R0194	Sub. Code
	501101

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

First Semester

Biotechnology

BIOCHEMISTRY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

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

1. If enthalpy change for a reaction is zero, then ΔG° equals to (CO1, K2)

   (a) –TΔS (b) TΔS°

   (c) –ΔH° (d) Inkeq

2. Which of the following special amino acid is not formed by post-translational modification? (CO1, K6)

   (a) Triodothyronine

   (b) Hydroxyproline

   (c) Hydroxylysine

   (d) Selenocysteine

3. In non-competitive antagonism which of the following is correct? (CO2, K3)

(a) Vmax decreases

(b) km decreases

(c) No change in Vmax

(d) Both km and Vmax increase

4. Final acceptor of Electrons in ETC is (CO2, K2)

(a) Cyt c (b) Oxygen

(c) FADH2 (d) CoQ

5. Irreversible steps of Glycolysis are catalyzed by (CO3, K1)

(a) Hexokinase, Phosphofructokinase, Pyruvate kinase

(b) Glucokinase, pyruvate kinase, glyceraldehyde 3 phosphate dehydrogenase

(c) Hexokinase, Phospho glycerate kinase, Pyruvate kinase

(d) Pyruvate kinase, Fructose 1,6 bisphosphatase, Phospho fructokinase

6. Which one of the following was obtained by Miller in his experiments on the origin of life? (CO3, K2)

(a) Simple sugars (b) Amino acids

(c) Nucleotides (d) Peptides

7. Which of the following is not dietary fiber? (CO4, K4)

(a) Cellulose (b) Pectin

(c) Gum (d) None of the above

8. Which is true about enzyme kinetics for competitive inhibition? (CO4, K1)

(a) Low K_m high affinity

(b) High K_m high affinity

(c) High K_m low affinity

(d) Low K_m low affinity

9. In metabolism, NAD is involved in (CO5, K2)

(a) Spontaneous reaction

(b) Elimination reaction

(c) Redox reaction

(d) None of the mentioned

10. Which of the following is not an intermediate of TCA Cycle? (CO5, K5)

(a) Acetyl CoA (b) Citrate

(c) Succinyl CoA (d) Alphaketoglutarate

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

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

11. (a) Water has high dielectric constant and high heat of vaporization. How does these help living organisms? (CO1, K6)

Or

(b) Define the Miller-Urey experiment with diagrammatic representation. (CO1, K2)

12. (a) Compare the functions of the following polysaccharides : glycogen, amylose and cellulose. (CO2, K3)

Or

(b) Classify triglycerides. Mention their biological importance. (CO2, K5)

13. (a) Identify and list out the characteristic of enzyme catalysis. (CO3, K2)

Or

(b) Construct a note on the effect of pH on enzyme catalysis. (CO3, K6)

14. (a) Simplify oxidative phosphorylation with an example. (CO4, K1)

Or

(b) Examine the structural features of ATP and write a short note on what makes it a high energy compound. (CO4, K3)

15. (a) Explain gluconeogenesis with a schematic representation. (CO5, K4)

Or

(b) Interpret the reactions of β – oxidation of activated fatty acids. (CO5, K5)

Part C (5 × 8 = 40)

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

16. (a) Recall about the laws of thermodynamics. (CO1, K2)

Or

(b) How does Competitive and non-competitive inhibition differ? Give example. (CO1, K3)

17. (a) Summarize your understanding about the secondary and super secondary structure of proteins. (CO2, K2)

Or

(b) Illustrate the fluid mosaic model with a neat diagram. (CO2, K4)

18. (a) Solve the Michaelis-Menton equation. Interpret the basic assumptions. (CO3, K1)

Or

(b) Discover why are enzymes specific? Give rationale for catalytic efficiency of enzymes. (CO3, K6)

19. (a) How does mitochondrial structure facilitate important reactions? (CO4, K2)

Or

(b) Demonstrate with reference to mitochondrial respiratory complexes. (CO4, K3)

20. (a) Examine TCA cycle with a schematic representation and calculate the number of ATP produced in TCA cycle. (CO5, K4)

Or

(b) Summarize your knowledge on nucleotides and brief about de novo synthesis and salvage pathway. (CO5, K6)

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R0195	Sub. Code
	501102

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

First Semester

Biotechnology

CELL AND MOLECULAR BIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** the objective questions by choosing the correct options.

1. Which of the cellular organelles does not contain DNA? (CO1, K1)

   (a) Nucleus
   (b) Lysosomes
   (c) Chloroplast
   (d) Mitochondria

2. Which organelle is responsible for primary packaging of chemicals that are distributed throughout the cell? (CO1, K1)

   (a) Mitochondria
   (b) Plastids
   (c) Vacuole
   (d) Golgi apparatus

3. What is the role of the sigma factor in transcription? (CO2, K1)

(a) Helicase action

(b) Transcription initiation

(c) Transcription elongation

(d) Transcription termination

4. Which of the following is TRUE for the RNA polymerase activity? (CO2, K1)

(a) DNA dependent DNA synthesis

(b) Direct repair

(c) DNA dependent RNA synthesis

(d) RNA dependent RNA synthesis

5. Nuclear localization signal that ensures transport of a protein to nucleus is rich in (CO3, K1)

(a) Lysine and arginine

(b) Glutamine and asparagine

(c) Serine and threonine

(d) Tryptophan and histidine

6. At which of the following stages of mitosis do individual chromosomes become distinct through the light microscope? (CO3, K1)

(a) Telophase

(b) Anaphase

(c) Prophase

(d) Prometaphase

7. Which of the following meristems is responsible for the primary growth of the plants? (CO4, K1)

(a) Apical meristem

(b) Lateral meristem

(c) Vascular cambium

(d) Cork cambium

8. Substances that originate from the tip of the stem and root and also controls the growth of different plant organs are called as (CO4, K1)

(a) Vitamins (b) Enzymes

(c) Hormones (d) Food substances

9. Which of the following is a bacteriophage? (CO5, K1)

(a) Poxvirus

(b) Retrovirus

(c) M13

(d) TMV

10. The capsid of the bacteriophage is made up of ———— (CO5, K1)

(a) DNA

(b) RNA

(c) Proteins

(d) Organic acids

Part B (5 × 5 = 25)

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

11. (a) Briefly discuss about the internal organization of a plant cell with a diagram. (CO1, K2)

Or

(b) What are cytoskeletons? Analyze its role in maintaining the cellular structure. (CO1, K5)

12. (a) Enumerate the significance of writers and erasers in chromatin modifications. (CO2, K2)

Or

(b) Summarize on eukaryote and prokaryotic RNA polymerases. (CO2, K4)

13. (a) Describe about the mechanism behind the intracellular protein sorting in a cell. (CO3, K2)

Or

(b) Illustrate and explain the mechanism of meiosis (CO3, K6)

14. (a) Outline the roles of any two hormones as a regulator for plant cellular differentiation. (CO4, K2)

Or

(b) Comment on the structure and organization of plant cell wall. (CO4, K2)

15. (a) Distinguish between lytic any lysogenic life cycle of a bacteriophage λ. (CO5, K4)

Or

(b) What is mutation? Describe about the physical and chemical causes of mutation. (CO5, K2)

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

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

16. (a) Illustrate and describe about the structure of an animal cell. (CO1, K2)

Or

(b) Give a detailed note on the structural organization and function of mitochondria. (CO1, K2)

17. (a) Elaborate the steps involved in protein synthesis. (CO2, K5)

Or

(b) Explain about the post-transcriptional modifications that takes place in the nucleus. (CO2, K5)

18. (a) Describe in detail about the intracellular vesicular trafficking from endoplasmic reticulum to lysosomes. (CO3, K5)

Or

(b) Summarize on how cell cycle is controlled and regulated through various cheek points. (CO3, K2)

19. (a) Elaborate on the organization of shoot and root apical meristem. (CO4, K2)

Or

(b) Describe in detail about the process and mechanism of cellular differentiation in plants. (CO4, K5)

20. (a) Explain about SOS response and how it is tightly regulated in response to DNA damage. (CO5, K5)

Or

(b) Elucidate about the various mechanism of repair during mutation of cells. (CO5, K5)

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R0196	Sub. Code
	501103

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

First Semester

Biotechnology

PLANT AND ANIMAL BIOTECHNOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the objective questions by
Choosing the correct option

1. Which one of the following belongs to cryoprotectant? (CO1, K2)

   (a) Glycerol (b) sodium alginate

   (c) macerozyme (d) MS medium

2. Cryopreservation is a process of preserving plant cell, tissues or organs (CO1, K3)

   (a) at very low temperatures by using ether.

   (b) at very high temperatures by using liquid nitrogen

   (c) at a very low temperature of -196 by using liquid nitrogen

   (d) at very low temperatures by using liquid nitrogen

3. What is the function of one genes in TDNA? (CO2, K3)

(a) Tumour-suppressing potential

(b) Tumour-inducing potential

(c) Either tumor-inducing or suppressing depending on the conditions

(d) Act as replicative genes

4. Which of the following does hot belong to direct gene transfer? (CO2, K3)

(a) chemical mediated gene transfer,

(b) microinjection

(c) electroporation,

(d) Through plasmid vector

5. Why was *Arabidopsis thaliana* chosen for genome sequencing? (CO3, K2)

(a) It is a cash crop of significant economic importance.

(b) It has a relatively large genome size compared to other plants.

(c) It serves as a model organism due to its small genome size and short lifecycle.

(d) It has no agricultural relevance and was chosen for its uniqueness.

6. What is *In Vitro* Fertilization (IVF) in the context of animal reproduction? (CO3, K2)

(a) A technique to transfer embryos into a surrogate mother.

(b) Artificially inducing mating behaviour in animals.

(c) Fertilization that occurs naturally within the body of the mother.

(d) Fertilization that occurs outside the body, in a laboratory setting.

7. Transgenic pigs have been developed to provide organs for human transplantation. What are these pigs often referred to as? (CO4, K1)

(a) Xenophobes

(b) Humanoids

(c) Organ donors

(d) Xenotransplantation pigs

8. Why is the cloning of endangered species considered ethically complex? (CO4, K4)

(a) It could lead to overpopulation of endangered species.

(b) It may disrupt natural ecosystems and biodiversity.

(c) It provides a solution for rapid population recovery.

(d) Cloning is too expensive to be a viable conservation strategy

9. What is a limitation of primary cultures? (CO5, K5)

(a) They are difficult to establish and require extensive training.

(b) They lack genetic diversity and stability.

(c) They can only be cultured for a limited number of passages.

(d) They are susceptible to contamination.

10. What is the main cell type often used for growing animal viruses in cell culture for vaccine production? (CO5, K3)

(a) Muscle cells

(b) Nerve cells

(c) Epithelial cells

(d) Red blood cells

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

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

11. (a) Write about plant Regeneration in detail. (CO1, K1)

Or

(b) How synthetic seeds are produced? List out their applications. (CO1, K3)

12. (a) Discuss about Mechanism of T-DNA transfer. (CO2, K2)

Or

(b) Explain Molecular farming with suitable examples in detail. (CO2, K3)

13. (a) Elaborate on Plant and Animal Genomics. (CO3, K2)

Or

(b) Arabidopsis Genome Initiative-Explain. (CO3, K4)

14. (a) What is gene transfer? Explain with types. (CO4, K1)

Or

(b) Give a detailed account of Gene therapy. (CO4, K4)

15. (a) Write about the history of animal cell culture. (CO5, K2)

Or

(b) Discuss about applications of cell culture technology in the production of human viral vaccines. (CO5, K5)

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

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

16. (a) Explain about Principles, Methods, and applications of cryopreservation. (CO1, K3)

Or

(b) Elaborate Molecular markers: RAPD, ISSR, SCAR, SSR. (CO1, K3)

17. (a) Explain various types of Direct gene transfer methods. (CO2, K5)

Or

(b) Write a detailed note on the Genetic engineering of the chloroplast genome and the development of transplastomic plants. (CO2, K6)

18. (a) Describe Molecular mapping and marker-assisted selection in detail. (CO3, K3)

Or

(b) What is the role of genomics in Animal reproductive biotechnology and vaccinology. (CO3, K5)

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

Or

(b) Discuss various transgenic animals. (CO4, K1)

20. (a) Explain about methods of animal cell culture techniques. (CO5, K4)

Or

(b) List out the applications of animal cell culture on virus isolation and in vitro testing of drugs. (CO5, K5)

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R0197	Sub. Code
	501104

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

First Semester

Biotechnology

MICROBIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the objective questions by Choosing the correct option

1. Who disproved spontaneous generation by showing that maggots only appear on decaying meat exposed to flies? (CO1, K1)

   (a) Koch (b) Pasteur

   (c) Jenner (d) Hansen

2. What is the main basis of classification in five kingdom system? (CO1, K2)

   (a) Structure of the nucleus

   (b) Structure of cell wall

   (c) Asexual reproduction

   (d) Mode of Nutrition

3. Which one of the following is used to treat pox virus? (CO2, K3)

   (a) Zalcitabine (b) Cidofovir

   (c) Penciclovir (d) Zanamivir

4. Name the chemical in a 'bleach' (a disinfectant used to eliminate bacteria, fungi, and viruses? (CO2, K4)

(a) Sodium chloride

(b) Ethylene oxide

(c) Sodium hypochlorite

(d) Ethyl alcohol

5. Neurodegenerative diseases, like mad cow and kuru, are caused by infectious particles like: (CO3, K1)

(a) virions (b) Prions

(c) Viroids (d) Satellite viruses

6. Transduction is mediated by (CO3, K2)

(a) F-factors (b) cosmids

(c) phage vectors (d) plasmid vectors

7. Which of the following is an example of commensalism? (CO4, K4)

(a) A virus infecting a host and causing disease

(b) A fungus growing on a dead tree

(c) A bacterium living in the human gut and providing beneficial nutrients

(d) A herbivore eating plants for food

8. Which one of the following is neurotoxin? (CO4, K2)

(a) Botulinum toxin (b) Exfoliative toxin

(c) pertussis toxin (d) Anthrax toxin

9. Microorganisms used to produce Organic acids (CO5, K1)

(a) Acetobacter (b) Penicillium

(c) Streptomyces (d) Bacillus megaterium

10. Which of the following is used as a biocontrol agent against caterpillars of butterflies? (CO5, K3)

(a) *Trichoderma*

(b) *Streptococcus*

(c) *Bacillus Thuringiensis*

(d) *Saccharomyces cerevisiae*

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

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

11. (a) Write a short note on classification of microorganisms. (CO1, K2)

Or

(b) Write in brief about diversity of microorganisms. (CO1, K2)

12. (a) Name any two anti-fungal compounds and narrate their mode of actions. (CO2, K1)

Or

(b) Give an account on biological control of microorganisms. (CO2, K5)

13. (a) Discuss briefly about bacterial growth curve. (CO3, K6)

Or

(b) Give an account on cultivation of viruses on embryonated eggs. (CO3, K2)

14. (a) Write in briefly about nosocomial infection. (CO4, K2)

Or

(b) Add a brief note on mechanism of drug resistance. (CO4, K2)

15. (a) Give a short note on uses of microbes in fermentation. (CO5, K4)

Or

(b) Quorum sensing and its inhibition mechanism. (CO5, K5)

Part C (5 × 8 = 40)

Answer **all** the questions note more than 1000 words

16. (a) Write in detail about classification of bacteria according to Bergey's manual. (CO1, K1)

Or

(b) Describe in detail about domain and kingdom concept in classification of microorganisms. (CO1, K2)

17. (a) Write elaborately about physical and chemical methods of sterilization. (CO2, K3)

Or

(b) Give in detail about antimicrobial drugs. (CO2 K4)

18. (a) What are the different serological methods used for the identification of viruses? (CO3, K6)

Or

(b) Describe in detail the nutrition and growth requirements of bacteria. (CO3, K5)

19. (a) Write in detail about the mechanism of pathogenesis in emerging microbial diseases. (CO4, K3)

Or

(b) What is host-pathogen interaction? Explain in detail. (CO4, K1)

20. (a) Give in detail about the industrial production of vitamins. (CO5, K4)

Or

(b) Explain in detail on Microbial interactions and its characteristics. (CO5, K6)

R0198	Sub. Code
	501105

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

First Semester

Biotechnology

GENETICS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

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

1. The -35 element usually consists of (CO1, K3)

   (a) TATAA (b) GGAGG

   (c) TTGACA (d) TATA

2. All introns share (CO1, K2)

   (a) GT in the 5' end and AG in the 3' end

   (b) AG in the 5' and 3' ends

   (c) AG in the 5' end and GT in the 3' end

   (d) GT in the 5' and 3' ends

3. The genotypic ratio of dihybrid cross is (CO2, K2)

   (a) 9:3:3:1 (b) 1:2:2:4:1:2:1:2:1

   (c) 12:3:1 (d) 2:1:2:4:1:2:1:1:2

4. RR genotype produces pink colour flowers. In the Fl generation, Interestingly Rr genotypes also produce the same pink colour flowers. This observation is due to (CO2, K4)

(a) Law of dominance

(b) Law of segregation

(c) Law of independent assortment

(d) All

5. Which one of the following is not true with regard to heterothallic? (CO3, K5)

(a) Determined by HO allele

(b) No active endonuclease

(c) Undergoes no change in mating type

(d) All of the above

6. Which one of the following dihybrid phenotypic ratio is not arising out of epistatic interaction (CO3, K1)

(a) 9:3:3:1 (b) 9:3:4

(c) 12:3;l (d) 13:3

7. The Hardy-Weinberg theorem characterizes (CO4, K4)

(a) the distributions of genotype frequencies in populations that are not evolving

(b) the distributions of genotype frequencies in populations that are evolving rapidly

(c) the distributions of genotype frequencies in populations that are evolving differently

(d) all

8. Fishers theorem states (CO4, K3)

(a) The rate of increase in fitness of any organism at anytime is equal to its genetic variance in fitness at that time

(b) The suppression of one gene is modified (e.g., masked, inhibited or suppressed) by the expression of one or more other genes.

(c) The distributions of genotype frequencies in populations that are evolving differently

(d) All

9. Heterosis refers to (CO5, K6)

(a) The phenomenon that progeny of diverse varieties of a species or crosses between species exhibit greater biomass, speed of development, and fertility than both parents.

(b) The phenomenon that progeny of a type of a species or crosses between species exhibit greater biomass, speed of development, and fertility than different parents.

(c) The genotype that progeny of diverse varieties of a species or crosses between species exhibit greater biomass, speed of development, and fertility than both parents.

(d) All

10. Gene pyramiding refers to the process of (CO5, K5)

(a) Stacking multiple genes into a single genotype to combine desirable traits through recombinant DNA technology or conventional breeding.

(b) the geneotype that progeny of diverse varieties of a species or crosses between species exhibit greater biomass, speed of development, and fertility than both parents.

(c) The rate of increase in fitness of any organism at any time is equal to its genetic variance in fitness at that time.

(d) all

Part B (5 × 5 = 25)

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

11. (a) Describe the molecular events associated with Specialized Transduction. (CO1, K1)

Or

(b) Illustrate fine structure analysis of a bacterial gene. (CO1, K3)

12. (a) Explain the significance of synthetic lethality. (CO2, K3)

Or

(b) What are the Non-Mendelian determinants of Yeast? What is the physiological significance of presumptive prions in yeast? (CO2, K2)

13. (a) Explain the sex linkage with example. (CO3, K5)

Or

(b) How will you confirm autosomal linkages? (CO3, K4)

14. (a) Illustrate mutation selection with example. (CO4, K6)

Or

(b) In Yeast, linkage can be studies through terad analysis. Substantiate. (CO4, K2)

15. (a) How will you maintenance of genetic purity of a bacterial isolate? (CO5, K4)

Or

(b) List the negatives of inbreeding. (CO5, K3)

Part C (5 × 8 = 40)

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

16. (a) Summarize the various events that take place in the conjugational cycle of *E.coli*. (CO1, K2)

Or

(b) Transcription and translation are coupled in prokaryotes. Substantiate this statement with the operon you have studies. (CO1, K3)

17. (a) Explain the mechanism and significance of the cassette mechanism of the MAT site in Yeast with a neat sketch. (CO2, K5)

Or

(b) How do homologous chromosomes align together and help meiotic crosses? And what phase of cell cycle it does it occur? (CO2, K4)

18. (a) Explain the UAS/GAL4 system for genetic screen in Drosophila. (CO3, K6)

Or

(b) Summaries the advantages of the drosophila as model to understand the different genetic concepts? How the knowledge will be helpful to the human? (CO3, K5)

19. (a) Narrate population bottlenecks and discuss its significant in evolution. (CO4, K3)

Or

(b) How the genetic variations are beneficial to a species? (CO4, K3)

20. (a) What is Gene pyramiding? What can you learn from gene pyramiding? (CO5, K6)

Or

(b) Illustrate Laws of segregation in plant crosses. (CO5, K3)

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R0199	Sub. Code
	501106

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

First Semester

Biotechnology

BASIC OF MATHEMATICS AND STATISTICS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** the following objective questions by Choosing the correct options

1. A system of three linear equations in three variables is inconsistent if their planes. (CO1, K1)

   (a) intersect only a t a point

   (b) intersect in a line

   (c) coincides with each other

   (d) do not intersect

2. Graphically, the pair of equations $7x - y = 5; 21x - 3y = 10$ represents two lines which are (CO2, K2)

   (a) intersecting at one point

   (b) parallel

   (c) intersecting at two points

   (d) coincident

3. What is the limit of sin (θ)/θ when θ approaches zero? (CO2, K1)

(a) 1 (b) sin (θ)

(c) 0 (d) None of these

4. What is meant of the differential? (CO2, K2)

(a) A word used a lot on a popular medical television series.

(b) A method of directly relating how changes in a dependent variable affect changes in an independent variable.

(c) A gearbox on the back end of your car.

(d) None of these

5. In damped oscillation the directions of the restoring force and the resistive force (CO3, K1)

(a) Are the same

(b) Are opposite

(c) May be same or opposite

(d) Have no relation with each other

6. For a magnet of time period T magnetic moment is M, if the magnetic moment becomes one fourth of the initial value, then the time period of oscillation becomes. (CO3, K2)

(a) Half of initial value

(b) One fourth of initial value

(c) Double of initial value

(d) Four-time initial value

7. Spring is pulled down by 2 cm. What is amplitude of motion? (CO3, K5)

(a) 0 cm (b) 6 cm

(c) 2 cm (d) 4 cm

8. Assuming the assumptions of parametric tests are met, non-parametric tests, compared to their parametric counterparts: (CO3, K2)

(a) Are all of these.

(b) Are more conservative.

(c) Are less likely to accept the alternative hypothesis.

(d) Have less statistical power

9. The coefficient of correlation lies between (CO3, K1)

(a) 0 to 1 (b) 1 to +1

(c) 0 to ∞ (d) $-\infty$ to $+\infty$

10. The degree to which a statistical model represents the data collected is known as the: (CO3, K2)

(a) Fit (b) Homogeneity

(c) Reliability (d) Validity

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

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

11. (a) What is meant by slope Intercepts? Also, state its importance role. (CO1, K1)

Or

(b) Describe graphs of polynomials. (CO1, K2)

12. (a) Describe forms of two-variable linear equations. (CO2, K2)

Or

(b) Draw a graph of binomials. (CO2, K4)

13. (a) Prove that the differential coefficient of a constant is zero. (CO2, K5)

Or

(b) Prove that the function $f(x) = x^3 - 3x^2 + 6$ is positive for all values of $x \geq 2$. (CO2, K5)

14. (a) Describe size limits and scaling in the biological systems. (CO2, K2)

Or

(b) What is meant by random variable? State its types. (CO2, K1)

15. (a) Define integrand with an example. (CO3, K1)

Or

(b) What is meant by developmental patterns in the biological systems? (CO3, K2)

Part C (5 × 8 = 40)

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

16. (a) Explain about constructing linear models in biological systems. (CO1, K2)

Or

(b) Explain in detailed manner about symmetry of polynomial functions. (CO1, K2)

17. (a) Evaluate $\int \frac{\tan x dx}{(\sec x + \cos x)}$. (CO3, K5)

Or

(b) Explain about modeling of fractal geometries. (CO3, K2)

18. (a) Describe graphing and constructing sinusoidal functions with examples. (CO3, K1)

Or

(b) Explain about types of matrices with examples. (CO3, K2)

19. (a) Describe about oscillations and circadian rhythms in biological systems. (CO3, K1)

Or

(b) Elucidate in detail about modeling chemical reaction networks and metabolic networks. (CO3, K2)

20. (a) Define conditional probability and state its applications with suitable illustrations. (CO4, K1)

Or

(b) Explain the parametric tests of statistical significance with examples. (CO4, K2)

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R0200	Sub. Code 501107

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

First Semester

Biotechnology

BASICS OF CHEMISTRY AND PHYSICS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** the objective questions by Choosing the correct option

1. A uniformly accelerated body has ———— (CO1, K1)

   (a) Constant speed (b) Constant velocity

   (c) Constant force (d) Constant momentum

2. If the velocity varies parabolically, how does the acceleration vary? (CO1, K2)

   (a) Linearly (b) Hyperbolically

   (c) Parabolically (d) Elliptically

3. When two same masses travelling in opposite directions with different velocities collide perfectly elastically, their velocities (CO2, K2)

   (a) Increase (b) Remain unchanged

   (c) Exchange (d) Decrease

4. Identify the factor on which the torque on a planar current loop does not depend. (CO2, K3)

(a) Current

(b) Strength of magnetic field

(c) Area of the loop

(d) The shape of the loop

5. The wave used in communication are generally called (CO3, K1)

(a) γ-rays (b) α-rays

(c) microwaves (d) radio waves

6. The accurate method of studying of Avogadro's number is the study of (CO3, K3)

(a) Crystalline Solid

(b) Metallic Solid

(c) Non-metallic Solid

(d) Molecules

7. What is the shape of NH_4^- (CO4, K2)

(a) linear (b) Trigonal

(c) tetrahedron (d) square planner

8. Which of the following main component of mass spectroscopy deal with resolving the ions into their characteristics mass components according to their mass-to- charge ratio? (CO4, K4)

(a) Ion Source (b) Analyzer

(c) Detectors system (d) Analyzer tube

9. Which of the following non–essential amino acids (CO5, K3)

(a) Lysine (b) Cystine

(c) Methionine (d) Threonine

10. For an ideal gas, enthalpy becomes. (CO5, K2)

(a) h=u–RT (b) h=–u–RT

(c) h=u+RT (d) h=–u+RT

Part B (5 × 5 = 25)

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

11. (a) What is electric charge separation? Write its application is physical science . (CO1, K2)

Or

(b) What are vector and scalar displacement? Explain with suitable examples. (CO1, K3)

12. (a) What is Coulomb's law? Write the key points of Coulomb's law. (CO2, K2)

Or

(b) (i) What are simple harmonic motions? Explain

(ii) What is Bernoulli's equation? Write its applications. (CO2, K3)

13. (a) Explain the Newton's Law of motions and conservation principles. (CO3, K2)

Or

(b) Explain the following terms in biological aspects.

(i) Chemical assemblies

(ii) Nerve impulses (CO3, K2)

14. (a) Explain the following:

(i) isotopes

(ii) Avogadro number

(iii) Gas constant (CO4, K1)

Or

(b) What is Nernst equation? how it employed in biological system to understand redox reactions. (CO4, K4)

15. (a) Explain the change in the Gibbs free energy of ATP driven reactions. (CO5, K5)

Or

(b) What is Maxwell Boltzmann's distribution? Explain its application. (CO5, K2)

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

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

16. (a) Explain the role of thermodynamics in biological system with appropriate discussions. (CO1, K5)

Or

(b) Elaborate the following terms with appropriate examples.

(i) Angular momentum

(ii) Buoyant forces

(iii) Kinetic Charge separation

(iv) electromagnetic spectrum (CO1, K3)

17. (a) What are molecular motors? Write their role in cells and organism. (CO2, K3)

Or

(b) What is entropy? Explain the importance of entropy change in both physical and chemical system. (CO2, K5)

18. (a) Define the following terms with appropriate examples.

(i) fluorescence

(ii) Paramagnetism

(iii) electronegativity

(iv) polarity (CO3, K1)

Or

(b) What is bioluminescence? Discuss how bioluminescence is used in biomarker applications? (CO3, K4)

19. (a) Explain the following with appropriate examples:

(i) Molarity

(ii) Molecular weight

(iii) Molecular formula

(iv) rate constant (CO4, K2)

Or

(b) What is Mass spectrometry? Write its application in structural determination of molecules. (CO4, K1)

20. (a) Explain the following electrochemistry terminologies.

(i) Oxidation and reduction reactions

(ii) Standard cell potentials

(iii) Nernst equation (CO5, K4)

Or

(b) Discuss the Various bonds/forces responsible for stabilizing — protein structure and highlight their importance. (CO5, K2)

———————

R0201	Sub. Code
	501108

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

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 objective the object questions by choosing the correct option.

1. _____ is defined as the number of gram equivalents of the solute dissolved per litre of the solution. (CO1, K1)

   (a) Molarity (b) Molality

   (c) Normality (d) Mole fraction

2. Which one of the following are the mixtures of buffers? (CO1, K2)

   (a) Strong acid and weak base

   (b) Strong acid and strong base

   (c) Weak base and their conjugate acid

   (d) Weak acid and their conjugate base

3. The Henderson Hasselbalch equation explains the relationship between (CO2, K3)

(a) pH and pKa (b) pH and pOH

(c) pH and logKa (d) pOH and pKa

4. pH below Pi values of aminoacids will be (CO2, K4)

(a) No charge (b) Anionic

(c) Cationic (d) Net charge zero

5. Which force is involved in the chromatography? (CO3, K5)

(a) Hydrogen bonding

(b) London dispersion force

(c) Electrostatic force

(d) All the above

6. Beer's law states that the intensity of light decreases with respect to (CO3, K2)

(a) Composition (b) Distance

(c) Concentration (d) Volume

7. Thin layer chromatography is (CO4, K3)

(a) Adsorption chromatography

(b) Partition chromatography

(c) Electrical mobility of ionic species

(d) None of the above

8. The role of APS in SDS PAGE is to (CO4, K3)

(a) Act as a bridge between aciylamide and bis-acrylamide

(b) Act as a source of free radicals

(c) Act as a catalyst in the polymerization of acrylamide

(d) Act as a pore developer in the polymerized gel

9. In non-competitive inhibiton, (CO5, K6)

(a) Vmax decreases and Km increases

(b) Vmax and Km both decreases

(c) the Vmax decreases and the Km remains unchanged

(d) the Vmax remains unchanged and the Km increases

10. Which of the following is the type of separator used in commercial GC-MS systems? (CO5, K3)

(a) Jet type molecular separator

(b) Flow type separator

(c) Teflon tube

(d) Porous tube

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

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

11. (a) How does buffers help in reactions? Describe few biological buffers. (CO1, K2)

Or

(b) Elaborate Molarity, Normality and Molality with example. (CO1, K2)

12. (a) Illustrate the estimation of pI value of aminoacids. (CO2, K3)

Or

(b) Write the principle and application of Fluorescence spectrophotometer. (CO2, K1)

13. (a) How does the Beer Lambert's law relate to colorimetry? (CO3, K5)

Or

(b) Compare different ion exchangers with applications. (CO3, K4)

14. (a) Discuss the method, principle and applications of 2D gel electrophoresis. (CO4, K2)

Or

(b) Outline the total activity and specific activity with illustrations. (CO4, K3)

15. (a) Interpret the significance of Michaelis-Menton equation derivation. (CO5, K3)

Or

(b) Discuss about the applications of GC-MS. (CO5, K4)

Part C (5 × 8 = 40)

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

16. (a) Discuss buffer solution and its types, mechanism of buffering action and preparation of phosphate buffer, citrate buffer, phosphate citrate buffer, and potassium phosphate buffer. (CO1, K1)

Or

(b) Formulate normality, molarity and molality and derive relation between molarily and molality. Calculate molality of 1M HCI solution having density l.5365g/mol. (CO1, K3)

17. (a) Explain the titrations of strong acid and base and weak acids and bases with the titration curve. (CO2, K2)

Or

(b) Explain Henderson Hassel bach equation with its principle, derivation, applications and limitations. (CO2, K2)

18. (a) What is Beer's Law and give the reasons for positive and negative deviations? (CO3, K6)

Or

(b) List out the factors to be considered when performing a protein assay using BSA. (CO3, K5)

19. (a) Explain in detail about 2DS PAGE. (CO4, K3)

Or

(b) Discuss and illustrate on the separation of aminoacids and plant pigments by paper chromatography and thin layer chromatography. (CO4, K6)

20. (a) Explain the factors affecting enzyme activity in detail and illustrate with suitable diagram. (CO5, K6)

Or

(b) Discuss in detail about the principle, instrumentation, advantages and applications of HPLC. (CO5, K5)

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R0202	Sub. Code 501109

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

First Semester

Biotechnology

LABORATORY II : MICROBIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

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

1. Which of the following methods is most effective in killing both vegetative cells and bacterial endospores? (CO1, K2)

   (a) Disinfection (b) Sanitization

   (c) Pasteurization (d) Autoclaving

2. Why are glycerol stock cultures commonly used for long-term storage of microorganisms? (CO1, K4)

   (a) Glycerol prevents bacterial growth

   (b) Glycerol improves bacterial metabolism

   (c) Glycerol lowers the freezing point of the culture

   (d) Glycerol increases the acidity of the medium

3. Nutrient agar is an example of which type of media? (CO2, K2)

(a) Complex media (b) Minimal media

(c) Selective media (d) Differential media

4. Why is pH adjustment important when preparing microbiological media? (CO2, K3)

(a) It affects the color of the media

(b) It prevents contamination

(c) It ensures proper growth of microorganisms

(d) It prolongs the shelf life of the media

5. Which principle of streaking technique helps dilute bacterial cells onto the agar surface? (CO3, K1)

(a) Dilution factor (b) Quadrant isolation

(c) Serial dilution (d) Dragging technique

6. What is the purpose of performing a standard plate count? (CO3, K2)

(a) To determine bacterial species

(b) To estimate the number of viable bacteria in a sample

(c) To measure bacterial turbidity

(d) To identify antibiotic resistance

7. What is the unit typically used to express bacterial counts in a standard plate count? (CO4, K2)

(a) Cells per milliliter (cells/mL)

(b) Cells per gram (cells/g)

(c) Colony-forming units (CFU)

(d) Bacterial concentration index (BCI)

8. Which term refers to the ability of bacteria to resist the effects of antimicrobial agents? (CO4, K4)

(a) Antibiosis (b) Pathogenicity

(c) Drug tolerance (d) Drug resistance

9. Which factor is important to consider when performing phenol coefficient testing? (CO5, K3)

(a) pH of the medium

(b) Bacterial species

(c) Size of the culture tube

(d) Ambient humidity

10. What is the term for the communication system used by bacterial cells to exchange information? (CO5, K5)

(a) Chemotaxis (b) Quorum sensing

(c) Antibiosis (d) Conjugation

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

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

11. (a) Discuss the differences between selective and differential media? (CO1, K2)

Or

(b) Describe the purpose of enriching media in microbiological laboratories? (CO1, K3)

12. (a) Compare the advantages and disadvantages of storing stock cultures as slants, stab cultures, and glycerol stock cultures? (CO2, K4)

Or

(b) Explain the process of isolating bacteria from soil or water samples? (CO2, K1)

13. (a) Explain the Types of streaking and its role in cultivation of Microbes. (CO3, K2)

Or

(b) Describe the procedure of Gram staining? (CO3, K2)

14. (a) Elaborate on the importance of carbohydrate fermentation tests in bacterial characterization? (CO4, K4)

Or

(b) Discuss strategies to combat multidrug-resistant bacteria. (CO4, K4)

15. (a) Define Cryo - preservation with an example? (CO5, K3)

Or

(b) What is the purpose of the iodine mordant in the Gram staining process, and how does it contribute to the staining results? (CO5, K5)

Part C (5 × 8 = 40)

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

16. (a) Explain the difference the principles behind selective and differential media in detail? (CO1, K1)

Or

(b) Discuss in detail the various methods of sterilization used in microbiological laboratories? (CO1, K4)

17. (a) Explain the rationale behind using glycerol as a cryoprotectant and its impact on the viability of bacterial cultures during freezing? (CO2, K5)

Or

(b) Differentiate Gram Positive and Gram Negative Bacteria with a neat Diagrammatic representation? (CO2, K5)

18. (a) Discuss the principles behind Polymerase Chain Reaction (PCR) and its application in bacterial identification. (CO3, K4)

Or

(b) Explain the process of conducting an antimicrobial sensitivity test using the Kirby-Bauer disc diffusion method? (CO3, K5)

19. (a) How does the MIC influence the choice of antimicrobial therapy and the potential outcome of treatment for bacterial infections? (CO4, K4)

Or

(b) Discuss phenol coefficient testing method contributes to assessing the disinfectant properties of agents? (CO4, K1)

20. (a) How can quorum sensing be targeted for therapeutic interventions? (CO5, K3)

Or

(b) Compare the advantages of traditional Sanger sequencing with the advancements of Next-Generation Sequencing (NGS) in identifying bacterial species from environmental samples? (CO5, K4)

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R0203	Sub. Code
	501110

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

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 objective questions by choosing the correct option.

1. Which of the following media is not used in plant tissue culture? (CO1, K2)

   (a) Murashige and Skoog medium

   (b) White medium

   (c) BG-11 media

   (d) Gamborg medium

2. What is the primary purpose of cryopreservation in the context of endangered plant germplasm? (CO1, K4)

   (a) Rapid growth of plant populations

   (b) Long-term storage of genetic material

   (c) Enhancing plant growth in the wild

   (d) Promotion of genetic diversity

3. Which part of the plant is commonly used for genomic DNA isolation using the CTAB method? (CO2, K2)

(a) Leaves (b) Roots

(c) Flowers (d) Stems

4. What is the primary purpose of inducing hairy roots in medicinal plants with commercial importance? (CO2, K3)

(a) To enhance leaf growth

(b) To stimulate flower production

(c) To facilitate the production of secondary metabolites

(d) To improve root structure

5. What type of biosafety cabinet (BSC) is recommended for working with animal cell cultures in a laboratory? (CO3, K3)

(a) Class I BSC (b) Class III BSC

(c) Class II BSC (d) Class IV BSC

6. What is the process of reviving cells from cryopreservation? (CO3, K4)

(a) Rapidly warming cells and placing them in fresh media

(b) Exposure to UV radiation

(c) Adding cryoprotectants to the frozen cells

(d) Keeping cells at room temperature for several hours

7. What is the primary purpose of using a hemocytometer for cell counting? (CO4, K3)

(a) To measure the volume of cell culture media

(b) To assess the viability of cells

(c) To determine the concentration of cells in a sample

(d) To visualize the cellular structure

8. Acridine orange and ethidium bromide are fluorescent dyes that can be used to stain DNA in cells. Which color does acridine orange fluoresce when bound to DNA? (CO4, K2)

(a) Red (b) Green

(c) Yellow (d) Blue

9. Which of the following is a commonly used instrument for dissection? (CO5, K4)

(a) Thermometer (b) Pipette

(c) Scalpel (d) Microscope

10. Which of the following is NOT typically included in the RNA isolation process? (CO5, K6)

(a) Cell lysis

(b) Proteinase K treatment

(c) DNA digestion

(d) RNA Precipitation

Part B (5 × 5 = 25)

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

11. (a) Write about Preparation of B5 stock solution in detail. (CO1, K2)

Or

(b) Discuss about Micropropagation of important medicinal plants. (CO1, K4)

12. (a) Explain about RAPD and ISSR profile of wild type medicinal plants. (CO2, K2)

Or

(b) Give a note on quantification methods involved in Plant Genomic DNA isolation. (CO2, K1)

13. (a) Discuss about any three equipments used in cell culture Laboratory. (CO3, K5)

Or

(b) Established cell lines-Explain. (CO3, K2)

14. (a) Explain about Checking cell viability by MTT. (CO4, K4)

Or

(b) Give a detailed account of Ethidium bromide staining in measurement of Apoptopsis. (CO4, K2)

15. (a) Write about *In vivo* animal model and route of administration of mice. (CO5, K3)

Or

(b) Discuss about Isolation of RNA from model system. (CO5, K5)

Part C (5 × 8 = 40)

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

16. (a) Give an account on the Preparation of various types of culture media for plant tissue culture. (CO1, K1)

Or

(b) Discuss Sterilization and inoculation of various explants for callus induction. (CO1, K4)

17. (a) How *Agrobacterium tumefaciens-mediated* transformation is important in food crops? (CO2, K4)

Or

(b) Elaborate Plant genomic DNA Isolation by the CTAB method. (CO2, K6)

18. (a) Describe the Preparation of primary cell cultures from different sources using mechanical disaggregation in detail. (CO3, K1)

Or

(b) Explain the Methods of Detection and prevention of contamination in cell culture. (CO3, K5)

19. (a) Discuss Cell counting by hemocytometer. (CO4, K3)

Or

(b) Describe Measurement of apoptosis by Acridine orange staining. (CO4, K2)

20. (a) Explain about Isolation of DNA from animal tissue. (CO5, K3)

Or

(b) Discuss about Chromosome staining from animal cells using Giemsa stain. (CO5, K5)

———————

R0204	Sub. Code
	501301

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

Third Semester

Biotechnology

BIOPROCESS ENGINEERING AND TECHNOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

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

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

1. In the equation, $\ln xt = \ln x0 + \mu t$, a plot of the natural logarithm of biomass concentration yields a straight line, in which the slope would equal to (CO1, K2)

   (a) μ (b) xt

   (c) $x0$ (d) k

2. The initial process in the screening of industry-suitable chassis microbial strains is _____ (CO1, K1)

   (a) characterization (b) identification

   (c) isolation (d) media formulation

3. In 2014, ———— was the database constructed to provide data on formulated medium for the cultivation of organisms using the sequenced genomes (CO2, K1)

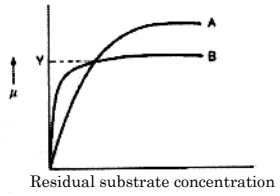
   (a) GenomeOB

   (b) MediaDB

   (c) High-throughput DB

   (d) MicrobeDB

4. A model of the competition between two microorganisms (A and B) capable of growing in a continuous enrichment culture is represented in the below figure. In this case, the selection of the organism by continuous enrichment depends on ————————. (CO2, K3)



(a) dilution rate

(b) photoautotrophic nature

(c) nutrient enrichment

(d) All of the above

5. ———————— is the phenomenon that represents the sensitivity of baker yeast towards free glucose at 5 μg dm-3, leading to the repression of its respiratory activity (CO3, K2)

(a) Controlled effect (b) Crabtree effect

(c) Demain effect (d) Elander effect

6. ———————— is used to rapidly but roughly estimate the cell concentration in a fermentation broth (CO3, K2)

(a) Packed cell volume

(b) Particle counter

(c) Hemocytometer

(d) Plate count

7. ———————— is the suitable example for the mixed–growth–associated product (CO4, K1)

(a) Penicillin production

(b) Glucokinase synthesis

(c) Spretomycin production

(d) Xanthan gum production

8. ———————— is the preferred method to replace centrifugation when it is crucial to avoid cell escape during product separation (CO4, K2)

(a) Hindered settling

(b) Cross-flow microfiltration

(c) Flocculation

(d) Coagulation

9. Which of the following antibiotics is the most suitable to isolate actinomycetes by targeting the *Microtetraspora*? (CO5, K2)

(a) Bruneomycin

(b) Dihydroxymethylfuratriazone

(c) Kanamycin

(d) Novobiocin

10. _____ is the process employed to convert the triacylglycerides into biodiesel and glycerol (CO5, K1)

(a) Bioconversion (b) Transesterification

(c) Saccharification (d) Biotransformation

Part B (5 × 5 = 25)

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

11. (a) Which culture method would you prefer, if you aim to prolong the log phase of the target microorganisms in the batch culture method? Write a brief note on that method with a suitable diagrammatic representation. (CO1, K3)

Or

(b) Explain in detail about the influence of environmental conditions affect the microbial growth kinetics. (CO1, K2)

12. (a) Describe the crucial roles of oxygen in the cultivation medium and fermentation. (CO2, K1)

Or

(b) Explain the impact of inhibitor provision in the glycerol fermentation with a suitable example. (CO2, K1)

13. (a) In the liquid-liquid extraction method, partition coefficient K plays a critical role in determining the ease of extraction. What extraction unit stage would you prefer for purification with a higher K value? Briefly explain its mechanism with a diagram. (CO3, K3)

Or

(b) If you are purifying the recombinant Histidine-tagged proteins from the microbial cells, what chromatographic technique would you choose to purify those proteins? Explain in detail with a picture. (CO3, K3)

14. (a) Describe the processes of site surveys for planning and designing the waste treatment in the fermentation industry. (CO4, K1)

Or

(b) Briefly outline the range of effluent disposal methods to be followed in the industry. (CO4, K3)

15. (a) Explain the classes of bacteriocins produced from the lactic acid bacteria. (CO5, K1)

Or

(b) Describe the applications of using molasses as the carbon source for fermentation. (CO5, K1)

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

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

16. (a) Which chemostat system can be employed to obviate the technical issues associated with the genetic stability of the microbes during single-stage chemostat specifically for the culture of genetically modified organisms? Explain in detail about that method. (CO1, K3)

Or

(b) Write in detail about the gradient plate technique for the isolation of analog-resistant mutants for the industrial production of lysine from *Brevibacterium flavum*. (CO1, K4)

17. (a) Explain in detail the scale-up and optimization of a batch sterilization process and the role of Del factor in the scale-up of batch sterilization processes. (CO2, K2)

Or

(b) Which is the most widely employed "continuous" sterilization system? Write in detail about its mechanism with the schematic representation. (CO2, K2)

18. (a) Which purification method is potentially used in separating the lipopeptide biosurfactant surfactin from *Bacillus subtilis* cultures? Explain it with a schematic flow diagram. (CO3, K3)

Or

(b) What are the physicomechanical methods available for cell disruption? Explain any two methods in detail with schematic representations. (CO3, K1)

19. (a) Describe the methods involved in the treatment of fermentation wastes with their merits and demerits. (CO4, K1)

Or

(b) Explain in detail about the components involved in the aeration and agitation of the fermenter with the pictorial representations. (CO4, K1)

20. (a) Describe the concept of food waste upcycling and its importance in circular bioeconomy and also brief the techno-biological obstacles existing in the bioconversion of food waste into valuable metabolites. (CO5, K1)

Or

(b) Describe the regulatory processes of the biosynthesis of purine nucleotides for the chemical synthesis of inosine monophosphate. (CO5, K1)

———————

R0205	Sub. Code 501302

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

Third Semester

Biotechnology

EMERGING TECHNOLOGIES

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

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

1. Transmitted light microscope has a light source below the stage while a reflected microscope has a light source that is located? (CO1, K1)

   (a) Below the stage/sample

   (b) Above the stage/sample

   (c) It has no light source

   (d) In the eyepiece

2. Which of the microscopes below is usually good for use on uncolored/unstained specimens? (CO1, K5)

   (a) phase-contrast

   (b) fluorescence

   (c) bright-field

   (d) scanning electron

3. Mass spectrometers are used to determine which of the following? (CO2, K1)

(a) Composition in sample

(b) Concentration of elements in sample

(c) Relative mass of atoms

(d) Properties of sample

4. In mass spectrometer, the ion currents are measured using which of the following? (CO2, K3)

(a) Scintillation counter

(b) Ion counter

(c) Electrometer tube

(d) Electric fields

5. Which of the following algorithm is used in MASCOT. (CO3, K1)

(a) MOWSE (b) Bayesian

(c) Bionic (d) Random Forest

6. HTS in drug discovery process refers to (CO3, K1)

(a) High Temperature System

(b) Higher Technology System

(c) High Throughput Screening

(d) Harmonized Tariff Schedule

7. Which of the following techniques do not require Protein crystallization for structure prediction? (CO4, K4)

(a) XRD

(b) NMR

(c) cryo-electron Microscopy

(d) SAXS

8. The cantilever tip is in hard contact with the surface called as: (CO4, K3)

(a) no deflection (b) repulsive regime

(c) attractive regime (d) feedback loop

9. What are the two main components of CRISPR-Cas9? (CO5, K1)

(a) CRISPR RNA and Cas 1 protein

(b) Guide RNA and Cas9 protein

(c) Guide RNA and Cas2 protein

(d) CRISPR RNA and Cas9 nuclease

10. What are some of the potential application of CRISPR-Cas9? (CO5, K3)

(a) Gene therapy (b) Crop Improvement

(c) Disease treatment (d) All of the above

Part B (5 × 5 = 25)

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

11. (a) Explain in detail about Differential Interference Contrast microscopy. (CO1, K1)

Or

(b) Define the principle of Confocal microscope and its applications. (CO1, K3)

12. (a) Write the application of Mass Spectrometry in defining the protein structure. (CO2, K1)

Or

(b) Write different types of mass analyzers and their working principle. (CO2, K2)

13. (a) How will you analyse the OMICS data using bioinformatics tools? (CO3, K4)

Or

(b) Explain any one of the validation methods in experimental biology. (CO3, K6)

14. (a) What is cryo-electron microscopy and write its application? (CO4, K1)

Or

(b) Write in detail about X-ray diffraction and its types. (CO4, K1)

15. (a) What are the applications of Genome editing? (CO5, K4)

Or

(b) Write about case studies using CRSPR-Cas9 technology. (CO5, K5)

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

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

16. (a) Define the principle of Fluorescence Microscope and Explain the background. (CO1, K2)

Or

(b) What is Coherent Anti-Stokes Raman Scattering Microscopy? Explain its working principle. (CO1, K3)

17. (a) Write the types of ionization techniques and explain their principle in detail. (CO2, K1)

Or

(b) Explain in detail about FT-ICR. (CO2, K4)

18. (a) Explain any two high throughput screening methods to study cellular biology. (CO3, K4)

Or

(b) Write about advanced mathematical modeling to solve the biological issues. (CO3, K6)

19. (a) Explain NMR and its application in Proteomics. (CO4, K2)

Or

(b) Write the principle and application of Atomic force microscopy. (CO4, K3)

20. (a) Write in detail about CRISPR-Cas9 and the molecular players involved. (CO5, K4)

Or

(b) How will you use the gene editing tool as future therapeutics? (CO5, K6)

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R0206	Sub. Code
	501304

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

Third Semester

Biotechnology

BIO ENTREPRENEURSHIP

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

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

1. Which of the following falls under the domain of environmental bio- industries? (CO1, K3)
   (a) Space exploration
   (b) Waste management and recycling
   (c) Financial services
   (d) Luxury fashion design
2. Which factor plays a significant role in shaping opportunities for innovation and entrepreneurship in the bio-sectors? (CO1, K4)
   (a) Availability of non-renewable resources
   (b) Economic downturns and recessions
   (c) Rapid advancements in technology
   (d) Limited access to education
3. What type of training is often included in entrepreneurship development programs by private agencies? (CO2, K2)
   (a) Physical fitness training
   (b) Artistic skill training
   (c) Business management, leadership, and negotiation skills training
   (d) Religious studies

4. Indian Patent system has (CO2, K3)

(a) Pre-grant opposition only

(b) Post-grant opposition only

(c) both pre-grant and post-grant opposition

(d) process opposition only

5. What does the journey from lab to market involve for a new innovation? (CO3, K4)

(a) Direct movement without any challenges

(b) A straightforward, linear process

(c) A complex path with various stages and challenges

(d) Immediate commercial success

6. Which contract principle defines the obligations and responsibilities of each party in a joint venture agreement? (CO3, K2)

(a) Non-disclosure agreement

(b) Force majeure clause

(c) Assignment clause

(d) Scope of work provision

7. What section of a business plan typically describes the company's products or services, target market, and competition? (CO4, K4)

(a) Executive Summary

(b) Financial Projections

(c) Marketing and Sales Strategy

(d) Legal Structure

8. Which of the following is NOT typically considered in a business feasibility study? (CO4, K2)

(a) Competitive analysis

(b) Budget for office parties

(c) Market research

(d) Legal requirements

9. How does quality control contribute to customer satisfaction? (CO5, K6)
   (a) By ignoring customer feedback
   (b) By decreasing product prices
   (c) By consistently delivering products that meet or exceed expectations
   (d) By avoiding direct interactions with customers
10. What is primary role of CDSCO (Central Drugs Standard Control Organization)? (CO5, K3)
   (a) Wildlife conservation
   (b) Monitoring air quality
   (c) Ensuring the safety, efficacy, and quality of drugs and cosmetics
   (d) National Defense

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

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

11. (a) What is Bio-entrepreneurship? List out the scope of Bio-entrepreneurship. (CO1, K2)

Or

   (b) What are the strategies and operations used in bio-sector firms? (CO1, K3)

12. (a) Explain alternatives faced by emerging biofilms. (CO2, K1)

Or

   (b) Discuss in detail about commercialization strategies. (CO2, K1)

13. (a) Write about various types of negotiations involved in the process of the road from lab to the market. (CO3, K3)

Or

   (b) Write a detailed note on Dispute resolution skills. (CO3, K4)

14. (a) How a person himself should prepare himself/ herself to start a business? What are the legal requirements mandatory to start a business? (CO4, K5)

Or

   (b) How Collaboration and Partnership can be maintained in business? (CO4, K4)

15. (a) Describe Technology assessment in detail. (CO5, K2)

Or

(b) Discuss regulatory compliances and procedures of the NBA. (CO5, K2)

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

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

16. (a) Explain about competitive dynamics happening between the pharmaceutical industries and Industrial biotech. (CO1, K3)

Or

(b) What about the factors that shapes the opportunities for innovation and entrepreneurship in bio-sectors? (CO1, K5)

17. (a) Discuss in detail entrepreneurship development programs by DBT, Make In India. (CO2, K4)

Or

(b) What do you think about the strategic dimensions of patenting? (CO2, K5)

18. (a) Write a detailed note on challenges in Bio-business marketing. (CO3, K4)

Or

(b) Discuss different types of agreements and contract terms typically found in joint venture and development agreements. (CO3, K5)

19. (a) Describe Financial management issues in procurement of capital and management loss. (CO4, K2)

Or

(b) Write about the role of Information Technology in business. (CO4, K3)

20. (a) How to use various technologies to upgrade the business? (CO5, K4)

Or

(b) Compare the regulatory compliances and procedures of CDSCO and GMP. (CO5, K3)

R0207	Sub. Code
	501305

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

Third Semester

Biotechnology

INTELLECTUAL PROPERTY RIGHTS, BIOSAFETY, AND BIOETHICS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

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

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

1. When did the World Trade Organization come into effect? (CO1, K1)

   (a) 6th March 1996

   (b) 8th April 1994

   (c) 5th February 1994

   (d) 1st January 1995

2. Intellectual property rights (IPR) protects the use and information of idea that are of ———— (CO1, K2)

   (a) Ethical value (b) Moral value

   (c) Social value (d) Commercial value

3. Budapest Treaty provides deposits of microorganism with ————————. (CO2, K2)

(a) Controller of patents

(b) State government

(c) International depository authority

(d) Contracting State

4. Patent application contains ————————. (CO2, K1)

(a) Form 1

(b) Form 2

(c) Both form 1 and 2

(d) Form 30

5. In which country are the most GMOs grown? (CO3, K1)

(a) China

(b) Brazil

(c) United States of America

(d) Argentina

6. Research laboratories that study diseases having serious or lethal consequences require which microbiological practices? (CO3, K2)

(a) Biosafety level 1 practices

(b) Biosafety level 2 practices

(c) Biosafety level 3 practices

(d) Biosafety level 4 practices

7. Which Indian organization is responsible for accessing the safety of introducing genetically modified organisms for public use? (CO4, K1)

(a) ICMR (b) CSIR

(c) RCGM (d) GEAC

8. When was the FSSAI established in India? (CO4, K1)

(a) 5th September 2008

(b) 5th August 2008

(c) 15th September 2008

(d) 15th August 2008

9. ———— includes rules of conduct that may be used to regulate our activities concerning the biological world. (CO5, K1)

(a) Biopiracy (b) Biosafety

(c) Bioethics (d) Biopatent

10. Which of these is NOT one of the major debates about stem cell research? (CO5, K2)

(a) Stem cell research could be used to cure degenerative diseases

(b) Stem cell research often involves destroying human embryos

(c) Stem cell research can be used to manipulate people's behavior

(d) All of these are major debates on stem cell research

Part B (5 × 5 = 25)

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

11. (a) What is GATT? Analyze its function in promoting international trade. (CO1, K4)

Or

(b) What is TRIPS? Describe its role in protecting intellectual property rights. (CO1, K2)

12. (a) Explain about the different types of patents in India. (CO2, K4)

Or

(b) Differentiate between trade mark and trade secret with suitable examples. (CO2, K4)

13. (a) Describe about the Biosafety level 3 (BSL3) in microbiological practices and mention any two examples of BSL 3 microbes. (CO3, K4)

Or

(b) Comment on GLP and access its importance. (CO3, K5)

14. (a) Outline the highlights of the draft bill of Biotechnology Regulatory Authority of India. (CO4, K4)

Or

(b) Elaborate on the role and responsibility of FSSAI in food safety and quality assurance. (CO4, K5)

15. (a) Outline the animal rights that are followed while doing research that involve the use of animals. (CO5, K4)

Or

(b) What is bioethics and how it has to be implemented within research community? (CO5, K1)

Part C (5 × 8 = 40)

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

16. (a) Describe in detail about the types of intellectual property. (CO1, K5)

Or

(b) Give a detailed note on plant variety protection and farmers right. (CO1, K5)

17. (a) Summarize on Indian Patent Act 1970 and its recent amendments. (CO2, K2)

Or

(b) Explain in detail about the types of patent application. (CO2, K5)

18. (a) Elaborate on the guidelines for rDNA research activities to be conducted in a scientific way. (CO3, K5)

Or

(b) What are GMOs and LMOs? Summarize the level of biosafety measures needed to be implemented in laboratories while Working with GMOs and LMOs. (CO3, K2)

19. (a) What is the purpose of the Codex Alimentarius Commission and explain its objectives? (CO4, K5)

Or

(b) Describe about the regulatory authorities in India that authorize biosafety research level trials. (CO4, K5)

20. (a) Explain about the general issues related to environmental release of transgenic plantsand animals. (CO5, K5)

Or

(b) Elucidate about the ethical issues that are involved with embryonic stem cell research. (CO5, K5)

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R0208	Sub. Code
	501308

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

Third Semester

Biotechnology

Laboratory VI : BIOPROCESS ENGINEERING AND TECHNOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

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

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

1. The wavelength of the visible spectrum of light ranges between (CO1, K1)

   (a) 200-440 nm (b) 400-700 nms

   (c) 200-800 nm (d) 150-540 nm

2. The incorporation of baffle in the bioreactor is meant to mainly _____ (CO1, K1)

   (a) prevent vortex

   (b) prevent aeration

   (c) influence over growth

   (d) spread the media evenly

3. Corrosion resistance of a fermenter can be enhanced by the presence of (CO2, K1)

   (a) tungsten (b) halogen salts

   (c) nickel (d) chromium

4. Which of the following components of the fermenter is not involved in the aeration and agitation? (CO2, K1)

(a) impeller (b) stirrer glands

(c) baffles (d) sensor

5. A fed-batch system operates at a quasi-steady state when the nutrient consumption rate is nearly equal to the nutrient feed rate. Since $dX/dt = 0$ at quasi-steady state, then μ_{net} = ———— (CO3, K2)

(a) D (b) K_s

(c) S (d) μ_m

6. In a fed-batch culture operating with intermittent addition of glucose solution, values of the following parameters are given at time t = 4 h, V = 1000 ml; F = 200 ml/h. Find the V_0 (initial volume of the culture) (CO3, K3)

(a) 600 ml (b) 200 ml

(c) 400 ml (d) 800 ml

7. ———— is the suitable method for fractionation of total lipids into phospho-, glyco- and neutral-lipids for biodiesel production (CO4, K3)

(a) Gas chromatography-mass spectrometry

(b) High -performance liquid chromatography

(c) Solid phase extraction

(d) Bligh and Dyer method

8. In the process of recovering and purifying citric acid as per Sodeck et al., 1981 ———— is added filtrate until the filtrate reaches pH 5.8 (CO4, K1)

(a) $CaSO_4$ (b) $Ca(OH)_2$

(c) H_2SO_4 (d) HNO_3

9. Which of the following methods can be used for the quantitative determination of total lipids from the microalgal biomass? (CO5, K3)

(a) BODIPY-confocal microscopy

(b) Nile-red based fluorescence intensity

(c) Gravimetric method

(d) UV-V is spectrophotometer

10. Which of the following enzymes can be assayed to assess the lipogenic role of NADPH in microbial systems? (CO5, K3)

(a) Malic enzyme

(b) Malonyl CoA : acyl carrier protein transacylase

(c) Lysophosphatidic acid acyl transferase

(d) 1, 6- β -transglycosylase

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

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

11. (a) Competent E. coil cells were prepared by the $CaCl_2$ method by your team, which will be employed for the transformation of the recombinant pCAMBIA 2301 vector later, Thus, the prepared competent cells have to be preserved until their further applications. At this juncture, which preservation method would you prefer to store those competent cells? (CO1, K3)

Or

(b) What are the key criteria to be followed for ensuring the quality control of the preserved stock cultures in academia? (CO1, K2)

12. (a) Draft the procedure to assess the impact of pH on amylase activity. (CO2, K3)

Or

(b) It is well known that the adequate provision of sterile air is warranted for aerobic fermentations. Which sterilization method would you prefer for air sterilization and write a note on it. (CO2, K3)

13. (a) Illustrate the model for fed-batch culture for lactic acid fermentation and discuss the impact of culture volume, specific growth rate, and cell and substrate concentrations in fedbatch fermentation. (CO3, K3)

Or

(b) Which method is considered the alternative to fed-batch culture, particularly for culturing animal cell cultures? Explain the system in detail with a picture. (CO3, K3)

14. (a) Describe the methodology to separate the extracellular compounds from the fermentation product with a suitable example (CO4, K3)

Or

(b) How do you recover and partially purify the Penicillin G from *Penicillium chrysogenum* fermentation? (CO4, K3)

15. (a) Explain the processes of distillation in the fermentation unit with a schematic representation. (CO5, K1)

Or

(b) Describe the principle and working methodology of centrifugal countercurrent solvent extraction and its role in Penicillin G extraction from the fermented broth. (CO5, K3)

Part C (5 × 8 = 40)

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

16. (a) The fermentation experiment is planned to cultivate genetically engineered *Chlorella vulgaris* strains in the photobioreactor as a batch culture for 14 days. Which methods would you prefer to determine the cellular growth by direct and indirect methods, respectively? Elaborate those methods in detail. (CO1, K3)

Or

(b) Explain in detail the steps and procedures involved in the isolation and screening of microorganisms from the soils contaminated with heavy metals with the flowcharts. (CO1, K3)

17. (a) Explain in detail the crucial components of a fermenter and its construction with a schematic representation. (CO2, K1)

Or

(b) A microbial strain with the capability to degrade tannic acid was isolated from the soil sample. Explain the detailed methodology involved in determining the enzymatic activity of tannase. (CO2, K3)

18. (a) Explain in detail the methods for immobilization of cells and their applications in industrial biotechnology. Illustrate the fermenter considerations in immobilised cell systems. (CO3, K3)

Or

(b) Which fermentation method is suitable for the fermentation of solid substrates such as agricultural products or foods? Elaborate the method with a diagram and compare the advantages of this method over the submerged fermentations. (CO3, K3)

19. (a) Describe any two methods employed for the removal of microbial cells and other insoluble materials harvested culture. (CO4, K3)

Or

(b) Explain in detail the methodology involved in the cell aggregation and flocculation for the purification of fermented products. (CO4, K3)

20. (a) Explain in detail the working principle and methodology of liquid chromatography mass spectrometer with a diagram. Highlight its applications in fermentation technology. (CO5, K1)

Or

(b) Heterologous overexpression of *Arabidopsis* tocopherol cyclase was heterologouslv over expressed in transgenic rice to hyperaccumulate α-tocopherol content in transgenic rice. The transgenic lines were generated and molecular analyses showed the successful integration of the transgene in the transgenic rice lines and further biochemical analysis has to be done to corroborate the α-tocopherol increment in transgenic rice. Explain the α-tocopherol extraction procedure and HPLC methodology to determine the α-tocopherol content in detail. (CO5, K3)

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R0209	Sub. Code
	501309

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

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 questions by choosing the correct option.

1. The laboratory work using computers and associated with web-based analysis generally online is referred to as _____ (CO1, K1)

   (a) In silico (b) Dry lab

   (c) Wet lab (d) All of the above

2. Which type of BLAST is used to compare protein sequences against a protein database? (CO1, K1)

   (a) BLASTn (b) BLASTp

   (c) BLASTx (d) tBLASTn

3. The procedure of aligning many sequences simultaneously is called (CO2, K1)

   (a) Multiple sequence alignment

   (b) Pair wise alignment

   (c) Global alignment

   (d) Local alignment

4. CLUSTALW is a more recent version of CLUSTAL with the W standing for ———— (CO2, K1)

(a) Weakening (b) Winding

(c) Weighting (d) Wiping

5. Which of the following is not a form of RNA? (CO3, K1)

(a) tRNA (b) rRNA

(c) mRNA (d) qRNA

6. A program to identify complete gene structures in genomic DNA (CO3, K1)

(a) SWISSPORT (b) BLAST

(c) PHYLIP (d) GENSCAN

7. What is the source of protein structures in SCOP and CATH? (CO4, K1)

(a) Uniprot (b) Protein Data Bank

(c) Ensemble (d) InterPro

8. Homology modeling is a computational technique used to predict the three dimensional structure of a protein based on (CO4, K1)

(a) Protein crystallography

(b) NMR spectroscopy

(c) Experimental data

(d) The primary amino acid sequence

9. Protein folding is a process in which a polypeptide folds in to ————. (CO5, K1)

(a) 2-D structure (b) Globular form

(c) 3-D structure (d) Linear form

10. Literature databases include (CO5, K1)

(a) MEDLINE and PUBMED

(b) MEDLINE and PDB

(c) PUBMED and PDB

(d) MEDLINE and PDS

Part B (5 × 5 = 25)

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

11. (a) Summarize the different protein sequence databases. (CO1, K2)

Or

(b) Classify the various genome databases. (CO1, K2)

12. (a) Explain the use of multiple sequence alignment. (CO2, K2)

Or

(b) Outline in detail about nucleotide sequences. (CO2, K2)

13. (a) Illustrate how to perform RNA structure prediction. (CO3, K2)

Or

(b) Infer the gene prediction using Genscan. (CO3, K2)

14. (a) Show the ways to visualize protein structures. (CO4, K3)

Or

(b) List out the various miRNA prediction tools. (CO4, K2)

15. (a) Identify the different secondary structures of protein. (CO5, K2)

Or

(b) Examine the use of Pubmed database search. (CO5, K4)

Part C (5 × 8 = 40)

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

16. (a) Classify the importance of NCBI databases. (CO1, K2)

Or

(b) Show the similarity searching of sequences using BLAST. (CO1, K2)

17. (a) Construct multiple sequence alignment using ClustalW. (CO2, K2)

Or

(b) Illustrate the phylogenetic analysis of protein sequences. (CO2, K2)

18. (a) Compare the different gene prediction methods. (CO3, K4)

Or

(b) Identify the various primer design and restriction site prediction tools of a gene. (CO3, K3)

19. (a) Explain how to perform homology modelling of a protein. (CO4, K2)

Or

(b) Classify the available protein structural databases. (CO4, K4)

20. (a) List out the steps involved in protein structure prediction. (CO5, K4)

Or

(b) Explain in detail about *Insilco* based drug design. (CO5, K3)

R0210	Sub. Code
	501508

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

Third Semester

Biotechnology

Elective : VACCINES

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

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

1. The following does not protect against body surfaces (CO1, K4)

   (a) Mucus

   (b) Skin

   (c) Gastric acid

   (d) Salivary amylase

2. Name the major constituents of cytotoxic T-Lymphocyte? (CO1, K3)

   (a) Perforin and granzyme

   (b) Protein

   (c) Lymph

   (d) Lysozyme

3. Acute inflammation can be initiated by (CO2, K2)

(a) Activation of mast cells

(b) Influx of neutrophils

(c) Influx of lysozyme

(d) Activation of grandzyme

4. The term variolation refers to (CO2, K1)

(a) Attenuation of virulent organisms

(b) Inoculation of scab material into skin wounds

(c) Injecting the pathogen through nasal mode

(d) Heating the pathogen and administering orally

5. A two-month-old breast fed baby will contain maternal (CO3, K1)

(a) lgA (b) IgM

(c) IgD (d) IgG

6. Hepatitis is an example of (CO3, K2)

(a) Sununit vaccine

(b) Killer vaccine

(c) Toxoids vaccine

(d) Recombinant vaccine

7. Which of the following is not an example of a live attenuated vaccine? (CO4, K3)

(a) Tetanus vaccine

(b) MMR vaccine

(c) Varicella (chickenpox) vaccine

(d) Small pox

8. The process of weakening a pathogen is known as (CO4, K3)

(a) Attenuation

(b) Vaccination

(c) Immunization

(d) Virulence reduction

9. A potential new vaccine is in the developmental phase which could be the preventive or therapeutic vaccine against HIV (CO5, K5)

(a) Live attenuated HIV

(b) Recombinat gp 120

(c) Marburg DNA plasmid

(d) Recombinant Na-GST-1

10. Plasmids encoding antigenic protein from a pathogen that is directly injected into the cells where it express constitute (CO5, K6)

(a) Protein vaccines

(b) DNA vaccines

(c) Nucleotide vaccines

(d) Recombined vaccines

Part B (5 × 5 = 25)

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

11. (a) Relate Innate and Adaptive immunity with examples. (CO1, K2)

Or

(b) How does endogenous and exogenous pathways of antigen presentation helpful in activating the immune system? (CO1, K3)

12. (a) Justify the role of cytokines in CD4+ T cells and CD8+ T cells differentiation. (CO2, K3)

Or

(b) How do adjuvants function in vaccination? (CO2, K5)

13. (a) Illustrate your understanding about cytokines and chemokines. (CO3, K2)

Or

(b) Summarize the applications of Nasal Vaccination. (CO3, K4)

14. (a) Construct a table explaining the distinctive features of the mucosal immune system. (CO4, K3)

Or

(b) Which cells produce T lymphocytes? Explain the types and importance. (CO4, K3)

15. (a) Compare and provide a table distinguishing the humoral and cell mediated immune responses. (CO5, K6)

Or

(b) Illustrate the process of hematopoiesis with a neat diagram. (CO5, K4)

Part C (5 × 8 = 40)

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

16. (a) What is epitope? Write an essay on characteristic features of B and T-cell epitopes. (CO1, K2)

Or

(b) Outline about the preventive immune responses against bacterial and viral infections. (CO1, K3)

17. (a) Explain what type of immunity is induced by using vaccine? Discuss the mechanism, advantages and disadvantages of recombinant vaccines. (CO2, K3)

Or

(b) Summarize your knowledge on the various mucosal delivery system. (CO2, K4)

18. (a) How will you classify the types of vaccines based on the routes of administration? (CO3, K4)

Or

(b) Demonstrate the mechanism of cell memory for both T and B cells of the immune system. (CO3, K3)

19. (a) Describe the most important molecular events and phenotypic changes that take place during antigen dependant B cell maturation. (CO4, K5)

Or

(b) Discuss the strategy to adopt various disease specific vaccine design. (CO4, K6)

20. (a) Illustrate in detail about bacterial vaccines and viral vaccines. (CO5, K3)

Or

(b) Describe the T-Cell receptor and its function. (CO5, K4)

———————