August 2000

1. Discuss the physical principles, design details and operational features of a modern therapy simulator.

2. Discuss the principles of the use of unsealed radionuclides in radiation oncology. Describe the concepts of uptake, distribution and elimination. Indicate the common radionuclides and the activities used in clinical practice and how the dose to target tissues and critical organs is estimated.

3.
   (a) Discuss briefly the importance and practical implementation of a program of periodic quality assurance checks on radiotherapy treatment machines.
   (b) List the parameters which should be so checked monthly or more frequently in the case of linear accelerators, and indicate acceptable tolerances for them.
   (c) Define those parameters in your list which are properties of the radiation beam, and indicate an appropriate method of checking them.

4. Explain how and why the dose distribution produced within a patient by an x-ray beam is modified by the presence of:
   (a) lung and
   (b) bone within the beam, for beams of various energies.
   Include consideration of the doses to the lung and the bone constituents themselves.

5. Compare the physical and dosimetric aspects in the stereotactic radiosurgical and radiotherapy treatment of intracranial lesions using:
   (a) Gamma Knife
   (b) linear accelerator
   Include an overview of the equipment and techniques used.

6. Write short notes on:
   (a) factors influencing surface dose with electron beams
   (b) variation of electron beam percentage depth dose with changing field size and SSD,
   (c) radiation protection considerations in the use of pulsed dose rate brachytherapy.