KISII UNIVERSITY

UNIVERSITY EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE IN BIOMEDICAL SCIENCES
FIRST SEMESTER, 2021/2022
(FEBRUARY - JUNE, 2022)

BMED 349: RADIOBIOLOGY AND RADIOTRACER TECHNIQUES

STREAM: Y3 S1 **TIME: 3 HOURS**

DAY: TUESDAY, 9:00 – 12:00 P.M. **DATE: 10/05/2022**

INSTRUCTIONS:

1. ***Do not write anything on this question paper.***
2. ***Answer question ONE (Compulsory) and any other TWO questions.***

QUESTION ONE (COMPULSORY – 30 MARKS)

a) Describe **three** main uses of ionising radiation in medicine

[3 marks]

b) Discuss the use of the following:

(i) Radiotherapy

(ii) Radioactive tracers

(iii) Ionising radiation [3 marks]

c) One of the most serious complications of the treatment of cancer is radiation damage to the spinal cord. Discuss the pathogenesis of radiation myelitis. [3 marks]

d) Define deterministic and stochastic effects. Give one example of each. [4 marks]

e) List the advantages and disadvantages of accelerated treatment schedules from a radiobiological point of view. [4 marks]

f) Draw a labelled diagram of the survival curves of cells from early and late reacting tissues treated with:

i) single doses of sparsely ionising radiation and

ii) fractionated sparsely ionising radiation [4 marks]

g) List the different types of radiation-induced DNA damage. [3marks]

QUESTION TWO (20 MARKS)

(a) Discuss the potential detrimental effects of ionizing radiation at the exposure levels encountered in diagnostic radiology with respect to:

(i) genetic effects; [6 marks]

(ii) somatic effects. [6 marks]

(b) Describe **two** common personnel dosimeters and explain how the dose is estimated for each one. [8 marks]

QUESTION THREE (20 MARKS)

a) Define stochastic and deterministic effects of ionising radiation, giving an example of each effect. [5 marks]

b) Define and describe consequential late effects in normal tissues after radiatio therapy

(5 marks)

c) List the treatment factors that can affect the development of a consequential l effect.

(5 marks)

d) Discuss the risk of therapeutic radiation during different stages of pregnancy.

(5 marks)

QUESTION FOUR (20 MARKS)

(a) Discuss the potential detrimental effects of ionizing radiation at the exposure levels encountered in diagnostic radiology with respect to:

(i) Genetic effects; [6 marks]

(ii) Somatic effects. [6 marks]

(b) Describe **two** common personnel dosimeters and explain how the dose is estimated for each one. [8 marks]

QUESTION FIVE (20 MARKS)

(a) Discuss why it is difficult to obtain accurate information about the biological effects on humans of low doses (e.g. 10 mGy) of low-LET radiations delivered over extended periods of time. [10 marks]

Describe the following radiation detectors based on gas ionization and discuss their relative merits in radiation protection:

(i) ionization chamber
(ii) Geiger-Mueller (G-M) counter [10 marks]