February 2002

1. For the following unsealed radionuclide sources: Iodine-131, Phosphorus-32, Yttrium-90, Strontium-89, Samarium-153, give the spectra of radiation emitted, half-life, physical form in which they are used and their advantages in clinical application.

2. Discuss the various radiation measuring devices used in a Radiotherapy Department. Describe their use in beam monitoring, dosimetry and in quality assurance.

3.
   (a) What is meant by the isocentric mounting of a linear accelerator?
   (b) Explain the distinction between SSD and isocentric techniques, and discuss their relative merits.
   (c) Discuss the criteria for treatment with a single photon beam, including choice of beam energy or quality.
   (d) What are the advantages and disadvantages of treatment with a pair of parallel opposed fields (equally weighted coaxial beams)?
   (e) How does the dose distribution of a pair of parallel opposed megavoltage fields depend on patient thickness and beam energy?

4.
   (a) Discuss the use of wedge filters and compensating filters in megavoltage photon beam radiotherapy, indicating the physical principles involved in their design and application.
   (b) How can independent jaws and multileaf collimators be used to produce wedging and compensation, and what are the advantages and disadvantages of using these instead of physical wedges and compensators.

5. Write short notes on the Quality assurance measures necessary in the planning and treatment delivery of stereotactic radiosurgery using multiple arcs for intracranial lesions.

6. Write short notes on:
   (a) Potential errors and uncertainties which may arise in the incorporation of CT and MRI images into radiation therapy planning systems. How might these errors and uncertainties be minimised or avoided?
   (b) ICRP dose limits for occupational and public exposure.