and shape of molecule

(c) Magnitude of charge, shape and mass of molecule

(d) Magnitude of charge and mass of molecule

9. When the velocity of enzyme activity is plotted against substrate concentration, which of the following is obtained? (CO5, K1)

(a) Hyperbolic curve

(b) Parabola

(c) Straight line with positive slope

(d) Straight line with negative slope

10. Which of the following components of the X-ray fluorescent spectrometer induces fluorescent radiation? (CO5, K1)

(a) Excitation source

(b) Energy analyzer

(c) X-ray spectrometer

(d) Detection system

Part B (5 × 5 = 25)

Answer **all** the questions not more than 500 words each.

11. (a) Explain a mole and estimate the molar concentration of ethanol in aqueous solution that contains 2.30g C_2H_5OH in 3.5 L (Mol. Wt of ethanol: 46.07) (CO1, K6)

Or

(b) Discuss about buffer capacity. Mention few applications of buffers. (CO1, K6)

12. (a) Show the pKa of acetic acid, given the fact that the concentration of free acetic acid is 0.15M and that of sodium acetate is 0.3M. The pH of the solution is 5.26. (CO2, K2)

Or

(b) Summarize isoionic point and isoelectric point. (CO2, K2)

13. (a) Compare absorption and emission spectra. (CO3, K4)

Or

(b) Distinguish between colorimetry and spectrophotometly. (CO3, K4)

14. (a) Discuss about paper chromatography. (CO4, K6)

Or

(b) Elaborate the role of urea, SDS and β-mercaptoethanol in protein separation. (CO4, K5)

15. (a) Explain briefly about phosphorescence and fluorescence. (CO5, K5)

Or

(b) Define retention time and relative retention time in response to GC-MS. (CO5, K5)

Part C ($5 \times 8 = 40$)

Answer **all** the questions not more than 1000 words each.

16. (a) Discuss briefly on tris buffers and phosphate buffers. (CO1, K6)

Or

(b) Elaborate on the factors that affect pH measurement with glass electrode. (CO1, K6)

17. (a) Explain Henderson- Hasselbalch equation.(CO2, K2)

Or

(b) The isotonic and isoelectric point of an amino acid are usually identical. But in case of proteins it is not so. Explain. (CO2, K2)

18. (a) Generate a brief note on the components of a spectrophotometer in details and discuss it's uses in biochemistry. (CO3, K4)

Or

(b) Explain in detail the Beer-Lambert's law. (CO3, K5)

19. (a) Explain the concept of thin layer chromatography and application for amino acid analysis. (CO4, K5)

Or

(b) Construct a note on PAGE using native and SDS gel systems. (CO4, K5)

20. (a) Derive the Michaelis-Menton equation. (CO5, K5)

Or

(b) Explain the principle, operation and applications of GC-MS. (CO5, K6)

———————

R1937	Sub. Code
	501109

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

First Semester

Biotechnology

LABORATORY II : MICROBIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. The main product glycolysis under aerobic condition is _____ (CO1, K3)

   (a) Pyruvate (b) Lactate

   (c) Ethanol (d) Glucose

2. Which of the following is a rich source of B vitamins? (CO1, K3)

   (a) Peptone (b) Yeast extract

   (c) Beef extract (d) Tryptone

3. Mycotoxins are formed during the end of _____ (CO2, K2)

   (a) Lag phase (b) Log phase

   (c) Death phase (d) Stationary phase

4. Most bacteria require vitamins as (CO2, K4)

(a) Growth Factors

(b) Sources of energy

(c) Sources of carbon

(d) Sources of electron donars

5. Geosmin, responsible for the earthy scent produced when rain falls on dry soil is produced by bacteria of the phylum (CO2, K3)

(a) Actinomycetota (b) Bacillota

(c) Pseudomonadota (d) Armatimonadota

6. Which of the following organisms lack definite cell wall? (CO1, K3)

(a) Mycoplasma (b) L-forms

(c) Both (a) and (b) (d) Bacteria

7. Endotoxin produced by gramnegative bacteria is present in? (CO2, K4)

(a) Peptidoglycan (b) Lippolysacharide

(c) Theichoic acid (d) Inner membrane

8. The preferred culture media for Kirby Bauer method for antimicrobial sensitivity test is (CO2, K4)

(a) Luria Bertani agar

(b) Mueller Hinton Agar

(c) Nutrient agar

(d) Tryptic soya agar

9. Quorum sensing (QS) is a bacterial cell–cell communication process that involves the production, detection, and response to extracellular signaling molecules called ———————— (CO2, K3)

(a) Autoinducers (b) Ligands

(c) Chemoattractants (d) Virulence factors

10. A flatoxin is produced by ———————— (CO2, K4)

(a) Aspergillus sps (b) Penicillium sps

(c) Alternaria sps (d) None of the above

Part B ($5 \times 5 = 25$)

Answer **all** the questions not more than 500 words each.

11. (a) Write a note on two sterilization methods involved in the preparation of microbial culture media. (CO1, K3)

Or

(b) Explain how different colonial morphologies help in characterizing Bacterial colonies. (CO1, K4)

12. (a) Give an account on microbial culture media preparation. What is the composition of nutrient agar media? (CO1, K4)

Or

(b) Show with proper diagrammatic representation on serial dilution of a water sample for plating of a bacterial culture. (CO2, K3)

13. (a) Write a note on pure cultures. How are they isolated from the environment and established? (CO2, K3)

Or

(b) Define Minimal Inhibitory concentration (MIC). How is MIC used in identifying drug resistance? (CO2, K3)

14. (a) List out the common source of the following bacterial strains. (CO2, K3)

(i) *Bacillus subtilis*

(ii) *E. coli*

(iii) *Staphylococcus aureus*

Or

(b) What is the role of bacterial cell-cell communication system in biofilm formation? (CO3, K2)

15. (a) Elaborate the following methods (CO3, K2)

(i) Continuous Streak plate

(ii) Quadrant streak plate

(iii) Spread plate.

Or

(b) How is Drug resistance in bacterial isolates screened? Why is it important to screen drug resistance in clinical isolates? (CO3, K2)

Part C (5 × 8 = 40)

Answer **all** the questions not more than 1000 words each.

16. (a) What are the methods to maintain bacterial cultures? Explain with neat diagrams. (CO1, K3)

Or

(b) Describe the principle involved in various sterilization techniques involved in microbial cell culture. (CO1, K4)

17. (a) How is aseptic conditions maintained in a microbial cell culture laboratory? (CO1, K4)

Or

(b) Give a detailed note on intermittent sterilization. (CO2, K3)

18. (a) Give a detailed note on the principle and methods Grams staining and their application. (CO2, K3)

Or

(b) Write the method for enumerating microbial colonies from soil sample. (CO2, K3)

19. (a) How is phenol co-efficient of antimicrobial agents determined? What is the purpose of the experiment? (CO3, K2)

Or

(b) Enlist and write the principles of biochemical test used for identifying common bacterial strains isolated from air. (CO3, K2)

20. (a) List of the precautions adapted in a microbiological laboratory to prevent the scenario of pathogenic bacterial outbreak. (CO3, K2)

Or

(b) What are multi drug resistant bacteria? Name a MDR bacterium seen in hospital setting. What are the saferguards required to prevent an out burst. (CO3, K2)

———————

R1938	Sub. Code
	501110

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

First Semester

Biotechnology

LABORATORY III : PLANT AND ANIMAL BIOTECHNOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Which cryopreservation technique involves cooling plant tissues at an ultra-rapid rate to prevent ice crystal formation? (CO1, K3)

   (a) Virification (b) Desiccation

   (c) Freezing (d) Osmoprotection

2. What is the primary advantage of micro-propagation for the mass production of medicinal plants? (CO1, K3)

   (a) Genetic variation

   (b) Rapid multiplication of elite clones

   (c) Resistance to diseases

   (d) High seed yield

3. What does RAPD stand for in the context of genetic profiling? (CO2, K3)

(a) Random Amplified Polymorphic DNA

(b) Rapid Analysis of Plant DNA

(c) Relative Amplification of Sequence Patterns

(d) Restriction Analysis of Phylogenetic Data

4. What is the significance of using Agrobacterium rhizogenes-mediated transformation in medicinal plant research? (CO2, K3)

(a) Increased resistance to pests

(b) Enhanced drought tolerance

(c) Efficient production of pharmaceutical compounds

(d) Accelerated flowering

5. Which biosafety level is suitable for work involving agents that pose moderate hazards to humans and the environment? (CO3, K3)

(a) Biosafety Level 1 (BSL-1)

(b) Biosafety Level 2 (BSL-2)

(c) Biosafety Level 3 (BSL-3)

(d) Biosafety Level 4 (BSL-4)

6. What distinguishes a primary cell line from an established or continuous cell line? (CO3, K3)

(a) Shorter lifespan in culture

(b) Derived directly from the organism

(c) Immortality in culture

(d) Tumorigenic properties

7. Which assay is more suitable for assessing cell proliferation over an extended period? (CO4, K4)

(a) MTT assay

(b) Trypan blue assay

(c) Both provide similar results

(d) Neither is suitable for proliferation studies

8. In the acridine orange/EtBr staining method, what does the red fluorescence indicate? (CO4, K4)

(a) Viable cells

(b) Early apoptotic cells

(c) Late apoptotic or necrotic cells

(d) Proliferating cells

9. What is the primary purpose of acclimatizing mice before experiments? (CO5, K3)

(a) To induce stress

(b) To minimize stress and adapt to the environment

(c) To increase aggression

(d) To reduce body weight

10. Which animal model is commonly used for studying cardiovascular diseases? (CO5, K3)

(a) Zebrafish (b) Mice

(c) Drosophila (d) Rabbits

Part B (5 × 5 = 25)

Answer **all** the following not more than 500 words each.

11. (a) Construct the MS medium with various supplements for plant tissue culture experiments. (CO1, K3)

Or

(b) Develop the synthetic seed. (CO1, K3)

12. (a) Interpret the commercial importance of hairy root induction in medicinal plant. (CO2, K3)

Or

(b) Distinguish the RAPD and ISSR profile of wild type plants. (CO2, K3)

13. (a) Discover the application of components and supplementations of animal cell culture media. (CO3, K3)

Or

(b) Interview the preservation and revival of animal cells. (CO3, K3)

14. (a) Evaluate the cell counting by haemocytometer. (CO4, K5)

Or

(b) Explain the MMT assay with it's purpose, advantages and limitations. (CO4, K4)

15. (a) Practice the isolation of DNA from animal tissue. (CO5, K3)

Or

(b) Interview the preparation of single cell suspension from chicken liver. (CO5, K3)

Part C ($5 \times 8 = 40$)

Answer **all** the following not more than 1000 words each.

16. (a) Practice the proper sterilization and inoculation of a explant for callus induction. (CO1, K3)

Or

(b) Construct a medicinal plant from meristem culture by micro-propagation technique. (CO1, K3)

17. (a) Operate the Agrobacterium tumefaciens mediated transformation of important food crops. (CO2, K3)

Or

(b) Examine the protocol of plant genomic DNA isolation by CTAB method and it's quantification with proper interpretation based on its underlying principles. (CO2, K3)

18. (a) Construct an established cell lines with detailed culture condition, maintenance and passaging. (CO3, K3)

Or

(b) Practice the preparation of primary cell cultures from different sources using mechanical and enzymatic disaggregation. (CO3, K3)

19. (a) Operate the cell counting by using haemocytometer. (CO4, K3)

Or

(b) Compare the following cell viability assays: MTT and Trypan blue assays. (CO4, K4)

20. (a) Identify the chromosome of animal cells by giemsa staining. (CO5, K3)

Or

(b) Interview the animal handling and dissection of *C. elegans*. (CO5, K3)

———————

R1939	Sub. Code
	501301

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

Third Semester

Biotechnology

BIOPROCESS ENGINEERING AND TECHNOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. A period in which the growth rate of cells gradually increases ————————. (CO1, K2)

   (a) Lag phase

   (b) Log phase

   (c) Stationary phase

   (d) Deceleration phase

2. Which of the following factors does not typically influence microbial death kinetics? (CO1, K2)

   (a) Temperature

   (b) pH

   (c) Nutrient availability

   (d) Osmotic pressure

3. Which of the following parameters is important while scaling up in a bioreactor process? (CO2, K4)

(a) Increasing agitation speed

(b) Maintaining the same temperature

(c) Reducing oxygen transfer

(d) Scaling down the nutrient concentration

4. Which of the following factors is important for efficient agitation in a bioreactor? (CO2, K4)

(a) Temperature control

(b) Ph

(c) Oxygen transfer

(d) Nutrient concentration

5. In centrifugation, ———— primarily determines the sedimentation rate of particles. (CO3, K4)

(a) Centrifuge rotor speed

(b) Particle size

(c) Temperature

(d) Density of the solvent

6. Which chromatographic technique is most suitable for separating proteins based on their charge? (CO3, K4)

(a) Ion exchange chromatography

(b) Affinity chromatography

(c) Reverse phase chromatography

(d) Gas chromatography

7. The heat control in the large-scale fermentor is carried out by ————————. (CO4, K3)

(a) Heating coils

(b) Cooling jackets

(c) Steam injection

(d) Electrical resistance heaters

8. Which of the following is NOT a typical advantage of aeration in bioreactors? (CO4, K3)

(a) Enhanced oxygen transfer efficiency

(b) Improved mixing of nutrients and cells

(c) Reduced risk of contamination

(d) Increased production of anaerobic metabolites

9. The primary function of bacteriocins is ————————. (CO5, K3)

(a) To provide nutrients for bacterial growth

(b) To enhance biofilm formation

(c) To inhibit the growth of competing bacterial strains

(d) To promote bacterial conjugation

10. Which microorganism is primarily responsible for the fermentation of beer? (CO5, K3)

(a) *Saccharomyces cerevisiae*

(b) *Lactobacillus acidophilus*

(c) *Escherichia coli*

(d) *Streptococcus thermophilus*

Part B (5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Write down the steps involved in the isolation of industrially important microbes. (CO1, K2)

Or

(b) Explain the different phases of microbial growth. (CO1, K2)

12. (a) Explain why agitation is a crucial step in a bioreactor. (CO2, K4)

Or

(b) Interpret on heat sterilization technique. (CO2, K4)

13. (a) Comment on cell separation by centrifugation methods. (CO3, K4)

Or

(b) Differentiate ultra and microfiltration in downstream processing. (CO3, K4)

14. (a) Write a brief note on the significance of sterilization in bioprocess technology. (CO4, K3)

Or

(b) How does agitation influence the mixing and mass transfer in a bioreactor? (CO4, K3)

15. (a) Give an account on the role of microbes involved in the pickling process. (CO5, K3)

Or

(b) Write a short note on the application of bacteriocins in food preservation. (CO5, K3)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Discuss in detail about the techniques used for screening of industrially important microorganisms. (CO1, K2)

Or

(b) Enumerate on the methods available for strain improvement. (CO1, K2)

17. (a) Explain about media formulation for bioprocessing. (CO2, K4)

Or

(b) Give an account on PID control system and explain how temperature affects the performance of a PID controller. (CO2, K4)

18. (a) Write a detailed note on any two separation methods to separate insoluble products in downstream processing. (CO3, K4)

Or

(b) Illustrate and elaborate the mechanism involved in Liquid-liquid extraction to separate soluble products in downstream processing. (CO3, K4)

19. (a) Explain the biological properties of the media used in bioprocess techniques. (CO4, K3)

Or

(b) Discuss the methods and importance of effluent treatment and disposal in bioprocess technology. (CO4, K3)

20. (a) Explain the process of fermentation in food and beverages. Discuss the role of microorganisms in this process and the types of fermentation that occur. (CO5, K3)

Or

(b) Describe about any one alcoholic beverage highlighting its production process and its significance. (CO5, K3)

———————

R1940

Sub. Code
501302

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

Third Semester

Biotechnology

EMERGING TECHNOLOGIES

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. What type of samples particularly useful for imaging with Differential Interference Contrast microscopy? (CO1, K2)

   (a) Fluorescent samples

   (b) Opaque samples

   (c) Transparent, unstained biological specimens

   (d) Metallic samples

2. What is the main advantage of using Evanescent Wave Microscope? (CO1, K4)

   (a) High surface sensitivity

   (b) Ability to image bulk materials

   (c) High penetration depth

   (d) Low cost

3. The image current induced by the cyclotron motion of ions in FT-ICR is detected using (CO2, K2)

(a) An electron multiplier

(b) A Fourier transform

(c) A photomultiplier tube

(d) A charge couple device

4. One of the main challenges associated with Nano LC-MS is (CO2, K4)

(a) Low sensitivity

(b) Incompatibility with mass spectrometry

(c) High sample volume requirement

(d) Complex sample preparation and handling

5. What is a common readout method used in high throughput screening to assess cellular activity? (CO3, K2)

(a) Mass spectrometry

(b) Luminescence

(c) Flow cytometry

(d) Electron microscopy

6. Which bioinformatics resource provides information on protein sequence and functional information? (CO3, K5)

(a) UniProt (b) PDB

(c) GenBank (d) KEGG

7. What is the role of the cryo-stage in cryo-EM? (CO4, K2)

(a) To magnify the sample

(b) To maintain the sample at cryogenic temperatures

(c) To generate the electron beam

(d) To detect the electron

8. Which mode of AFM operation involves the cantilever oscillating near its resonant frequency? (CO4, K4)

(a) Contact mode

(b) Non-contact mode

(c) Tapping mode

(d) Friction force mode

9. Which of the following modifications can CRISPR-Cas9 be used to perform on a gene? (CO5, K3)

(a) Knockout of the gene

(b) Base editing

(c) Knock-in of a new sequence

(d) All the above

10. Which Cas protein is most commonly used for gene editing? (CO5, K3)

(a) Cas 1 (b) Cas 9

(c) Cas 3 (d) Cas 12

Part B (5 × 5 = 25)

Answer **all** the questions not more than 500 words each.

11. (a) Discuss Rayleigh's criterion and its significance in the context of light microscopy. (CO1, K2)

Or

(b) Discuss the components of a confocal microscope and their functions with neat diagram. (CO1, K4)

12. (a) Explain the principle of Electrospray Ionization and its applications in mass spectrometry. (CO2, K2)

Or

(b) Describe the importance of peptide fragmentation in proteomics for identifying and characterizing proteins. (CO2, K5)

13. (a) Highlight how rigorous validation of experimental methods used to generate omics data to ensures data quality, reliability and reproducibility? (CO3, K2)

Or

(b) Give an account on significance of bioinformatics analyses in understanding genomic sequences and their functions. (CO3, K4)

14. (a) Differentiate between solution NMR and solid-state NMR. (CO4, K4)

Or

(b) Describe Small Angle X-ray Scattering as a technique used to study the structure of materials at the nanoscale. (CO4, K4)

15. (a) Summarize the historical milestones and significance of the discovery of CRISPR-CAS systems. (CO5, K4)

Or

(b) Describe how Cas9 induces a site-specific double strand break at the target site, enabling precise genome editing? (CO5, K3)

Part C ($5 \times 8 = 40$)

Answer **all** questions not more than 1000 words each.

16. (a) Discuss in detail how fluorescent microscopy utilizes fluorophores that absorb light at specific wavelengths and emit light at longer wavelengths? List their advantages and limitations. (CO1, K2)

Or

(b) Compare and contrast the principles, instrumentation, applications of FLIM, FRET, and FCS as advanced fluorescence microscopy techniques. (CO1, K5)

17. (a) Give an account on FT ICR and Orbitrap as high-resolution mass spectrometry techniques used for accurate mass determination and structural analysis of biomolecules. Address their potential applications in emerging fields. (CO2, K2)

Or

(b) How nano LC-MS is extensively used for proteomics studies? Mention its applications in analyzing contaminants and food additives. (CO2, K5)

18. (a) Explain how high throughput screening helps to identify potential drug targets and validate their biological relevance? (CO3, K2)

Or

(b) Describe how mathematical models are used in systems biology to study interactions within biological networks and pathways. (CO3, K4)

19. (a) Explain the process in determining 3D structures of proteins using XRD. Mention its widespread use in both structural biology and material science. (CO4, K3)

Or

(b) Describe the principles and techniques of atomic force microscopy in imaging biological specimens with neat sketch. (CO4, K4)

20. (a) Explicate the step-by-step process of how CRISPR-Cas functions in bacterial immunity and its adaptation for genome editing. (CO5, K2)

Or

(b) Discuss the promise of CRISPR-Cas technology as a next-generation therapeutic method. Explain its potential applications, advantages, challenges, and ethical considerations in clinical settings. (C5, K3)

———————

R1941

Sub. Code
501304

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

Third Semester

Biotechnology

BIOENTREPRENEURSHIP

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. What is a key factor shaping opportunities for innovation in the bio-sector? (CO1, K2)

   (a) Government regulations

   (b) Technological advancements

   (c) Global economic trends

   (d) Social media influence

2. How do emerging technologies, such as CRISPR, impact entrepreneurship in the bio- sector? (CO1, K4)

   (a) Increase competition

   (b) Create new opportunities

   (c) Slow down innovation

   (d) Reduce market demand

3. Which agency is associated with entrepreneurship development programs in the bio-sector in India? (CO2, K4)

(a) MSME (b) NASA

(c) FDA (d) EPA

4. What is a strategic dimension of patenting for bio-firms? (CO2, K1)

(a) Quantity of patents

(b) Speed of filing

(c) Length of patent documents

(d) Patent office location

5. What is a tool for assessing strategic alternatives in emerging bio-firms? (CO3, K3)

(a) Financial statements

(b) PESTEL analysis

(c) Employee satisfaction survey

(d) Inventory management

6. How does patenting contribute to the strategic positioning of bio-firms? (CO3, K4)

(a) Enhances legal liabilities

(b) Establishes a monopoly

(c) Reduces innovation

(d) Lowers market share

7. What financial management issue is specific to bio-firms in procurement of capital (CO4, K3)

(a) Lack of funding options

(b) Excessive government support

(c) Overemphasis on profits

(d) Rapid capital turnover

8. How does information technology contribute to the success of bio-sector firms? (CO4, K5)

(a) Increases bureaucracy

(b) Reduces efficiency

(c) Facilitates data management

(d) Hinders communication

9. What is a key consideration in the assessment of technology in the bio-sector? (CO5, K2)

(a) Cost reduction (b) Speed of development

(c) Long-term impact (d) Market saturation

10. How do knowledge centers contribute to technology transfer in the bio-sector? (CO5, K3)

(a) Isolate information

(b) Facilitate collaboration

(c) Hinder innovation

(d) Reduce accessibility

Part B (5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Write a detailed note on Types of bio-industries. (CO1, K2)

Or

(b) How does collaboration help innovation in the bio-sector, and what challenges may arise?(CO1, K4)

12. (a) Describe alternatives faced by emerging bio-firms. (CO2, K4)

Or

(b) Explain in detail about commercialization strategies. (CO2, K3)

13. (a) Elaborate the role of government and regulatory authorities in the process of negotiating the road from lab to market. (CO3, K4)

Or

(b) Write about Basic contract principles. (CO3, K3)

14. (a) Outline the statutory requirements involved in business plan preparation for bio- firms. (CO4, K4)

Or

(b) How does information technology contribute to the success of bio-sector firms, and what challenges may arise? (CO4, K3)

15. (a) Discuss in detail about quality control. (CO5, K2)

Or

(b) Describe the regulatory compliances and procedures relevant to CDSCO in the bio- sector. (CO5, K3)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Compare various types of competitive dynamics between sub-industries of the biosector. (CO1, K4)

Or

(b) What are the factors do you think that can shape oppurtunities for innovation and entrepreneurship in bio-sectors. (CO1, K4)

17. (a) Examine the role of public and private agencies, such as MSME, DBT, BIRAC, and Make In India, in supporting entrepreneurship in the bio-sector. Highlight specific programs and initiatives that contribute to the growth of emerging bio-firms. (CO2, K3)

Or

(b) Evaluate the importance of strategic decision-making tools for emerging bio-firms. Discuss specific tools and methodologies that can aid in making effective strategic choices, considering the challenges faced by these firms. (CO2, K4)

18. (a) What are the challenges in bio business marketing. Explain with examples. (CO3, K3)

Or

(b) Classify different types of agreement and contract terms typically found in joint venture. (CO3, K3)

19. (a) What can be the problem causing factors in procurement of capital and management of costs in financial way? (CO4, K3)

Or

(b) Collaborations and partnership in business – List out merits and demerits in your own view. (CO4, K3)

20. (a) What kind of development and upgradation techniques should to be followed by entrepreneurs to improve their business status? (CO5, K2)

Or

(b) Explain Regulatory compliances and procedures of NBA, GCP and GLA. (CO5, K3)

———————

R1942

Sub. Code
501305

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

Third Semester

Biotechnology

INTELLECTUAL PROPERTY RIGHTS, BIOSAFETY AND BIOETHICS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. In which year GATT came into effect? (CO2, K1)

   (a) October 1947 (b) October 1948

   (c) December 1947 (d) December 1948

2. How many members are present in WTO? (CO2, K1)

   (a) 120 (b) 154

   (c) 164 (d) 138

3. Intellectual property rights exclude (CO1, K2)

   (a) Patent (b) Trademark

   (c) Copyright (d) Innovation

4. The legal monopoly that safeguards against unauthorized use of a device or process, even if discovered independently by the person using it is called as _____ (CO1, K4)

(a) Trademark (b) Patent

(c) Copyright (d) Trade secrets

5. At what Biosafety Level (BSL) would you anticipate encountering work involving microorganisms that present minimal risk to both laboratory personnel and the environment? (CO2, K2)

(a) BSL-l (b) BSL-2

(c) BSL-3 (d) BSL-4

6. Specimens of Ebola and Marburg viruses for cell culture identification should be managed in _____ (CO2, K4)

(a) BSL-l (b) BSL-2

(c) BSL-3 (d) BSL-4

7. What is the primary focus of the Cartagena protocol on biosafety? (CO1, K2)

(a) Protection of traditional agricultural practices

(b) Regulation of genetically modified organisms (GMOs)

(c) Preservation of biodiversity in marine ecosystems

(d) Promotion of organic farming methods

8. What is the primary purpose of OECD Consensus Documents? (CO2, K1)

(a) Economic policy recommendations

(b) Harmonization of regulatory guidelines for the safety assessment of chemicals

(c) Climate change mitigation strategies

(d) Agricultural production standards

9. What is the primary principle underlying bioethics in research? (CO2, K2)

(a) Profit maximization

(b) Respect for persons and their autonomy

(c) Rapid experimentation

(d) Government regulations

10. What is the primary ethical concern regarding the use of embryonic stem cells in research? (CO2, K2)

(a) Limited availability

(b) Potential for tumorigenesis

(c) Lack of therapeutic applications

(d) Destruction of embryos

Part B ($5 \times 5 = 25$)

Answer **all** questions not more than 500 words each.

11. (a) Explain the role of the World Trade Organization (WTO) in the global economy. (CO3, K5)

Or

(b) Describe the role of WIPO in fostering international cooperation in the field of patents. (CO2, K2)

12. (a) Define Intellectual Property (IP) and provide examples of different types of intellectual property. (CO1, K1)

Or

(b) Describe the key components of a patent application. (CO2, K2)

13. (a) What are the primary goals of a biosafety program? (CO2, K1)

Or

(b) Define Good Laboratory Practices (GLP) and explain their significance in a laboratory setting. (CO2, K5)

14. (a) Explain the role and functions of an Institutional Biosafety Committee (IBC) in the context of genetic engineering research. (CO2, K2)

Or

(b) What is the significance of Recombinant DNA Advisory Committee (RCGM) in regulating and overseeing genetic manipulation research in a country? (CO3, K1)

15. (a) Define bioethics and explain its significance in the field of research. (CO2, K1)

Or

(b) Explore the ethical challenges associated with emerging technologies in research, such as gene editing and artificial intelligence. (CO3, K2)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Discuss the role of WIPO in the protection of industrial designs at the international level, with reference to the Hague Agreement. (CO2, K2)

Or

(b) Describe the function of the Trade Policy Review Body (TPRB) within the WTO. Why is the periodic review of member countries' trade policies important for the organization? (CO3, K5)

17. (a) Discuss the differences between copyright and trademark. Provide examples to illustrate these distinctions. (CO2, K5)

Or

(b) What is the significance of the patent claims? (CO2, K1)

18. (a) Explain the importance of biosafety in laboratory research and biotechnology. (CO2, K5)

Or

(b) What ethical considerations should be considered when conducting research under GLP? How does ethical behaviour contribute to the credibility of scientific research? (CO3, K1)

19. (a) Elaborate on the responsibilities of the Genetic Engineering Appraisal Committee(GEAC) in evaluating and approving genetically engineered products for release into the environment. (CO3, K1)

Or

(b) Discuss the ethical considerations associated with the work of Institutional Biosafety Committees (IBCs) and their role in ensuring the responsible conduct of genetic research. (CO2, K5)

20. (a) What are the pros and cons in producing transgenic animals and mention the ethical issues associated with it. (CO2, K1)

Or

(b) Analyze the potential risks and benefits of genetically modified crops from a bioethical standpoint. (CO2, K4)

———————

R1943	Sub. Code
	501308

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

Third Semester

Biotechnology

LAB VI : BIOPROCESS ENGINEERING AND TECHNOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Which instrument is used to measure the optical density of microbial cultures? (CO1, K1)

   (a) Microplate reader (b) Spectrophotometer

   (c) Microscope (d) Centrifuge

2. What is the correct sequence for scaling up microbial cultures from a frozen vial? (CO1, K2)

   (a) Shake flask culture → Agar plate → Frozen vial

   (b) Agar plate → Frozen vial → Shake flask culture

   (c) Frozen vial → Agar plate → Shake flask culture

   (d) Frozen vial → Shake flask culture → Agar plate

3. What aspect of microbial growth does growth kinetics primarily study? (CO2, K2)

   (a) The rate of cell division and population increase

   (b) The types of microorganisms present

   (c) The enzyme activity levels

   (d) The temperature effects on growth

4. Which factor does not significantly influence enzyme activity in biochemical reactions? (CO2, K2)

(a) pH (b) Temperature

(c) Light intensity (d) Substrate concentration

5. What distinguishes fed-batch fermentation from batch fermentation? (CO3, K1)

(a) Nutrients are added continuously

(b) No nutrients are added after the initial setup

(c) Nutrients are added at intervals during the fermentation process

(d) Fermentation occurs in a closed system

6. Continuous fermentation involves ———————— (CO3, K1)

(a) Intermittent removal of products and addition of nutrients

(b) No addition of nutrients during fermentation

(c) Constant addition of nutrients and removal of products

(d) Stopping the process to add nutrients periodically

7. Microfiltration in biotechnology primarily serves to: (CO4, K2)

(a) Sterilize the bioreactor

(b) Measure optical density

(c) Separate cells from the broth

(d) Analyze enzyme activity

8. Which technique is not typically used in bio-separations? (CO4, K1)

(a) High-Performance Liquid Chromatography (HPLC)

(b) Gas Chromatography-Mass Spectrometry (GC-MS)

(c) Polymerase Chain Reaction (PCR)

(d) Microfiltration

9. Which technique combines the separation capabilities of chromatography with the detection capabilities of mass spectrometry? (CO5, K2)

(a) FPLC (b) GC-MS

(c) HPLC (d) Microfiltration

10. The primary function of Fractional Analytical Techniques in biotechnology is to ———————— (CO5, K1)

(a) View microbial cells

(b) Measure the amounts of products/substrates accurately

(c) Culture cells in a bioreactor

(d) Sterilize biological samples

Part B ($5 \times 5 = 25$)

Answer **all** questions not more than 500 words each.

11. (a) Describe the working principles and applications of the microplate reader and spectrophotometer in microbiology. (CO1, K3)

Or

(b) How are microorganisms isolated from soil samples? Discuss the techniques and their importance. (CO1, K3)

12. (a) Describe the assembly and sterilization process of a bioreactor. Why is sterilization crucial? (CO2, K3)

Or

(b) How do pH and temperature affect enzyme activity? Provide examples to illustrate your points.(CO2, K4)

13. (a) Compare batch, fed-batch, and continuous fermentation processes. Highlight their advantages and disadvantages. (CO3, K2)

Or

(b) Analyze the factors that affect the efficiency of fermentation processes. How can these factors be optimized? (CO3, K4)

14. (a) Explain the process of microfiltration and its role in separating cells from broth. Why is this step important in bioprocessing? (CO4, K4)

Or

(b) Discuss the principle of various chromatographic techniques used in bioseparations. How do they differ? (CO4, K3)

15. (a) Compare HPLC with FPLC in terms of their methodologies, sensitivities and specific applications. (CO5, K4)

Or

(b) Discuss the applications of Gas Chromatography-Mass Spectrometry (GC-MS) in bioanalytics. How does GC-MS enhance the measurement and analysis of biochemical compounds in complex mixtures? (CO5, K5)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1,000 words each.

16. (a) Describe the process of scaling up from a frozen vial to a shake flask culture. Explain the significance of each step and how it ensures the successful cultivation of microorganisms. (CO1, K5)

Or

(b) Analyze the importance of fundamental microbiology techniques in biotechnological applications. Provide examples to support your analysis. (CO1, K4)

17. (a) Explain the concept of growth kinetics in bioreactor operations. How is growth rate measured and analyzed? Provide examples of how growth kinetics data is used in optimizing bioprocesses. (CO2, K5)

Or

(b) Discuss the steps involved in developing enzyme assays and quantifying enzyme activity. Why are these assays significant in biochemical research? (CO2, K5)

18. (a) Discuss the role of enzymatic reactions in biotechnology. Provide examples of key enzymatic processes and their applications in industrial and medical fields. (CO3, K4)

Or

(b) Describe the basic principles of fermentation and its significance in biotechnological process. How do different fermentation technique impact product yield and quality? (CO4, K4)

19. (a) Discuss the applications of bioseparation techniques in biotechnology. How do these techniques contribute to the purification and characterization of biological molecules? (CO3, K4)

Or

(b) Discuss recent innovations in chromatographic techniques and their impact on biotechnological processes. Provide specific examples. (CO4, K4)

20. (a) Discuss the principles and applications of advanced bioanalytics techniques. How do bio-separation and fraction analytical techniques enhance the efficiency and effectiveness of biochemical analysis in biotechnology? (CO5, K5)

Or

(b) Evaluate the importance of advanced separation techniques in biotechnology. How do they impact the overall efficiency and stability of bioprocesses? (CO5, K4)

———————

R1944

Sub. Code
501309

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

Third Semester

Biotechnology

LABORATORY VII : BIOINFORMATICS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. When was the NCBI founded? (CO1, K1)

   (a) 1978 (b) 1988

   (c) 1998 (d) 2008

2. What is the primary purpose of BLAST? (CO1, K1)

   (a) To align proteins

   (b) To search for local alignments in biological sequences

   (c) To design new genetic sequences

   (d) To analyze meteorological data

3. Which types of sequences are generally aligned in MSA? (CO2, K2)

   (a) Only DNA sequences

   (b) Only RNA sequences

   (c) Only protein sequences

   (d) Protein, DNA, or RNA sequences

4. What is the primary goal of phylogenetic analysis? (CO2, K3)

(a) To classify organisms based on physical traits

(b) To understand the evolutionary relationships among species

(c) To determine the age of fossils

(d) To identify the ecological roles of organisms

5. What are the nitrogenous bases used in RNA to convey genetic information? (CO3, K1)

(a) Adenine, thymine, cytosine, guanine

(b) Adenine, uracil, cytosine, guanine

(c) Thymine, uracil, cytosine, guanine

(d) Adenine, thymine, uracil, cytosine

6. What is the recommended GC content range for PCR primers? (CO3, K2)

(a) 20-30% (b) 40-60%

(c) 70-80% (d) 90-100%

7. What is homology modeling used for? (CO4, K1)

(a) To predict the 3D structure of a protein with an unknown structure

(b) To synthesize new proteins

(c) To analyze the genetic code of a protein

(d) To study protein-ligand interactions

8. Which of the following software tools is commonly used for homology modeling? (CO4, K2)

(a) BLAST (b) Modeller

(c) GROMACS (d) PyMOL

9. Which of the following is a widely used tool for miRNA target prediction? (CO4, K2)

(a) BLAST (b) TargetScan

(c) RASMOL (d) GROMACS

10. What is the primary goal of energy minimization in protein structure analysis? (CO4, K3)

(a) To predict secondary structure

(b) To identify binding sites

(c) To achieve stable conformation

(d) To sequence the protein

Part B $(5 \times 5 = 25)$

Answer **all** questions not more than 500 words each.

11. (a) What is Uniport? How does Uniport contribute to scientific research? (CO1, K2)

Or

(b) Discuss the features, usability, and significance in biological research of any one nucleotide database. (CO1, K2)

12. (a) Explain the significance of multiple sequence analysis in molecular biology. (CO2, K2)

Or

(b) Outline the steps involved in performing a multiple sequence alignment of protein sequence. (CO2, K2)

13. (a) What is RNA and describe any two RNA structure prediction tools. (CO3, K3)

Or

(b) Discuss two methods used for gene prediction. (CO3, K2)

14. (a) Discuss two tools used for restriction site prediction. (CO3, K3)

Or

(b) Comment on PyMol. (CO4, K3)

15. (a) Discuss two tools used for miRNA target prediction. (CO4, K2)

Or

(b) Explain the significance of homology modelling in molecular biology. (CO4, K3)

Part C ($5 \times 8 = 40$)

Answer **all** questions not more than 1000 words each.

16. (a) Give a detailed account on EMBL and its resources. (CO1, K2)

Or

(b) Explain the role and significance of NCBI in the field of biotechnology and bioinformatics. (CO1, K2)

17. (a) What is BLAST in bioinformatics? Outline the steps involved in BLAST analysis. (CO1, K2)

Or

(b) Give a detailed account on phylogenetic analysis of protein sequences. (CO2, K3)

18. (a) What are primers? Outline the rules and steps involved in primer designing. (CO3, K3)

Or

(b) Give a detailed account on RNA structure prediction. (CO3, K2)

19. (a) Write a detailed note on PDB. (CO4, K2)

Or

(b) Give a detailed account on homology modelling of proteins. (CO4, K4)

20. (a) What is miRNA? Discuss two tools used for miRNA prediction. (CO4, K3)

Or

(b) Discuss the tools for mutation and analysis of the energy minimization of proteins structures. (CO4, K3)

———————

R1945

Sub. Code
501508

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2024

Third Semester

Biotechnology

Elective – VACCINES

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Which of the following immunity is present from our birth? (CO1, K1)

   (a) Innate Immunity (b) Active Immunity

   (c) Passive immunity (d) Acquired immunity

2. Skin, body hair, cilia, eyelashes, the respiratory tract and the gastrointestinal tract are examples of ———————— (CO1, K1)

   (a) Physical barrier (b) Cellular barriers

   (c) Cytokine barriers (d) Physiological barriers

3. Humoral immunity is a type of adaptive immunity that results in the circulation of which of the following throughout the blood? (CO2, K2)

   (a) Antigens

   (b) Macrophages

   (c) Natural killer cells

   (d) Antibodies

4. Which of the following is not one of the three main antigen-presenting cell types? (CO2, K2)

(a) Dendritic cells (b) B-cells

(c) NK cells (d) Macrophages

5. What is the basic principle of immunisation and vaccination? (CO3, K3)

(a) It is based on the number of B and T lymphocytes

(b) It is based on the property of memory of the immune system

(c) It is based on antigen-antibody interactions

(d) It is based upon the number of white blood cells

6. Who discovered the technique of preparing vaccine from attenuated pathogen and in which year? (CO3, K3)

(a) Edward Jenner, 1796

(b) Louis Pasteur, 1879

(c) Robert Downey, 1856

(d) Von Behring, 1950

7. What is the typical route of administration for most vaccines? (CO4, K2)

(a) Intramuscular injection

(b) Intravenous infusion

(c) Oral ingestion

(d) Topical application

8. All of the following vaccines are examples of the recombinant type vaccines that are currently used in developed countries, Except? (CO4, K2)

(a) Vaccine for hepatitis B

(b) Vaccine for human *papillomavirus*

(c) Vaccine against *Haemophilus influenza b*

(d) Vaccine against hepatitis A

9. A potential new vaccine is in the developmental phase which could be the preventive or therapeutic vaccine against HIV. (CO5, K4)

Name the vaccine which is in the first phase of the developmental process.

(a) Recombinant Na-GST-1

(b) Recombinant gp120

(c) Marburg DNA plasmid

(d) Live attenuated HIV

10. The BCG vaccine used for the prevention of tuberculosis is derived from which of the following microorganism? (CO5, K5)

(a) *Bordetella pertussis*

(b) *Bacillus subtilis*

(c) *Mycobacterium bovis*

(d) *Saccharomyces cerevisiae*

Part B (5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Write a short note on innate immunity with an example. (CO1, K1)

Or

(b) Give a brief note on immune system in humans. (CO1, K1)

12. (a) Define immune response. Explain their types with example. (CO2, K2)

Or

(b) Explain the mechanism of immune response with any one parasitic infection. (CO2, K2)

13. (a) Write about soluble mediators in vaccination. (CO3, K3)

Or

(b) Define adjuvant. Write their role in vaccination. (CO3, K3)

14. (a) Write an account on peptide vaccine with example. (CO4, K2)

Or

(b) Write the difference between live attenuated and inactivated vaccine. (CO4, K2)

15. (a) Write advantages of engineered virus vectors in vaccination. (CO5, K4)

Or

(b) Discuss the designing of AIDS vaccine. (CO5, K5)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Write the differences between innate and adaptive immunity. (CO1, K1)

Or

(b) Explain the role of T cells in activation of adaptive immunity. (CO1, K1)

17. (a) Write the mechanism involved in Humoral Immunity. (CO2, K2)

Or

(b) Describe the role of CD4+ and CD8+ cells in immune response. (CO2, K2)

18. (a) Explain the concept of liposomal mediated delivery system of vaccines. (CO3, K3)

Or

(b) Write about (CO3, K3)

(i) Chemokines

(ii) Mucosal immunity.

19. (a) Write history of vaccines and its types in detail. (CO4, K2)

Or

(b) Describe the design of viral vaccines with an example. (CO4, K2)

20. (a) Give a detail account on new approaches in targeted delivery systems of vaccines. (CO5, K4)

Or

(b) Discuss in detail about malarial vaccine design and its targeted delivery. (CO5, K5)

———————