

- N.B. :** (1) Attempt all section.  
(2) Use **separate answer sheet** for each section.  
(3) Draw neat **figures** whenever **necessary**.

**Section I**

**All questions are compulsory (40x1 = 40 marks)**

- Triplet state in delayed fluorescence is due to excited state of....
  - Anti-parallel electron pair
  - Parallel electron pair
  - Additional electron
  - None of these
- The hydrophobicity of a macromolecule is governed by
  - Brownian movement
  - Enthalpy
  - Entropy
  - None
- Refractive index is related to study of .....

  - CD
  - ORD
  - ESR
  - FTIR

- Identification of blood group involves
  - opsonization
  - precipitation
  - neutralization
  - agglutination
- lipid phase transition and movement can be studies using
  - NMR
  - Electron microscopy
  - ESR
  - Phase contrast microscopy
- For an endothermic reaction to occur spontaneously the
  - $\Delta G=0$
  - $\Delta G<0$
  - $\Delta G>0$
  - Independent of  $\Delta G$
- Dimethyl sulfoxide (DMSO) is used as a cryopreservent for mammalian cell cultures because
  - It easily penetrates cell
  - it is an organic solvent
  - It is utilized as nutrient
  - it protects cells by preventing crystallization of water
- Most of the radiosensitive type of the cell among the following
  - Erythrocyte
  - Lymphocyte
  - granulocyte
  - Muscle cells.
- Human cell commonly used for biological dosimetry by chromosomal aberration analysis
  - RBC
  - fibroblast
  - germ cell
  - lymphocyte
- The helix contents of the protein can be determined using
  - a UV -Visible spectrophotometer
  - an infrared spectrometer
  - a circular dichroism spectrometer
  - a fluorescence spectrometer

11. Which of the following chromosomal damage shows a consistent radiation response?
  - a) Translocation
  - b) sister chromatin exchange
  - c) dicentric
  - d) inversions
12. Choose appropriate signal transduction pathway
  - a) Hormone  $\rightarrow$  7TM receptor  $\rightarrow$  G protein  $\rightarrow$  cAMP  $\rightarrow$  PKA
  - b) Hormone  $\rightarrow$  G protein  $\rightarrow$  7TM receptor  $\rightarrow$  cAMP  $\rightarrow$  PKA
  - c) Hormone  $\rightarrow$  7TM receptor  $\rightarrow$  G protein  $\rightarrow$  PKA  $\rightarrow$  cAMP
  - d) Hormone  $\rightarrow$  7TM receptor  $\rightarrow$  cAMP  $\rightarrow$  G protein  $\rightarrow$  PKA
13. DNA fragment between size 2000KD and 500 KD can be separating using
  - a) PAGE
  - b) Chromatography
  - c) Centrifugation
  - d) Pulse field Gel Electrophoresis
14. Critical Target structures in living cells for the action of radiation
  - a) Protein molecule
  - b) disulfide bond
  - c) lipoproteins
  - d) DNA molecule
15. Absorption of UV radiation by protein & nucleic acid due to transition of electron between
  - a) Vibrational energy level
  - b) Rotational energy level
  - c) Nuclear energy level
  - d) Electronic energy level
16. The binary representation of decimal number 63 will be
  - a) 11111
  - b) 111111
  - c) 100101
  - d) 10101010
17. DNA-protein interactions *in vivo* can be studied by
  - a) Gel-shift assay
  - b) fluorescence in situ hybridization assay
  - c) Southern hybridization
  - d) chromatin immunoprecipitation assay
18. The earliest radiation effect which appears among those exposed to large acute doses
  - a) Skin burn
  - b) cataract
  - c) temporary sterility
  - d) radiation sickness
19. The first protein whose structure was determined by x-ray crystallography
  - a) Hemoglobin
  - b) myoglobin
  - c) neuroglobin
  - d) albumin
20. Ligand gated channel open in respond to
  - a) Intracellular chemical
  - b) extracellular chemical
  - c) both extra and intra cellular chemicals
  - d) all of the above.
21. The activity of an enzyme is expressed in International Units (IU). However, the S.I unit for enzyme activity is Katal. One Katal is.
  - a)  $1.66 \times 10^4$  IU
  - b) 60 IU
  - c)  $6 \times 10^7$  IU
  - d)  $10^6$  IU
22. Repolarization due to
  - a) Influx of  $\text{Na}^+$  ions
  - b) outflux of  $\text{Na}^+$  ion
  - c) influx of  $\text{K}^+$  ions
  - d) outflux of  $\text{K}^+$  ions
23. Changes in genetic information of a cell can be caused by
  - a) A loss of chromosome
  - b) Substitution of base
  - c) Deletion of chromosome
  - d). All of the above
24. The variations of dicentric chromosome frequency (y) with the dose of gamma radiation dose (D) can be described by the relationship
  - a)  $Y = \alpha D$
  - b)  $Y = \alpha \exp D$
  - c)  $Y = \alpha D + \beta D^2$ .
  - d)  $Y = \alpha D^2$
25. Threshold for deterministic effect
  - a) Depend on the effect
  - b) Depends on the dose rate
  - c) Depends upon the sensitivity of the target cells
  - d) All of the above



34. A protein exist as a zwitterions at the  
 a) Optimum pH b) Blood pH of 7.4 c) Neutral pH d) Isoelectric pH
35. A electric potential a difference necessary for single ion to be equilibrium across a membrane is best described by  
 a) Fick's principle b) Goldman Eq. c) Hendersen Hassalbach Eq. d) Nernst Eq.
36. Ionic solute diffuse along:  
 a) Conc. Gradient b) Electric gradient c) Pressure gradient d) Both electric & conc. gradient.
37. In graph population density is plotted on x-axis, then what should be plotted on y axis to get a bell shape curve  
 a)  $dn/dt$  b)  $1-dn/dt$  c) T d)  $Nt-1$
38. During the prenatal period foetal central nervous system is most sensitive to radiation during  
 a) 0-7 days b) 0-8 week c) 8-15 weeks d) 25-35 weeks
39. In zinc finger proteins , the amino acid residues that coordinate zinc are  
 a) Cys and His b) Asp and Glu c) Arg and Lys d) Asp and Arg
40. Alpha amanitin inhibits  
 a) Only RNA polymerase I  
 b) Only RNA polymerase II  
 c) Only RNA polymerase III  
 d) All RNA polymerases

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## SECTION II

- Attempt any three questions out of four (3x10=30 Marks)

Q.1 Write note on: Amplified Fragment Length Polymorphism and Random Amplified Polymorphic DNA

Q.2 Write principle of Mass Spectrometry (MS)? How you determine primary structure of protein using MS.

Q.3 what is the plausible explanations that why there is no confirmation of polypeptide (approx 70 AA) detected by hydrodynamic methods upon addition of 8M urea.

Q.4 What is the principle of SDS electrophoresis? Does SDS electrophoresis demonstrate the presence of disulfide bond in protein? Describe it in details.

Q.5 what is cell fusion? How Red blood Cell Nuclei are reactivated by fusion process?

## SECTION III

- Attempt any two questions out of four (2x15=30 Marks)

Q.1 What is hypochromic and hyperchromic effect? Discuss in details UV visible spectra of nucleic Acids. Write a note on vibrational modes of polyatomic molecules.

Q.2 Discuss various models for cell survival response to radiation and derive the expression for Biologically Effective Dose (BED) for fractionated radiotherapy based on the LQ model.

Q.3 Write in details the mechanical properties of lipid bilayer. Add a note on transmembrane proteins.

Q.4 With reference to the immunological tests for the detection of antigens and antibodies, explain in detailed immunodiffusion and immunofluorescence techniques.

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