

**THE ROYAL AUSTRALIAN AND NEW ZEALAND COLLEGE OF
RADIOLOGISTS**

EXAMINATION FOR DIPLOMA, PART I

RADIATION ONCOLOGY
RADIOTHERAPEUTIC PHYSICS

Time allowed: 3 hours

ALL QUESTIONS are to be attempted. All questions are of equal value.
Clearly labeled diagrams should be drawn wherever relevant.

PART A

1. Write notes on:
 - a) Natural and artificial radioactivity.
 - b) Physical, biological and effective half lives.
 - c) The types of radiation which may be emitted from a radioactive element and their characteristics.
 - d) The units used in the measurement of radioactivity and of radioactive emissions
2. Discuss in detail the advantages and disadvantages of a high energy linear accelerator (say 20 MeV) compared with the lower energies of a 4 or 6 MeV linear accelerator or a Cobalt-60 unit in the treatment of a malignancy in the pelvis of a female.

PART B

3. Write short notes on:
 - a) Tissue Air Ratio and its application.
 - b) Back Scatter Factor and its variation with field size and beam energy.
 - c) Wedge filters and their use.
4. Discuss the physical advantages and disadvantages in the treatment of an extensive superficial squamous cell carcinoma of the glans penis using each of the following:
 - i) megavoltage photon beam
 - ii) electron beam
 - iii) superficial x-ray beam
 - iv) brachytherapy
5. Sketch a central axis depth dose curve for an electron beam and explain its general shape. Discuss the clinical significance of its various features, and indicate how these features vary with the beam energy and field size.
6. Describe and explain how the dose distribution produced within a patient by an x-ray beam is modified by the presence of bone within the beam, for beams of various energies. Include the effect on soft tissue inclusions within the bone itself.