# TECHNICAL UNIVERSITY OF MOMBASA

## FACULTY OF MEDICAL ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR DEGREE OF**:**

**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.**

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**Question ONE (30 marks)**

(a) i. Describe the three atomic models (3mks)
ii. Explain the meaning of the following terms
I. Half-life (1mk)
II. Nuclear fission (1mk)
III. Excited state (1mk)
IV. Ground state (1mk)

(b) i. Distinguish between somatic and genetic effects of radiation (2mks)
ii. Briefly explain how brachytherapy is done, giving example (4mks)

(c) i. Explain what happens during alpha and beta particles decay, giving illustrations (4mks)
ii. Describe the isotopes of hydrogen (3mks)
iii. What does LD50/60 stands for? (2mks)

(d) i. Explain the factors that will determine cell response to radiation (2mks)
ii. Explain three characteristics of a good dosimeter (3mks)
iii. State the three types of lasers used in medicine (3mks)

**Question TWO (20marks)**

(a) What is radioactivity? (2mk)

(b) The half-life of a radioisotope is 6 hours. After how much time will $\frac{1}{16}$th of the radioisotope remains. (4mks)

(c) Explain the biological effects of electromagnetic radiations. (8mks)

(d) i. Explain any three characteristics of Alpha particles (3mks)

ii. Explain any three properties of X-Rays that make them useful in medicine (3mks)

**Question THREE (20marks)**

(a) Describe the basic components of a laser (6mks)

(b) Explain how the three types of lasers are used in medicine . (6mks)

(c). Explain the hazards of laser (6mks)

(d). Explain the laser safety measures (2mks)

**Question FOUR (20marks)**

(a) Explain the three categories of radiation damage (6mks)

(b) Explain how certain radioisotopes are used in therapeutic medicine (6mks)

(c) Explain the advantages of cyclotron over nuclear reactor in isotope production (4mk)

(d) Describe the differences between ionizing and non-ionizing radiations, giving an example of each (4mks)

**Question FIVE (20marks)**

(a) Explain the properties of beta particles (3mks)

(b) Highlight the shortcomings of Bohr's atomic model (2mks)

(c) State any two types of dosimeters (2mks)

(d) Explain the advantages of CT over regular X-ray (2mks)

(e) (i) Under what circumstance are positrons emitted (2mks)

(ii) Write down a chemical equation for positron emission (2mks)

(f). (i) Explain the Biological effects of microwave and RF waves (4mks)

(ii) Distinguish between genetic and somatic effects of radiation, giving an example of each. (4mks)