

*This question paper contains 4 printed pages.*

6857

*Your Roll No*

**M.Sc. – Ph.D. Biomedical Science / IV Sem. J**

Paper— PCL-818

**RADIATION BIOLOGY AND ONCOLOGY**

*Time : 3 hours*

*Maximum Marks : 75*

*(Write your Roll No on the top immediately  
on receipt of this question paper.)*

*Attempt six questions from Q. Nos. 1 to 11  
Q No. 12 is compulsory.*

- 1 (a) What is photoelectric absorption? How does it vary with atomic number of absorber and energy of the incident radiation? 6
- (b) Define the following and give their SI units:
  - (i) Radiation absorbed dose
  - (ii) Linear energy transfer. 4
2. (a) Describe briefly the "direct" and "indirect" action of ionization radiation on cells. 3
- (b) What are the different chemical species formed during the radiolysis of water? 2
- (c) Explain 4H abstraction pathway for radiation-induced DNA strand breakage under aerobic conditions. 5

P. T. O.

*Or*

**What is protein oxidation? Give *three* examples of common protein modification. How can you inhibit macromolecular oxidation?** 5

3. (a) Identify with the help of a diagram, all relevant parameters for the characterization of radiation dose response in mammalian cells. 4
- (b) Define the terms OER and RBE. 3
- (c) The PE for a cell population is 50% and the surviving fraction (SF) at 5GY is 0.20. What will be the colony number if 600 cells are plated after irradiation? 3
4. (a) List at least *five* methods for measuring DNA double strand breaks in mammalian cells. Discuss *one* of the methods in detail and mention its advantages and limitations. 5
- (b) Name the different DNA repair pathways. Describe briefly the Homologous Recombination Pathway for the repair of DNA double strand breaks in mammalian cells. 5
5. (a) Discuss radiation-induced alterations in cell cycle progression in mammalian cells. 5
- (b) Discuss the roles of oxidative stress and cell signalling in radiation-induced cell death. 5

6. (a) What are the different methods for studying radiation response of normal tissues? Describe any *one* method with an illustration. 5
- (b) How do the four R's of Radiotherapy contribute to the response of tumours to radiation? 5
- 7 (a) What are the different types of radiation hazard? Describe briefly, the approaches for achieving radioprotection 5
- (b) What are the different classes of radiosensitizers? Discuss *one* of them with an example. 5
8. (a) What is "Low-Dose Radiation Hypersensitivity"? Name *four* cellular factors that influence this phenomenon 3
- (b) Explain briefly how the cell cycle regulation is related to low-dose hyper radiation sensitivity. 3
- (c) Describe the role of TGF- $\beta$  in "bystander effect". 4
9. (a) What are radiation-induced structural and numerical chromosome aberrations? Explain the link between these aberrations and hereditary transfer of disease in humans. 5
- (b) List different biomarkers for assessing radiation absorbed dose during whole body exposure to gamma radiation. Discuss *one* of them in detail. 5
10. What is acute radiation syndrome? Describe the

- underlying events, characteristics, signs and syndromes of GI tract syndrome. 10
- 11 Explain radiation-induced CNS damage with reference to the adult neurogenesis. 10
12. Write short notes on any *three* of the following:
- (i) Target theory
  - (ii) Radiation-induced lipid peroxidation
  - (iii) Role of caspases in radiation induced apoptosis
  - (iv) Cell cycle check points
  - (v) Ceramide-activated pathways in radiation induced apoptosis
  - (vi) SLDR
  - (vii) Nucleotide Excision Repair Pathway
  - (viii) Radiosensitizers
  - (ix) Radiation-induced Behavioural impairments. 15