R7659	Sub. Code 501101

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Biotechnology

BIOCHEMISTRY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** questions.

1. Miller and Urey had performed an experiment to prove the origin of life. They took gases H_2O, Co and CH_4 along with _____.

   (a) N_2 and H_2O (b) NH_3 and H_2

   (c) CH_4 and N_2 (d) CO_2 and NH_3

2. 1M NaCl and 1M HCl are present in an aqueous solution. The solution is _____.

   (a) Not a buffer solution with pH <7

   (b) Not a buffer solution with pH > 7

   (c) A buffer solution with pH <7

   (d) A buffer solution with pH > 7

3. In which amino acid has Imidazole group, and an aromatic ring?

   (a) Lysine (b) Arginine

   (c) Histidine (d) Glutamate

4. Which type of bonds present in vegetable fats account for their liquid state?

(a) Single bonds (b) Double bonds

(c) Amide bonds (d) Glycosidic bonds

5. Which of the following is not true for coenzymes?

(a) Coenzymes may be immobilized/regenerated with the use of whole-cell systems

(b) Membrane reactors may be used to immobilize the coenzyme

(c) They are referred to as artificial enzymes

(d) Coenzymes may be derivatized for adequate immobilization and regeneration

6. The enzymes having a catalytic site which is used for binding for regulatory metabolites is referred to as _____

(a) Isoenzyme

(b) Biosensor

(c) Allosteric enzymes

(d) Effectors

7. Which of the following molecules is present in the mitochondrion?

(a) Acetyl CoA (b) Acetyl CoB

(c) Acetylanase (d) Acetylcholine

8. What is the rate of electron transfer when proton motive force is high?

(a) Faster (b) Slower

(c) Moderate (d) None

9. The first product of TCA cycle is _____

(a) Fumaric acid (b) Oxalic acid

(c) Malic acid (d) Citric acid

10. Which of the following statements is true regarding acetyl co-A?

(a) It stimulates pyruvate dehydrogenase

(b) It stimulates pyruvate carboxylase

(c) It inhibits pyruvate carboxylase

(d) It stimulates hexokinase

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

Answer **all** questions, choosing either (a) or (b).

11. (a) Give a brief note on the abiotic formation of amino acid oligomers.

Or

(b) Give a brief account on biological oxidation-reduction reactions.

12. (a) Explain lipid bilayer model.

Or

(b) Explain the structure, functional groups and properties of amino acids.

13. (a) Write short note on catalytic power and specificity of enzymes.

Or

(b) Write note on the Allosteric and feedback inhibition.

14. (a) Give a brief account on electrochemical gradient and its applications.

Or

(b) Give a short note on the mitochondrial respiratory complexes.

15. (a) Give a short note on the gluconeogenesis.

Or

(b) Give note on citric acid cycle as a source of biosynthetic precursors.

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

Answer any **five** questions.

16. Give a detailed note on maintenance of blood pH and pH of gastric juice.

17. Elaborate the mechanism of transport across membrane.

18. Explain in detail about mono, di, and polysaccharides.

19. Give a derivative account on the Michaelis- Menten equation.

20. Give a detailed note on applications of enzymes in agriculture, industry and therapy.

21. Explain in detail about photosynthesis.

22. Explain in detail the about F1-F0 ATP Synthase and its mechanism.

23. Give a detailed note on the citric acid cycle.

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R7660	Sub. Code
	501102

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Biotechnology

CELL AND MOLECULAR BIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

1. Where was golgi complex first recognized?

   (a) Blood cell (b) Root cell

   (c) Nerve cell (d) Nucleus

2. What is "zone of exclusion" associated with?

   (a) Nucleus (b) Nucleolus

   (c) Nucleoplasm (d) Golgi complex

3. DNA wrapped around a set of eight histone proteins is called?

   (a) Nucleotide (b) Nucleoside

   (c) Nucleosome (d) Nucleolus

4. What is called as the inactive part of the chromosome?

   (a) Heterochromatin (b) Chromatin

   (c) Exon (d) Inactive portion

5. Which one of the following reasons explains the difference in mechanism of replication between eukaryotes and prokaryotes?

(a) Use of DNA primer rather than RNA primer

(b) Different enzyme for synthesis of lagging and leading strand

(c) Discontinuous rather than semi-discontinuous replication

(d) Unidirectional rather than semi-discontinuous replication

6. How do the small molecules pass through the outer membrane of mitochondria?

(a) ATP pump

(b) Carrier protein

(c) Channels

(d) Porins

7. Which of these is the correct order of events in the cell cycle?

(a) G1→G2→S→M

(b) G1→G2→M→S

(c) G1→S→G2→M

(d) S→M→G1→G2

8. What is the plant cell-wall made of?

(a) Cellulose

(b) Muramic acid

(c) Mucopeptide

(d) Chitin

9. It is very important to study lambda biology as lambda phages are used for cloning purposes. Which of the statement is true for lambda phage?

(a) It is an example of temperate phage

(b) The fate of the phage is decided before it infects the cell

(c) The lysis fate is that where the phage inserts its genome into the bacterial genome and the replication goes on

(d) The lysogenic fate is that where the phage infects the cell and lysis is carried out

10. What is the capsid (protective coat) of the bacteriophage made up of?

(a) DNA (b) RNA

(c) Protein (d) Organic acid

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

Answer **all** questions, choosing either (a) or (b).

11. (a) Differentiate between the structure and organisation of prokaryotic and eukaryotic cell.

Or

(b) Give a brief note on the three-dimensional organization and functions of cytoskeleton.

12. (a) Explain the role of writers, readers and erasers in chromatin modification.

Or

(b) Give a note on protein translation machinery.

13. (a) Write note on the mechanism and regulation of intracellular transport of proteins across nucleus.

Or

(b) Give a note on the regulation of cell cycle and the major check points.

14. (a) Write down the role of hormones in regulation of celluar differentiation.

Or

(b) Give a short note on the shoot and root development

15. (a) Give a short note on the phase of lambda phage if cro proteins predominate

Or

(b) Write about the adaptive responses and their regulation of DNA damages.

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

Answer any **five** questions.

16. Give a detailed note on endoplasmic reticulum, peroxisome and chloroplast

17. Give a detailed account on the steps involved in transcription.

18. Explain co and post translational modification in detail.

19. Write note on the mechanism and regulation of Intracellular vesicular trafficking from Endoplasmic Reticulum through Golgi apparatus to lysosomes

20. Give a detailed explanation on the transcriptional control, with special emphasis on structure and assembly of eukaryotic and prokaryotic RNA Polymerases, promoters and enhancers, and transcription factors.

21. Detail on the process of mitochondrial genetic code translation product cleavage,modification and activation.

22. Explain protein translation machinery with special emphasis on ribosomes-composition and assembly.

23. Explain the role of plant hormones in regulating the process of cellular differentiation.

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R7661	Sub. Code
	501103

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Biotechnology

PLANT AND ANIMAL BIOTECHNOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

All questions carry equal marks.

1. Which of the following is not a basic component of plant tissue culture media?

   (a) Sucrose/Agar (b) Complex mixture of salts

   (c) Serum albumin (d) Amino acids

2. The pair of hormone required to induce callus are,

   (a) Auxin and cytokinin

   (b) Ethylene and auxin

   (c) Cytokinin and gibberellin

   (d) Auxin and abscisic acid

3. The process of changing the permeability of cell membrane to uptake macromolecule is known as.

(a) Ultrasonication

(b) Electroporation

(c) Particle bombardment

(d) Microinjection

4. The metabolite produced by *Agrobacterium* during plant infection is,

(a) Morphine (b) Codeine

(c) Opine (d) Genistein

5. The Arabidopsis Information Resource (TAIR) is maintained by,

(a) Celera bioinformatics corporation

(b) Wellcome trust bioinformatics corporation

(c) Phoenix bioinformatics corporation

(d) John Innes bioinformatics corporation

6. Development of embryo without fertilization of an egg by sperm is termed as

(a) somatic cell nuclear transfer

(b) in vitro fertilization

(c) parthenogenesis

(d) oogenesis

7. The most established method of gene transfer in fish is

(a) ultrasonication (b) microinjection

(c) lipofection (d) particle bombardment

8. The first recombinant protein of animal origin to be released as a drug for clinical use in humans is

(a) antithrombin (b) lactoferrin

(c) alpha fetoprotein (d) Factor IX

9. The first human immortal cell line is

(a) HK-2 (b) CHO

(c) HeLa (d) iPS

10. Virus titer can be calculated by,

(a) PCR (b) colony counting

(c) redox assay (d) plaque assay

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

Answer **all** questions, choosing either (a) or (b).

11. (a) Write a short note on cryopreservation and its applications.

Or

(b) Explain briefly about sterilization techniques used in plant tissue culture.

12. (a) What are binary vectors? Explain their role in transgenics.

Or

(b) List the differences between Ti plasmid and Ri plasmid.

13. (a) What is RFLP? Give any two applications of RFLP in genetic mapping.

Or

(b) How recombinant vector vaccines are constructed?

14. (a) What are the physical methods of gene transfer to develop recombinant vectors?

Or

(b) Discuss the ethical issues in cloning.

15. (a) Briefly explain the significance of suspension cell cultures.

Or

(b) Give the applications of cell culture technology in viral vaccine production.

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

Answer any **five** questions.

All questions carry equal marks.

16. Write the role of gene expression during somatic embryogenesis.

17. State the principles behind SCAR and SSR techniques and explain. Mention their applications.

18. Give a detailed outline on the production of transgenic crops against abiotic stresses.

19. Explain the gene transfer mechanism of *Agrobacterium* in plants.

20. How can neurogenerative disorders to treated using transgenics? Discuss using animal models.

21. Defective genes responsible for disease development can be corrected using gene therapy. Justify using *ex vivo* and *in vivo* gene therapy.

22. List the components of cell culture media and their role in cell growth and differentiation?

23. Explain the use of cell culture for toxicity testing of environment pollutants.

R7662	Sub. Code
	501104

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Biotechnology

MICROBIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** questions.

1. Which part of the compound microscope helps in gathering and focusing light rays on the specimen to be viewed?

   (a) Condenser lens (b) Magnifying lens

   (c) Objective lens (d) Eyepiece lens

2. Bacteria having clusters of flagella at both poles of cells are known as?

   (a) Amphitrichous (b) Monotrichous

   (c) Peritrichous (d) Lophotrichous

3. How much time is required by the young cells to be killed by a lethal agent?

   (a) 24 hours (b) 3-4 hours

   (c) 30 mins (d) 5 mins

4. Which of the following actions are not affected by antimicrobial agents?

(a) Cell wall synthesis

(b) Nucleic acid synthesis

(c) Protein synthesis

(d) Capsule formation

5. Which of the following is an indirect method for measuring bacterial growth?

(a) Cell count

(b) Cell mass

(c) Cell activity

(d) Both Cell mass and Cell activity

6. Which of the following method is used for enumeration of bacteria in vaccines and cultures?

(a) Microscopic Count

(b) Membrane filter

(c) Plate count

(d) Dry weight determination

7. Which of the following microorganism occurs in swine?

(a) *Brucella melitensis*

(b) *Brucella abortus*

(c) *Brucella suis*

(d) *Legionella pneumophila*

8. Which of the following is a plasmid-mediated toxin?

(a) Diphtheria toxin (b) Botulism toxin

(c) Tetanus toxin (d) Food-poisoning toxin

9. Which of the following yeast is used for the production of riboflavin?

(a) *Saccharomyces cerevisiae*

(b) *Eremothecium ashbyi*

(c) *Saccharomyces rouxii*

(d) *Candida utilis*

10. Solvents and enzymes are found in which of the following categories of microbial products?

(a) Pharmaceutical chemicals

(b) Commercially valuable chemicals

(c) Food supplements

(d) Alcoholic beverages

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

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the history of microbiology.

Or

(b) Discuss about the five kingdom concepts.

12. (a) How importance of disinfection?

Or

(b) List out the physical methods of sterilization.

13. (a) Write about the bacterial structure.

Or

(b) Explain about the prions.

14. (a) Clarify about reservoir of infections.

Or

(b) Comments on pathogenicity island.

15. (a) How identify microbial invasion?

Or

(b) What are probiotics?

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

Answer any **five** questions.

Answer should not exceed 2 pages.

16. Discuss about the classification of bacteria according to Bergey's manual.

17. Write about the various methods of bacterial culture.

18. Discuss the reasons emerging and reemerging diseases.

19. Discuss the various types of viral taxonomy.

20. How microbes adopted to extreme environments? Give an example and explain.

21. How microbial density decrease through quorum quensing?

22. Discuss the pathogen transmission and interaction.

23. Describe the microbial role in biogeochemical cycles.

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R7663	Sub. Code
	501105

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Biotechnology

GENETICS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

1. Who proved first that DNA was indeed the genetic material through experiments?
   (a) Alfred Hershey and Maclyn McCarty
   (b) Oswald Avery and Maclyn McCarty
   (c) Oswald Avery and Martha Chase
   (d) Alfred Hershey and Martha Chase

2. Transformation carried out using a particle gun is known as biolistic transformation. It falls under which category of transformation?
   (a) Physical (b) Chemical
   (c) Electroporation (d) Natural

3. Mark the INCORRECT statement about mutation?
   (a) Mutation is predestined
   (b) Major source of evaluation
   (c) Usually deleterious and recessive
   (d) Its causatives are known as mutagens

4. The type of mutation that is imposed by transposons is _____.

(a) Silent mutation

(b) Reverse mutation

(c) Polar mutation or insertional inactivation

(d) Frame shift mutation

5. If a pure line tall pea plant is crossed with a pure line short pea plant, what will be the phenotype of the F1 generation?

(a) All short (b) All tall

(c) 3:1. short: tall (d) 1:3 short: tall

6. In case of dominant epistasis which of the following will have the same expression, when A is the epistatic locus?

(a) A/a B/b and a/a B/b

(b) A/A b/b and A/A B/b

(c) a/a b/b and A/a b/b

(d) a/a b/b and a/a B/B

7. Which of the following represents the Hardy Weinberg equation?

(a) $p^2 + q^2 = 1$ (b) $p^2 + 2pq + q^2 = 1$

(c) $p^2 + q^2 = 0$ (d) $(p^2 + q^2)^2 = 1$

8. Which of the following is not associated with inbreeding?

(a) Mating between animals of unrelated species

(b) Elimination of undesirable characters

(c) Increases homozygosity

(d) Causes inbreeding depression

9. What are polygenes?

(a) Genes involved in quantitative inheritance

(b) Genes involved in the qualitative inheritance

(c) Genes involved in multiple allelism

(d) Multiple genes for a single trait

10. Type II diabetes is a cause of mutation in

(a) Polygenes (b) Single gene

(c) Two genes (d) None of the gene

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

Answer **all** questions, choosing either (a) or (b).

11. (a) Give a brief note on the experiment that proves DNA as the genetic material.

Or

(b) Give a brief account on mobilized plasmids.

12. (a) Explain switching of yeast mating type.

Or

(b) Explain transposons.

13. (a) Write short note on back cross.

Or

(b) Write note on the screening of mutations and How will you confirm mutation.

14. (a) Write down the Fishers theorem and its applications.

Or

(b) Give a short note on the linkage disequilibrium.

15. (a) Give a short note on the C value paradox.

Or

(b) Give note on genome imprinting.

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

Answer any **five** questions.

16. Give a detailed note on inducible operon and repressible operon.

17. Explain dominant and recessive genes/mutation in detail with an example for each type.

18. Give a detailed note on mutagenesis and genetic epistasis.

19. Explain in detail the Monohybrid and dihybrid crosses with suitable examples.

20. Explain in detail the about genetic variation and genetic drift.

21. Give a detailed note on the Bayesian statistics.

22. Explain in detail the structure of chromosomes and the special type of chromosomes.

23. Give an account on inbreeding and selfing.

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R7664	Sub. Code
	501106

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

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** questions.

1. A system of three linear equations in three variables is inconsistent if their planes

   (a) intersect only at 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

   (a) intersecting at one point

   (b) parallel

   (c) intersecting at two points

   (d) coincident

3. Variables of linear equation is implicitly raised to

   (a) first power (b) second power

   (c) third power (d) fourth power

4. What is the limit of sin $(\theta)/\theta$ when θ approaches zero?

(a) 1 (b) $\sin(\theta)$

(c) 0 (d) None of these

5. What is meant of the differential?

(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

6. Mathematical models provide

(a) estimated results (b) accurate results

(c) wrong results (d) approximate results

7. In mathematical modelling of a process, which option is not a characteristic of an analytical solution?

(a) Mathematical equations are used to describe process

(b) Most practical problems cannot be solved

(c) Exact information on the quantities of interest is obtained

(d) Finite element method is used

8. Spring is pulled down by 2 cm. What is amplitude of motion?

(a) 0 cm (b) 6 cm

(c) 2 cm (d) 4 cm

9. Assuming the assumptions of parametric tests are met, non-parametric tests, compared to their parametric counterparts:

(a) Are all of these

(b) Are more conservative

(c) Are less likely to accept the alternative hypothesis

(d) Have less statistical power

10. The coefficient of correlation lies between

(a) 0 to 1 (b) –1 to +1

(c) 0 to ∞ (d) – ∞ to +∞

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Describe forms of two-variable linear equations.

Or

(b) Draw a graph of binomials.

12. (a) Define vector with an example.

Or

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

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

Or

(b) State quotient rule.

14. (a) Define integrand with an example.

Or

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

15. (a) Describe size limits and scaling in the biological systems.

Or

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

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

Answer any **five** questions.

16. Explain about constructing linear models in biological systems.

17. Explain in detailed manner about symmetry of polynomial functions.

18. Evaluate $\int \frac{\tan x \, dx}{(\sec x + \cos x)}$.

19. Explain about modeling of fractal geometries.

20. Describe about oscillations and circadian rhythms in biological systems.

21. Elucidate in detail about modeling chemical reaction networks and metabolic networks.

22. Define conditional probability and state its applications with suitable illustrations.

23. What is meant by correlation analysis? Also, describe its types with example.

R7665	Sub. Code 501107

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Biotechnology

BASICS OF CHEMISTRY AND PHYSICS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

1. The rate of change velocity of the body is called
   (a) Acceleration (b) Velocity
   (c) Speed (d) Displacement
2. The electric and magnetic field of an electromagnetic wave is
   (a) in phase and perpendicular to each other
   (b) in phase and parallel to each other
   (c) in opposite phase and perpendicular to each other
   (d) in opposite phase and parallel to each other
3. Which law state that the rate of diffusion is proportional to both the surface area and the concentration difference and is inversely proportional to the thickness of the membrane?
   (a) Ficks Law (b) Avagadro's law
   (c) Hooke's Law (d) Pascal's Law
4. Which pathway produces the most ATP per glucose molecule?
   (a) Fermentation (b) Glycolysis
   (c) Krebs cycle (d) Electron Transport Chain

5. The first law of thermodynamics is based on

(a) conservation of linear momentum

(b) conservation of energy

(c) conservation of work

(d) conservation of angular momentum

6. Isotopes have the same number of ———— But different numbers of neutrons

(a) Protons (b) Neutrons

(c) Electrons (d) Positrons

7. The H_3O^+ ion is called as ————.

(a) Hydrogen ion (b) Hydronium ion

(c) Water (d) hydroxide ion

8. The entropy of the universe is ————.

(a) constant

(b) continuously decreasing

(c) continuously increasing

(d) the same as the energy, E

9. Which of the following non-essential amino acids?

(a) lysine (b) cystine

(c) methionine (d) threonine

10. When compounds differ from one another only in their three-dimensional shape and configuration, such type of isomers must these compounds be?

(a) Regioisomers (b) Constitutional isomers

(c) Stereoisomers (d) Spatial isomers

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the following physical parameter and its application
    (i) Vectors
    (ii) Displacement
    (iii) Kinetic energy.

    Or

    (b) What is angular momentum? Write is applications in physical sciences.

12. (a) What is elastic collision? What is Inelastic collision? Explain both the collision with suitable examples.

    Or

    (b) (i) What are simple harmonic motions? Explain (2.5)

    (ii) What is Bernoulli's equation? Write its applications. (2.5)

13. (a) Explain the following terms in biological aspects.
    (i) Chemical assemblies
    (ii) Nerve impulses.

    Or

    (b) What is mass spectrometry? How is useful in the characterization of chemical compounds?

14. (a) What is Maxwell Boltzmann's distribution? Explain its applications.

    Or

    (b) What is bioluminescence? How bioluminescence is used in biomarker application?

15. (a) Explain the following terms

(i) Vapor Pressure

(ii) Surface tension

(iii) Capillary action.

Or

(b) Explain the change in the Gibbs free energy of ATP-driven reactions.

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

Answer any **five** questions.

16. What are kinematic formulas? Write any for kinematic formulas with their applications.

17. What is the Doppler effect? Explain the detailed application of the Doppler effect in the application of the wave function.

18. Explain the role of thermodynamics in biologicals system with appropriate discussions.

19. What are molecular motors? Write their role in cells and organisms.

20. Explain the following with appropriate examples.
(a) Avogadro number
(b) Molarity
(c) Molecular weight
(d) Molecular formula ‘

21. Explain the difference between spontaneity versus driven reactions in biology.

22. Explain the theories of ATP production and dissipation across biological membranes.

23. Discuss the various bonds/forces responsible for stabilizing protein structure and highlight their importance.

R7666	Sub. Code
	501108

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

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** questions.

1. Two solutions of a substance (non-electrolyte) are mixed in the following manner. 480 mL of 1.5 M first solution + 520 mL of 1.2 M second solution. What is the molarity of the final mixture?

   (a) 1.20 M (b) 1.344 M

   (c) 1.50 M (d) 2.70 M

2. Which of the following is a source used in spectroscopy?

   (a) LASER

   (b) Tube light

   (c) Sodium vapour lamp

   (d) Tungsten lamp

3. Which of the following are added for pH adjustment in sodium analyser?

(a) Acidic solution (b) Basic solution

(c) Hydrazine (d) Ammonia buffer

4. Which of the following represent the concentration of a solution?

(a) Only free ions

(b) Only bound ions

(c) Free ions and bound ions

(d) Either free ions or bound ions

5. In a solution with NaOH and HCI, what is the concentration of OH– ions if the H+ ion concentration is 1.3×10^{-4}?

(a) 7.7×10^{-11} M (b) 7.7×10^{-10} M

(c) 1.4×10^{-11} M (d) 1.4×10^{-10} M

6. Derive the units for the extinction coefficient ε from the Beer-Lambert law, which states: $A = \varepsilon c \ell$ where A is the absorbance (no units), c is the concentration (in mol m–3), and is the thickness of the absorbing material (in m).

(a) m mol^{-1} (b) m^3 mol^{-1}

(c) mol m^{-2} (d) m^2 mol^{-1}

7. Assume that the reaction catalyzed by an enzyme follows Michaelis-Menten kinetics. If at a substrate concentration of 100 nM, the reaction proceeds at 98% of the maximum reaction velocity (Vmax), what is the Michaelis constant (Km) for this substrate. Km is the substrate concentration needed to reach 50% of Vmax.

(a) 2 nM (b) 5 nM

(c) 10 nM (d) 50 nM

8. Which of the following is incorrect regarding 2D-Page?

(a) Not all proteins can be separated by this method or stained properly

(b) The stained gel can be scanned and digitized for image analysis

(c) Membrane proteins are largely hydrophilic and readily solubilized

(d) One of the challenges of this technique is the separation of membrane proteins

9. Which of the following is incorrect regarding Mass Spectrometry Protein Identification?

(a) The proteolysis doesn't generate a pattern according to molecular weight

(b) Proteins can be identified and characterized using MS

(c) The proteins from a two dimensional gel system are first digested *in situ* with a protease

(d) Protein spots of interest are excised from the two-dimensional gel

10. A heterodimer enzyme-X consists of a subunit of 20 kD and a subunit of 35 kDa. The subunits are linked by many disulphide bridges. What is the size of band that will appear on modified SDS-PAGE (without Beta-mercaptoethanol treatment)?

(a) Two bands of 20 kD and 35 kD, respectively

(b) One band with 55 kDa

(c) Three bands with 20kD, 35kD, and 55 kDa, respectively

(d) Smear because separation will be poor

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) How would you prepare a stock solution of 100, 0. 5M NaOH?

Or

(b) Explain the principle and application of spectrofluorimetric method.

12. (a) Explain the concept and application of colorimetry.

Or

(b) Which chromatographic technique would you employ to separate and identify amino acids?

13. (a) Give a note on buffers with two examples.

Or

(b) Describe in detail about amino acids, PI values of the amino acids and its significance.

14. (a) Explain the method-used to separate plant pigments.

Or

(b) Write note on GC-MS.

15. (a) Write note on HPLC.

Or

(b) Explain in detail the estimation of pKa values in Acid-Base titration.

Part C (5 × 8 = 40)

Answer any **five** questions.

16. Prepare Acetic acid - Sodium Acetate buffer and validate the Henderson Hasselbach equation.

17. How would you identify proteins using 2D gel electrophoresis?

18. Imagine you are a virologist, and you have infected mouse brain with a virus, MHA-59 strain, and you want to check the expression levels- of a neuronal cell protein called GFAP. You assume that the symptoms is lack of proper motor coordination due to the over expression of GFAP. Design an experiment to extract the protein, quantify its concentration and finally check the qualitative expression level with proper illustration.

19. Imagine you are an analytical chemist. You want to prepare working BSA protein reagents. You have been given individual vials of 1 mL of 2 mg/mL of BSA stock solution, in order to prepare a set of diluted standard solutions. The diluted standards have been labelled in alphabetical order in the following table. Find the final BSA concentration providing the calculation for each dilution.

Dilution Scheme for Standard Test Tube Protocol and Microplate Procedure (2 mg/mL of BSA stock solution)			
Vial	Volume of Diluent (µL)	Volume and Source of BSA (µL)	Final BSA Concentration (µg/mL)
A	0	300 of Stock	
B	125	375 of Stock	
C	325	325of Stock	
D	175	175 of Vial B dilution	
E	325	325 of Vial C dilution	
F	325	325 of Vial E dilution	
G	325	35 of Vial F Dilution	
H	400	100 of vial G dilution	
I	400	0	

20. Explain in detail the principle and application of TLC.

21. Explain and derive Michelis-Menten equation.

22. Explain the procedure and application of native polyacrylamide gel.

23. Differentiate between Molarity, Molality, Normality and Mass percentage, providing the equation. Also calculate the concentration in Molarity, Molality and mass percentage of them according to the following scenario.

    You have of 15 mg of EDTA that you want to prepare a solution in 100 mL of TBE buffer. Molecular weight of EDTA is 292.24 g/mol. Density of EDTA is 860 kg/m^3.

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R7667	Sub. Code
	501109

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Biotechnology

Lab II – MICROBIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **ALL** questions.

1. Growth of microbes in a solid media is identified by the formation of?

   (a) Pellicle at the top of media

   (b) Colonies

   (c) Sediment at the bottom

   (d) Turbidity

2. What is the correct order of staining reagents in Gram-Staining?

   (a) Crystal violet, alcohol, iodine solution, safranin

   (b) Crystal violet, iodine solution, alcohol, safranin

   (c) Crystal violet, safranin, alcohol, iodine solution

   (d) Iodine solution, crystal violet, alcohol, safranin

3. Which bacteria appears purple-violet colour after staining?

(a) Gram-positive

(b) Gram-negative

(c) Both Gram-positive and Gram-negative

(d) Neither Gram-positive nor Gram-negative

4. Which of the staining technique helps in demonstrating spore structure in bacteria as well as free spores?

(a) Acid-fast stain (b) Endospore stain

(c) Capsule stain (d) Flagella stain

5. Gram-positive bacteria are usually more susceptible to?

(a) Streptomycin (b) Tetracyclin

(c) Penicillin (d) Ampicillin

6. An agent that prevents the growth of bacteria are known as

(a) Bactericide (b) Bacteriostatic

(c) Antimicrobial (d) Antibiotic

7. Which of the following is the characteristics of a sanitizer?

(a) Destroys all microbial forms

(b) Prevents the growth or action of microorganisms

(c) Reduces the microbial population to safe levels

(d) Kills all the bacteria and the bacterial spores

8. The process of killing all microorganisms along with their spores is

(a) Disinfections (b) Antisepsis

(c) Sanitization (d) Sterilization

9. Growth in broth cultures occurs mainly in the form of

(a) Slightly turbid (b) Heavy surface pellicle

(c) Sediment (d) Viscous

10. Which of the following instrument is used for the bacterial count?

(a) Petroff-Hausser counting chamber

(b) Microscope

(c) Chemostat

(d) Turbidostat

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

Answer **ALL** questions, choosing either (a) or (b).
All questions carry equal marks.
Answer should not exceed 1 page or 250 words.

11. (a) Discuss about the physical sterilization.

Or

(b) What is MPN?

12. (a) List out the importance of solidifying agent.

Or

(b) Describe about nature media.

13. (a) Write about the various bacterial enumeration methods.

Or

(b) What is standard plate Count?

14. (a) Why important of mother culture?

Or

(b) Discuss the indications of microbial contamination.

15. (a) Comments on quorum sensing.

Or

(b) Describe the bacterial morphology.

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

Answer any **five** questions.
All questions carry equal marks.
Answer should not exceed 2 page.

16. Explain the various methods to isolation of bacteria from natural sources.

17. Write about the antimicrobial sensitivity.

18. Discuss the antimicrobial agents.

19. How will you develop and maintenance of the pure culture?

20. Discuss about the minimum inhibitory concentration.

21. List out the biochemical features to use for bacterial isolation.

22. Bacteria is an opportunistic organism — Justify.

23. Determination of phenol co-efficient of antimicrobial gent.

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R7668	Sub. Code
	501110

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Biotechnology

LAB III — PLANT AND ANIMAL BIOTECHNOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** questions.

1. Essential requirement of an artificial plant tissue culture is that
   (a) The medium should have very low carbon concentration
   (b) The medium should have a carbon source
   (c) The medium should have aniodine source
   (d) The medium should have a sulphur source

2. Crown gall disease infects _____ region of the plant.
   (a) Root (b) Stem
   (c) Leaf node (d) Leaf

3. Which of the following is a symptom of hairy root disease in plants?
   (a) Dwarfness in plants
   (b) Decreased proliferation
   (c) Cancerous outgrowth
   (d) Massive proliferation

4. Length range of arbitrary, short primers used in RAPD PCR is

(a) 8-12 bp (b) 18-25 bp

(c) 3-5 bp (d) 13-15 bp

5. Which of the following is used to precipitate nucleic acids in CTAB method of DNA isolation?

(a) Chloroform (b) Isopropanol

(c) Ethylene (d) Glycerol

6. Sample tissues can be cryopreserved at

(a) 0°C (b) –196°C

(c) –20°C (d) 4°C

7. Which of the following is added to a medium to prevent contamination?

(a) Antibiotics (b) Antipyretics

(c) Nutrients (d) Hormones

8. In order to count RBCs in hemocytometer, what squares are used?

(a) two squares on left

(b) top corner square

(c) corner squares

(d) central square

9. Which of the following is NOT used as an anesthetic while handling animals?

(a) ketamine (b) chloroform

(c) ether (d) adrenaline

10. The component used in lysis buffer is

(a) Proteinase (b) Ethanol

(c) SDS (d) RNase

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

Answer **all** questions, choosing either (a) or (b).

11. (a) Write a short note on Callus culture.

Or

(b) What is cryopreservation? Mention its applications.

12. (a) Briefly explain RAPD and its applications.

Or

(b) What is the principle of CTAB Method? Why CTAB method is used in DNA extraction?

13. (a) Define passaging. How cells can be passaged?

Or

(b) What is the need for cell dissociation? Brief mechanical and enzymatic disaggregation methods.

14. (a) Why cell lines are to be preserved? Discuss the cell line preservation and revival techniques.

Or

(b) How cell viability can be measured using trypan blue assay?

15. (a) Explain the principle behind Giemsa chromosome banding.

Or

(b) How single cell suspension is prepared from chicken liver?

Part C

$(5 \times 8 = 40)$

Answer any **five** questions.

16. Write the steps to prepare MS media for plant tissue culture and mention the role of reagents used in MS media.

17. Explain in detail about ISSR and how it helps in the conservation of endangered plants?

18. Comment on hairy root induction in medicinal plants.

19. What is micropropagation? Explain the different stages of micropropagation and mention the importance of medicinal plant micropropagation.

20. Explain the different types of cell culture media with their applications.

21. Discuss different routes of drug administration using *in vivo* animal models.

22. What are the different steps of RNA isolation from animal tissue? Give the role of reagents used in the technique.

23. Detail the background and steps involved in measurement of apoptosis by acridine orange/ ethidium bromide staining.

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