# February 2005

1. 1. A chest wall tumour is to be treated with radiation therapy treatment. It extends from midline to post/lateral ribs and from clavicle to lower ribs. Describe each of the following treatment techniques with particular attention to the limitations and possible solutions:
   (a) Fixed field electrons
   (b) Electron arc
   (c) MV photons

2.
   (a) Draw and label a typical isodose curve for a 10cm x 10cm, 6MV photon beam incident perpendicularly to the surface of a water phantom at 100cm SSD. Discuss the clinically important features of this curve.
   (b) Discuss the importance of density/heterogeneity correction for CT planning in calculating the dose deposition for potentially curative treatment of lung cancer.

3. 3. Discuss the radiotherapeutic gains and losses following the deployment of new technology for:
   (a) Wedging: fixed v dynamic
   (b) Field shape: blocks v multileaf collimator
   (c) Port imaging: films v electronic images

4. 4. Modern linear accelerators employ a record and verify (R&V) system.
   (a) Briefly give the justification for a R&V system.
   (b) Describe the essential and optional features of a R&V system.
   (c) Discuss the ways that a modern R&V system can improve efficiency and safety in patient treatment.
   (d) Discuss the new errors introduced, and errors not diminished by a modern R&V system.

5.
   (a) List the characteristics which make a material suitable for use as a phantom. Provide examples of materials commonly used in clinical practice.
   (b) With the aid of a diagram, outline the design principles and characteristics of a practical thimble ionisation chamber used with MV photon beams.
   (c) Briefly describe the procedure for absolute calibration of a clinical 6MV photon beam. Identify how the dose per monitor unit is determined for the reference conditions described. Include in your answer a description of equipment and diagram of setup.

6. 6. Mrs Brown is being treated with High Dose Rate (HDR) brachytherapy Ir192 implant to the cervix, using an automatic afterloading technique. On completion of the treatment episode the independent radiation monitor is reporting higher than expected radiation activity in the room, although the HDR console reports that the radioactive source has been retracted. Consider the three following scenarios:

   Scenario 1 – The active source pellet is lodged within the applicator inside the patient.
   Scenario 2 – The active source pellet is stuck in the transfer tube between the patient and the HDR unit.
   Scenario 3 – The active source pellet escaped the tube, through a crack and is lying on the floor.

   For each of the three scenarios:
   (a) List the resources you expect to have available (personnel and equipment) to deal with this situation.
   (b) What needs to be done immediately, in the short term and in the long term?
   (c) Who needs to perform each of these action items?