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1.
   (a) Describe the processes that occur in the absorption of an electron beam as it passes from air into a tissue medium and from tissue into an air cavity.
   (b) Give a specific example and show how computer planning may assist in treatment strategy.

2. Discuss the ward procedures that should be adopted to minimise the radiation hazards associated with patients being treated with:
   (a) Sealed and
   (b) Unsealed radioactive substances.
   Discuss the limitations to the discharge of these patients.

3.
   (a) What is meant by the penumbra of a radiation beam?
   (b) Describe the components of the penumbra of a photon beam at a depth in a patient, and the factors which affect these components.
   (c) What can done to
      i. minimise or
      ii. broaden the penumbra, and in what circumstances might such actions be advantageous?
   (d) Describe and explain the initial dose build-up phenomenon that occurs with a megavoltage beam, and discuss its clinical significance.
   (e) What factors affect the magnitude of the relative surface dose for a photon beam?
   (f) What can be done to
      i. minimise or
      ii. increase the relative skin dose from a megavoltage photon beam?

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 collimaters be used to produce similar effects?

5.
   (a) Write short notes on the Quality Assurance measures necessary in the planning and treatment delivery of stereotactic radiosurgery using multiple arcs for intracranial lesions.
   (b) Write short notes on the physical aspects of total skin electron beam therapy. Include reference to physical aspects of dose uniformity achievable, treatment technique and quality assurance.

6. Discuss what is meant by stochastic and deterministic effects with regard to the impact of ionising radiation on human beings. Give two examples of each type of effect. Outline the human data sources that have been used by the ICRP to develop the current risks of radiation exposure. What is the likely magnitude of the total detriment from radiation exposure at low doses and dose rates? What does this detriment include?
   What dose limits does the ICRP recommend for occupational and public exposure? How do these limits compare with annual dose from natural background radiation?