



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied and Health Sciences

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR DEGREE OF:

BACHELOR OF SCIENCE IN MEDICAL ENGINEERING

ECL 4101: MEDICAL PHYSICS I.

END OF SEMESTER EXAMINATION

SERIES: MAY 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 (COMPULSARY)** and any other **TWO** questions.

Do not write on the question paper.

Question ONE (30Marks)

- (a) i. State the three atomic models (3mks)
ii. Define the following terms
- I. Half-life (1mk)
 - II. Nuclear fusion (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. Name the isotopes of hydrogen (3mks)
iii. What does LD50/60 stands for? (2mks)
- (d) i. State the ways in which radiation can impact the DNA (2mks)
ii. State 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. (3mks)
- (c) Explain the biological effects of electromagnetic radiations. (8mks)
- (d) Define the following terms as used in radioactivity (2mks)
- i. Transmutation
 - ii. Critical mass
- (e) i. State any three characteristics of Alpha particles (3mks)
- ii. State any two properties of X-Rays that make them useful in medicine (2mks)

Question THREE (20Marks)

- (a) Explain how the three types of lasers are used in medicine (6mks)
- (b). Explain five advantages of LASER surgery over standard surgical tools (10mks)
- (c). Explain two disadvantages of LASER surgery (4mks)

Question FOUR (20Marks)

- (a) Explain three determinants of biological effects of radiation (8mks)
- (b) Explain three advantages of cyclotron radioisotope production over nuclear reactor (6mks)
- (c) State any two radioisotopes commonly used in medicine (2mk)
- (d) Distinguish between ionizing and non-ionizing radiations, giving an example of each (4mks)

Question FIVE (20Marks)

- (a) What is Nuclear Medicine (2mks)
- (b) Describe the techniques in which radionuclides are used to provide diagnostic information about the body, giving a specific area of application for each (6mks)
- (c) Explain the advantages of Positron Emission Tomography (PET) over X-Ray imaging (6mks)
- (d) Explain where certain radionuclides are used in medicine (6mks)