KISII UNIVERSITY
UNIVERSITY EXAMINATIONS

FOURTH YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF BACHELOR OF EDUCATION SCIENCE/GENERAL CHEMISTRY
FIRST SEMESTER 2022/2023
[SEPTEMBER-DECEMBER, 2022]

CHEM 417: RADIATION AND NUCLEAR CHEMISTRY

STREAM: Y4S1 **TIME: 2 HOURS**

DAY: MONDAY, 12:00 – 2:00 PM **DATE: 05/12/2022**

INSTRUCTIONS

1. ***Do not write anything on this question paper.***
2. ***Answer ALL questions in SECTION A and any other TWO in SECTION B.***

SECTION A

1a. Which type of radiation does the most tissue damage, but only when the emitter is internally ingested? (3marks)

b. Name and give examples two major types of nuclear reactions. (2marks)

c. Explain a radioactive isotope giving at least an example. (3marks)

2a. Explain metastable state with an illustration. (2marks)

b. Why are alpha and beta particles considered directly ionising. (3marks)

c. With illustrations explain effect of electric field and magnetic field on Radiation source. (4marks)

3a. Give three methods of reducing radiation exposure. (3marks)

b. Name and explain four effects of radiation on cells. (4marks)

c. With an illustration, explain the Einstein's equation. (2marks)

4a. Give four effects of an acute dose in chronic radiation. (4marks)

b. State and fully explain two somatic effects. (3marks)

c. Explain the particle formed with the help of an equation when a beta and positron emission combine. (2marks)

5a. with the help of a diagram, explain penetrating powers of radiation. (3marks)

5. Explain the nuclear fussion process with an illustration. (2marks)

SECTION B

6a. Name and explain four radio waste disposal methods giving examples of their effects. (8marks)
b. Using a well elaborate diagrams differentiate between controlled and uncontrolled Nuclear Chain Reactions. (7marks)

7a. The recommended dosage of ^{131}I for a test is 4.2 microcuries per kg of body weight. How many mCi should be given to a 110 kg patient? (1 mCi = 1000 μCi) (5 mrks)

b. With the help of a diagram explain X- ray formation. (5 marks)

c. Explain the type of radioisotope is used for diagnosing thyroid disorders? (2 marks)
d. explain the serious risk factor associated with the operation of a nuclear power plant. (3 marks)

8a. Explain Scintilization counters and where they are commonly used (5 marks)

b. Name the applications of radiochemistry in different medical field of life. (5 marks)

c. The half-life of 18F is 112 minutes. If radio labelled Prozac were administered to a patient for a PET scan at 8:00 A.M. on Monday, at what time would its activity reach 5% of the original activity? (5 marks)