KISII UNIVERSITY
UNIVERSITY EXAMINATIONS

FOURTH YEAR EXAMINATION FOR THE AWARD OF
THE DEGREE OF BACHELOR OF SCIENCE IN EDUCATION AND
GENERAL CHEMISTRY
SECOND SEMESTER 2021/2022
(FEBRUARY-JUNE, 2022)

CHEM 417: RADIATION AND NUCLEAR CHEM

STREAM: Y4 S2   **TIME: 2 HOURS**

DAY: WEDNESDAY, 9.00 AM – 11.00 AM   **DATE: 18/05/2022**

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. With an example explains a radioactive isotope.   (3 marks)

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

c. With an example explain radiation.   (3 marks)

2a. Account for ionising radiation and give three forms of ionising radiations   (4 marks)

b. Why is it not possible to eliminate the hazard of nuclear waste by the process of incineration   (3 marks)

c. Explain three problems encountered when working with radioactive isotopes

(4 marks)

3a. Give three conditions that make nucleus unstable.   (3 marks)

b. Demonstrate how the penetrating power, size of particles and energy of alpha, beta and gamma decay products compare. (4 marks)

c. What particle is produced by decay of Thorium 214 to radium 210? (2 marks)

4a. why do alpha and beta decay produce new elements but gamma decay does not. (4 marks)

b. List and explain two somatic effects. (3 marks)

5a. Show the effects of the four types of rays on a hand with the effect of a diagram.

(3 marks)

5b. In a nuclear reactor, explain what slows down the neutrons.
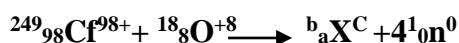
(2 marks)

SECTION B

6a. what are the different ways in which nuclear fission energy can be released from nuclear fission processes (8 marks)

b. Uranium 238 undergoes alpha decay. Which nucleus is formed as a result of this decay? Explain. (3 marks)

c. suppose that a radioactive isotope whose halflife is equivalent to 30 hrs is allowed to decay . After waiting for 24 hrs how much of this compound is expected to remain compared to the initial amount? Explain. (4 marks)

7a. Phosphorous 32, a radioisotope used in leukemia therapy has a half life of 14.26 days. What % sample remains after 35.0 days? (8 marks)

b. Determine **x** in the following reaction. (7 marks)

$$^{249}_{98}Cf^{98+} + {}^{18}_{8}O^{+8} \longrightarrow {}^{b}_{a}X^{C} + 4{}^{1}_{0}n^{0}$$

8a. describe the process of nuclear fission with an example. (5 marks)

b. Name the applications of radiochemistry in different fields of life. (10 marks)