M.Sc. ZOOLOGY
First Semester
BIO-INSTRUMENTATION & CELL BIOLOGY
(MSZ - 102)

Duration: 3Hrs. **Full Marks: 70**

Part-A (Objective) =20
Part-B (Descriptive) =50

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins. **Marks: 50**

Answer any *four* from *Question no.* 2 to 8
***Question no.* 1 is compulsory.**

1. Short notes on *any two* of the following: (2×5=10)

   a) ELISA.

   b) Cell signalling classification.

   c) Organisation of intermediate filament.

   d) Kinesin and dynein.

2. Describe in details the moleculer events that take place in mitosis cell division. How is metaphase I different from metaphase II of meiosis cell division? (5+5=10)

3. What is immunoflouresence technique? Differentiate between direct and indirect immunoflouresence. Mention two of its applications. (4+6=10)

4. Write a note on Cross-linking fixative. Discuss the different factors affecting fixation process. (4+6=10)

5. Describe the working principle of Gas-Liquid Chromatography. Discuss the applications of High Pressure Liquid Chromatography (5+5=10)

6. Distinguish between PAGE and Agarose gel electrophoresis. State the mechanism of a separation of protein in a given gel. (4+6=10)

7. Define radioactive isotope. State how is the autoradiography useful in identifying various biological molecules. (3+7=10)
8. Describe how membrane carbohydrates present in human RBC plasma membrane play a crucial role in determining blood group. Discuss briefly the properties of three classes of membrane protein and how they vary among themselves. (5+5=10)

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Duration: 20 minutes **Marks – 20**

(PART A - Objective Type)

I. Choose the correct answer: **1×20=20**

1. Which of the following is not used for detection in GLC?
   a) Infrared Spectroscopy b) NMR
   c) Flame ionization d) Electrical Conductivity

2. The eluent strength is a measure of
   a) Solvent adsorption energy b) Solvent absorption energy
   c) Solvent diffusivity d) Solvent mixing index

3. Which of the following is a metachromatic stain?
   a) Janus green- B b) Fuchsine
   c) Azure B d) Toluidine blue

4. The _____ surrounds the cell like a belt, preventing the passage of substance between the cells.
   a) Gap junction b) Desmosomes
   c) Hemi desmosomes d) tight junctions

5. Which type of microscope is best to study the topography of a specimen?
   a) SEM b) Confocal
   c) Phase-contrast d) Fluorescence

6. A crossed precipitation line following double diffusion technique is due to-
   a) Shared epitopes between antigens.
   b) Identity between antigens.
   c) No common epitopes between antigens.
   d) Few common epitopes between antigens.

7. Progression to anaphase is mediated by activation of –
   a) Anaphase Promoting Complex b) Mad/Bub complex
   c) Cyclin-cdk complex d) Condensin and cohesion

8. In which stage of prophase I,crossing over takes place?
   a) Leptotene b) Pachytene
   c) Diplotene d) Zygotene

9. Which of the following technique is used to quantify antigens on gels?
   a) Flow cytometry b) Mancini method
   c) ELISA d) Immunoelectrophoresis

10. In a given thermal cycler the temperature gradient is arranged as
   a) 72^0c 94^0c 50^0c b) 94^0c 72^0c 50^0c
   c) 50^0c 94^0c 72^0c d) 94^0c 50^0c 72^0c

11. In the Southern blotting technique the DNA molecules could be separated due to-
   a) Their molecular weight b) Capillary phenomenon
   c) Optimal buffer concentration d) Nitrocellulose filter paper

12. The transmittance of light is
   a) Directly proportional to absorption light.
   b) Inversely proportional to absorption light.
   c) Directly proportional to that of the monochromatic light.
   d) Inversely proportional to that of the monochromatic light.

13. Which of the following statements are true in case of fluid-mosaic model for cell membranes?
   P. Between 5-8 nm thick and appear trilaminar when viewed in cross section under electron microscope.
   Q. Less than 1 nm thick and consist of a layer of protein sandwiched between two layers of phospholipids.
   R. In the lipid bilayer, proteins are embedded at irregular intervals and held by hydrophilic interactions between lipids and hydrophilic domains of proteins.
   S. The protein domains exposed on one side of the lipid bilayer are different from those exposed on the other side.

   a)P,Q b)P,S c)Q,S d)P,R

14. Identify the correct set of three statements for cytoskeletal protein filaments from the following list.
   P. microfilament is about 8 nm wide
   Q. microfilament is about 25 nm wide
   R. intermediate filaments have size intermediate between microfilament and microtubules
   S. protofilaments of microtubules are composed of alpha/beta tubulin heterodimer
   T. colchicine binds to the tubulin subunits in the spindle microtubule causing disassembly to free units
   a) R,S,T b) Q,R,S c) P,R,S d) P,Q,R

15. Lipid anchored proteins are bound to membrane by a complex oligosaccharides linked to a molecule of
   a) Phophatidylcholine b) Phosphatidylinositol
   c) Phosphatidylserine d) Phosphatidic acid

16. A feature common to all transmembrane protein is
   a) A phosphorylated exterior domain.
   b) A structure consisting almost exclusively beta-sheet.
   c) An amino acid sequence rich in acidic residues.

d) An alpha-helical region of about 20 to 25 hydrophobic amino acids.

17. A polar molecule
    a) Is slightly negative at one end and slightly positive at one end.
    b) Has an extra electron, giving it a negative charge.
    c) Has an extra neutron, making it weight more.
    d) Has covalent bond.

18. All the following are thermostable polymerases except
    a) Taq polymerase b) Vent polymerase
    c) DNA polymerase d) Pfu polymerase

19. In which stage of the cell cycle, DNA synthesis takes place?
    a) G1 b) G2 c) S d)M

20. Post mitotic phase is
    a) G_0 phase b) G_1 phase c) S-phase d) G_2 phase

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