



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

ACH 4118 - ORGANIC CHEMISTRY

SPECIAL/SUPPLEMENTARY EXAMINATION

FEBRUARY 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) Which of the following has the greatest penetrating ability: an α particle, a β particle or a γ ray?

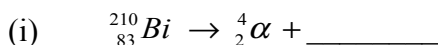
(1mark)

- b) What type of shield is necessary to stop the following:

- (i) X-rays
- (ii) β particles
- (iii) γ Rays
- (iv) α particles

(1mark each)

- c) Fill in the missing symbol in each of the following nuclear equations



- (ii) ${}^{15}_8\text{O} \rightarrow {}^{15}_7\text{N} + \underline{\hspace{2cm}}$
- (iii) $\underline{\hspace{2cm}} \rightarrow {}^4_2\alpha + {}^{222}_{86}\text{Rn}$
- (iv) ${}^9_4\text{Be} + \underline{\hspace{2cm}} \rightarrow {}^{12}_6\text{C} + {}^1_0\text{n}$
- (v) ${}^{27}_{13}\text{Al} + {}^2_1\text{H} \rightarrow \underline{\hspace{2cm}} + {}^4_2\alpha$

(1mark each)

d) What is the effect on the mass number and atomic number of the reacting isotope when the following transmutations occur?

- (i) A β particle is emitted
- (ii) An α particle emitted
- (iii) A γ ray is emitted

(2marks each)

e) How does a breeder nuclear reactor produce more fuel than it uses? **(6marks)**

f) With the aid of a diagram describe how a Geiger counter works and how radioactivity is detected **(8marks)**

Question TWO

With the aid of diagrams write succinct notes on:

a) α particles, β particles and γ rays in an electric field **(10marks)**

b) The Half-life of Radioisotopes **(10marks)**

Question THREE

a) Describe the effects on Humans of short-Term whole-body exposure to the following doses of radiation doses in rems:

<50

50 – 250

250 – 500

500 – 1000

1000 – 10,000

100,000

(2marks each)

- b) The half-life of ^{222}Ra radon is 3.8 days. If the basement of a house contains 45g of ^{222}Ra will remain after 8.5 days (assuming that only radioactive decay is the cause of the depletion of the ^{222}Ra)? **(8marks)**

Question FOUR

- a) Write an account of neutron-proton ratios and the stability of nuclei. **(10marks)**
- b) Define the kinetics of radioactive decay **(4marks)**
- c) The ^{14}C activity of an archeological wooden sample is 11.6 disintegrations per second. The activity of a fresh wood carbon sample of equal mass is 15.2 disintegrations per second. The half-life of ^{14}C is 5715 years. What is the age of the archeological sample?

(6marks)

Question FIVE

Discuss the uses of radioisotopes as radioactive tracers in:

- (i) Studying reaction mechanisms **(5marks)**
- (ii) Diagnosis of disease **(5marks)**
- (iii) Industry **(5marks)**
- (iv) Agriculture **(5marks)**