Examination for Diploma, Part 1

Clinical Radiobiology

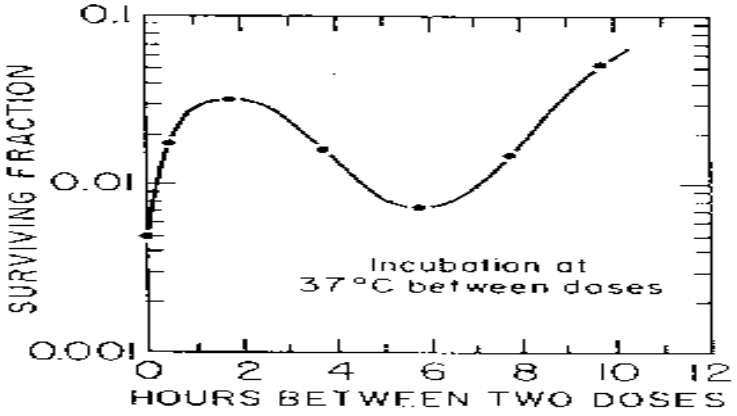
Time allowed : 3 hours

ALL QUESTIONS ARE TO BE ATTEMPTED.

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

1. The reason why some human tumours are locally controlled by radiotherapy and others are not remains one of the key questions in the radiobiology of cancer treatment. Give an account of the various factors thought to be responsible for this difference in radiation response.

2. The Figure below depicts the survival of a proliferating population of mammalian cells in vitro exposed to two 7.0 Gy fractions of X-rays with various intervals of time between the doses.



Describe the characteristics of the cell populations at 0, 2, 5 & 10 hours. In radiobiological terms give an account of the process/es which are responsible for the surviving fraction of cells increasing, decreasing and then increasing again. Explain the type of cell survival curve likely to be observed following exposure to split, doses of high LET radiation.

3. "Conventional" external beam fractionated radiotherapy generally refers to daily fractions, five days per week at approximately 2.0 Gy per fraction. Discuss the underlying radiobiological factors, including tumour and tissue kinetic factors, that may have contributed to the evolution of this practice.

4. Describe the biological effects of irradiation of the whole adult head using parallel opposed fields with eye shielding as may be used for treating whole brain to near tolerance doses . What radiobiological mechanisms are thought to be responsible for the effects observed?

5. In radiobiological terms, write short notes on three of the following :

   A) Recall phenomenon.
   B) Thermotolerance.
   C) Rationale for post-operative irradiation.
   D) Growth fraction in tumours.

6. This question is of multiple choice format and is to be answered on the separate QUESTION DOCUMENT provided, according to the instructions of the document itself.

February, 1992