NATIONAL OPEN UNIVERSITY OF NIGERIA
14/16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
MARCH/APRIL 2014 EXAMINATION

COURSE CODE: CHM406
COURSE TITLE: NUCLEAR AND RADIOCHEMISTRY
TIME ALLOWED: 2 ½ HOURS
INSTRUCTION: ANSWER ANY FOUR (4) QUESTIONS. EACH QUESTION CARRIES 17$^{1/2}$MARKS.

QUESTION 1

A (i) what is radioactivity? (2 mark)

ii) Briefly discuss the types of radioactivity (4 marks)

B Differentiate between ordinary chemical reactions and nuclear reactions (4 marks)

C Define these terms in radioactivity

(i) Nuclear Stability (2 mark)

(ii) Electron capture (2 mark)

(iii) Gamma ray emission (2 mark

d. _____ + ^{27} Al ----------→^{30} P + $^{1}_{1}$ n (1 ½)

QUESTION 2

A i) Mention and discuss the types of exposure to large dose radiation (51/2 marks)

ii) write short notes on the basic principles recommended for keeping radiations exposure to a minimum level (6 marks)

b. Discuss the protection of radiation measures in large organisation (6 marks)

QUESTION 3

ai) Identify the symbol X in each of the following

ii) $^{0}_{-1}$X (ii) $^{4}_{2}$X (iii) $^{0}_{+1}$ X (iv) $^{1}_{0}$ X (2 marks)

b (i) Explain the term Radioactive decay (2 ½ marks)

Write short notes on the following:

(ii) Conservation laws that must hold in radioactive reactions (8 marks)

(iii) Above the stability region (1 ½ marks)

iv) Below stability level (1 ½ marks)

C Balance the following radioactive equations

i) $^{38}_{19}K$ ---------- >_____ + $^{0}_{+1}\beta$ (1 mark)

ii) $^{40}_{19}K$ ---------- > $^{40}_{20}Ca$ + _____ (1 mark)

QUESTION 4

A write short notes representing with an equation where necessary on these

i) Beta decay (2 marks)

ii) Alpha decay (2 marks)

iii) Positron decay (2 marks)

iv) Gamma decay (2 marks)

b) Define and discuss the following

i) Nuclear fusion Reactor (2 marks)

ii) Nuclear fusion (2 marks)

iii) Nuclear Fission (2 marks)

iv) Chain reaction (2 marks)

C Mention 2 uses of radioactivity (1 1/2mks)

QUESTION 5

A what are tracks and its measurement (2 marks)

B Briefly discuss the following

i) Solid state nuclear track detector (SSNTD) (2 marks)

ii) Cloud and bubble chambers (2 marks)

C Briefly explain the various forms of gas ionization counter (6 marks)

D Explain the two types of sample preparation in radioactivity measurements (5 ½ marks)

QUESTION 6

A (i) Mention the two major rules guiding the writing of chemical equations of nuclear reactions. (4 marks)

ii) Mention the nuclear models (3 marks)

b write short notes on the following

i) Elastic scattering (2 marks)

ii) Inelastic scattering (2 marks)

iii) Nuclear excitation (2 marks)

iv) Rotational excitation (2 marks)

v) Vibrational excitation (1 mark)

C Mention the types of scintillation detector (1 1/2marks)