NATIONAL OPEN UNIVERSITY OF NIGERIA
UNIVERSITY VILLAGE, PLOT 91 CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESS WAY, JABI - ABUJA.
FACULTY OF SCIENCES
DEPARTMENT OF PURE AND APPLIED SCIENCE
FIRST SEMESTER EXAMINATION 2021_2 45678

COURSE CODE: **CHM406**
COURSE TITLE: **Nuclear and radiochemistry**
TIME: **2 Hours**
INSTRUCTION: **Answer question one and any three questions.**

QUESTION ONE

1a. In a tabular form differentiate between nuclear fusion and nuclear fission. (5 marks)

1b. Describe the four types of emission undergone by radioactive isotopes

(5 marks each = 20 marks)

QUESTION TWO

2a.Given that N = number of atom of A initially before disintegration, t = time taken for disintegration, $t_{1/2}$= half life, k = delay constant, show that $t_{1/2}$= 0.693/K

(5 marks)

b. Cobalt – 60 nucleus decay with the emission of beta particle – gamma rays with half life of 5.27 years. According to the equation $^{60}_{27}Co$ -----$^{60}_{28}Ni + ß + \gamma$ how much of a 3.42 mg sample will remain after 30.0 years? (5 marks)

c. Discuss the following

i. Unifield model for deforming nuclei

ii. Single particle module (5 marks)

QUESTION THREE

3a. With relevant example explain the following terms:

i. Isobars ii Isotopes ($2^1/_2$ marks each = 5 marks)

3b. Consider the equation $^{12}_{5}B + ^{4}_{2}He$---------- $^{x}_{y}Q + ^{1}_{0}n$

i. What element does Q represent in the periodic table? Explain (3 marks)

ii. How many nucleons does Q posses? Explain (2 marks)

3c) Explain briefly the basic principles of a detector (5 marks)

QUESTION FOUR

4a. List and explain the two basic principles for minimizing radiation exposure (4marks)

b. List 2 uses and 3 disadvantages of nuclear fission (5 marks)

c. Write short notes on the following methods of measuring radiation

i. Scintillator detector

ii. Solid scintillators (6marks)

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QUESTION FIVE

5a Arrange α, β, and γ particles in order of

i. Increasing penetration energy

ii. Increase ionization energy

iii. Increasing wavelengths

iv. Increasing speed (1.5marks each)

b. Give 5 properties of the alpha particles (5 marks)

c. Alpha particles are only slightly deflected towards the negative plate of an electric field

i. Why is the deflection towards the negative plate (2 marks)

ii. Why is the deflection only slightly? (2 marks)