

Examination for Diploma, Part 1

Clinical Radiobiology

Time allowed : 3 hours

ALL QUESTIONS ARE TO BE ATTEMPTED.

All questions are of equal value. Clearly labeled diagrams should be drawn wherever relevant.

1. Repopulation of cells after exposure to multiple doses of photons has been the subject of considerable interest in radiotherapy since it was found that the proliferation of surviving cells between successive fractions of radiation may be a determinant in tumour control. Discuss the biological characteristics of the types of tumour in which this process has been observed. What is the radiobiological basis for the adoption of altered fractionation regimes that are presently being utilised to overcome repopulation?
2. Compare and contrast the biological effects of hyperthermia (42o C) and X-rays on mammalian cells in vitro. What is the radiobiological rationale for combined use of hyperthermia, and X-rays? Discuss the therapeutic applications and problems involved in hyperthermic treatment for partial-body exposures.
3. Although there is a difference of opinion as regards the origin of radiation-induced damage in the blood vessels of the microcapillary system it is undeniable that such late effects may be important to the continued functional integrity of some tissues and organs. Give an account of the radiation response of the relevant cell population /s involved and, in your opinion, the likely mechanism by which this damage is manifested as late effects.
4. In radiobiological terms discuss the rationale behind the combined use of chemotherapy and radiotherapy with particular reference to the contribution of each component to tumour control probability, the effects on acute reacting and late reacting normal tissue, the significance of timing of delivery, and the likelihood of chemoresistance and /or radioresistance.
5. In radiobiological terms, write short notes on three of the following :
 - A) hypoxia and haemoglobin
 - B) radiation induced cataracts
 - C) bone marrow syndrome
 - D) effects of X-rays on embryo / foetus.
6. This question is of the multiple choice format and is to be answered on the separate QUESTION DOCUMENT provided, according to the instructions of the document itself.

September, 1992