



# TECHNICAL UNIVERSITY OF MOMBASA

## FACULTY OF MEDICAL ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

**BACHELOR OF TECHNOLOGY IN MEDICAL ENGINEERING**

TMD 4101: MEDICAL PHYSICS I.

END OF SEMESTER EXAMINATION

**SERIES: DECEMBER 2016**

**TIME: 2 HOURS**

### Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions.

Attempt question **ONE (COMPULSORY)** and any other **TWO** questions.

**Do not write on the question paper.**

### **Question ONE (30marks)**

(a). Explain the meaning of the following terms.

(i) Isotope (1mk)

(ii) Mass number (1mk)

(iii) Atomic number (1mk)

(b) Describe the structure of the nucleus. (3mks)

(c) What is the meaning of the following terms

(i) Electronegativity (1mk)

(ii) Electro positivity (1mk)

(d) (i) Define Dosimetry (1mk)

(ii) Highlight any three outcomes in irradiated cells (3mks)

(iii) Explain any two genetic effects radiation (2mks)

- (e) Describe any two characteristics of acute radiation effects (2mks)
- (f) Explain giving examples, what Ionizing and Non-Ionizing radiations are (4mks)
- (g) (i) State three adverse effects of Ultraviolet (3mks)
- (ii) Highlight two adverse effects of visible light (2mks)
- (iii) Distinguish between radio protectors and radio sensitizers (2mks)
- (h) Explain three examples of deterministic effects of radiation (3mks)

**Question TWO (20marks)**

- (a) Describe the three types of radiation therapy (6mks)
- (b) Explain the somatic and genetic effects of radiation, giving examples (4mks)
- (c) Explain the three fractionation schemes of improving therapeutic ratio (6mks)
- (d) Explain the effects of x-rays during pregnancy (4mks)

**Question THREE (20marks)**

- (a) Describe the production and specific uses of any four medical radioisotopes (10mks)
- (b) Describe characteristics of target material of a reactor in radionuclide production (6mks)
- (c) Explain direct and indirect action of cell damage by radiation (4mks)

**Question FOUR (20marks)**

- (a). Explain the five Rs of radiotherapy (10mks)
- (b). Explain the following terms, giving examples of each
  - I. Stochastic effects (3mks)
  - II. Deterministic effects (3mks)
- (c). Explain the Acute and Chronic effects of radiation, giving two characteristics of each (4mks)

**Question FIVE (20marks)**

- (a) Describe the Rutherford atomic model, stating its limitations (5mks)
- (b) Explain the meaning of the following terms as used in radioactivity
  - I. Activity (2mks)
  - II. Specific activity (1mk)
- (c) Describe the three naturally occurring radiation (6mks)
- (d) I. State two differences between alkali metals and halogens, giving examples of each (3mks)
- II. What is the meaning of the following terms.
  - (i) Valence electrons (2mk)
  - (ii) Nuclear Fusion (1mk)