



Technical University of Mombasa

Faculty of Applied and Health Sciences

DEPARTMENT OF PURE AND APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
TECHNOLOGY IN APPLIED CHEMISTRY (ANALYTICAL & INDUSTRIAL OPTION)
BTAC 12J

ACH 4211: NUCLEAR & RADIOCHEMISTRY

SEMESTER EXAMINATION

DECEMBER 2013 SERIES

2 HOURS

Instructions to candidates:

This paper consist of **FIVE** questions

Answer question **ONE** (compulsory) and any other **TWO** questions

QUESTION ONE

a) Write detailed accounts on the properties of each of the following;

- (i) Alpha rays (4 marks)
- (ii) Positrons (4 marks)
- (iii) Neutrinos (4 marks)

b) What are the contributions of the following scientists on nuclear chemistry;

- a) Glen T. Seaborg
- b) Pierre and Marie Curie
- c) Rutherford
- d) Enrico Fermi (4 marks)

c) Describe the **FIVE** types of radioactive decay. (10 marks)

d) List down the different

(i) Natural sources of Radioactivity (2 marks)

(ii) Artificial sources of radioactivity (2 marks)

QUESTION TWO

Write an essay on Nuclear Energy as a development and environmental necessity. (20 marks)

QUESTION THREE

a) What is Neutron Activation Analysis? (4 marks)

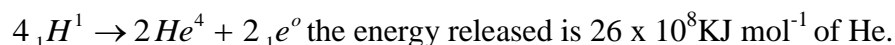
b) Describe the process of determining the quantity of arsenic in a plant sample using Neutron Activation Analysis (16 marks)

QUESTION FOUR

a) Describe the kinetics of radioactive decay (4 marks)

b) The ratio of the mass of ^{206}Pb to that of ^{238}U in a certain rock specimen is 0.5. Assuming that the rock initially contained no lead, calculate its age. Half-life of Uranium is 4.5×10^9 years (6 marks)

c) In the reaction:



Calculate the change in mass (m) in g mol^{-1} of He. (10 marks)

QUESTION FIVE

a) Describe, giving TWO examples in each case, the uses of radioisotopes as radioactive tracers in:

(i) Studying reaction mechanisms. (3 marks)

(ii) Diagnosis of diseases (3 marks)

(iii) Industry (3 marks)

(iv) Agriculture (3 marks)

b) Write an account on the usefulness and limitations of Radiocarbon dating (8 marks)