

## August 2004

1. 1. You need to select an appropriate external beam to treat a thin but 3 cm wide BCC lying over the bridge of the patient's nose. Thoroughly discuss the radiotherapeutic PHYSICS issues involved in selecting the appropriate beam.
2. With reference to the Radiotherapy Photon Beam Penumbra
  - (a) Define the term
  - (b) Describe and discuss 3 types of penumbra, drawing on your knowledge of various photon beams, beam shielding and modifying devices and their clinical use
  - (c) Discuss the clinical advantages and disadvantages of both large and small beam penumbra.
3. In the radical treatment of a tumour situated in the clivus (base of skull), consider the radiotherapy treatment modalities [teletherapy and brachytherapy] typically available in a modern radiotherapy department. Discuss the modalities you would use and those you would reject. Use your knowledge of the PHYSICS of each modality to justify your answer, for this particular application.
4. For the reporting of 3D conformal radiotherapy treatments, provide a detailed definition of the 6 volumes that need to be described. Discuss Internal Margins and Setup Margins, with particular reference to methods for reducing each margin and how these margins are used in creating the Planning Target Volume.
5. Answer ONE of the following:
  - (a) A In working safely with ionising radiation
    - Which factors [protection practices and physical entities] do you have at your discretion to directly minimise your dose
    - Briefly identify the philosophical principles underlying the use of ionising radiation for medical practice
    - Draw a plan of a typical bunker housing a >10MV linac. Give a short description of each barrier, its purpose, placement and suitable constituent material

OR

- (b) This morning a radiation oncology registrar entered a >10MV linac bunker searching for a lost pager, while a patient was being set up. Just as the pager is spotted on the floor in the far corner of the bunker, the registrar notices that they are alone in the room with the patient, the linac is producing a different sound and assumes that the beam has been turned on. The registrar yells, races out of the room challenging the radiation therapists at the console, who turned the beam on. Meanwhile the patient rolled off the treatment couch in shock.

Using your knowledge of good radiation protection practices, with reference to your local hospital protocols and procedures and the legislation in your region:

- identify the poor features of this scenario
  - list the events, following this incident, in the order they should have occurred, justifying the reason for each event, quoting relevant values, markers or indicators
  - discuss how this incident could have been avoided what should be done to prevent this situation re-occurring?
6. Answer ONE of the following:
    - (a) Not all radionuclides are acceptable for therapeutic use. Select three radionuclides that have essentially disappeared from clinical use. Use the radionuclides' physical features to describe why this has happened, thereby identifying characteristics which should be avoided in future novel clinical radionuclides.

OR

- (b) Radioisotopes of Iodine are used as sealed and unsealed sources.
  - i. List the specific physical features common to ALL radionuclides.
  - ii. Describe the radiation physics features specific to radioactive iodine, used for therapeutic purposes
  - iii. Provide an assessment of the advantages and disadvantages of radioactive iodine in its various clinical roles