

**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.

1. Describe in detail how the high speed stream of electrons in the wave guide of a linear accelerator may be manipulated and controlled to produce clinically useful beams of:
 - a) photons and
 - b) electrons.Describe how doses in these beams may be monitored and indicate the energy ranges and various beam parameters attainable.
2. Discuss the ward procedures that should be adopted to minimize the radiation hazards associated with patients being treated with:
 - a) sealed and
 - b) unsealed radioactive substances.
3. Discuss the use of radiographic methods in the planning of:
 - i) external beam treatments
 - ii) brachytherapy treatments employing afterloading techniques.
4.
 - a) Describe and explain the effects of filtration on a kilovoltage x-ray beam. What are the clinical implications of these effects?
 - b) How is the optimum amount of filtration determined?
 - c) Discuss briefly the choice of filter materials and design of filters for:
 - i) a orthovoltage unit and
 - ii) a superficial therapy unit
 - d) Why is it particularly important to avoid using the wrong [or no] filter in a treatment of skin cancer with a superficial therapy unit employing a beryllium window x-ray tube?
5. Discuss the physical aspects of the use of arc rotation therapy in radiation oncology.
6.
 - a) Outline the principles underlying the ICRP recommendations for radiation protection and effective dose
 - b) Describe the physical characteristics of, and the dose distributions produced by sources currently used for beta ray brachytherapy.

July, 1995