NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES

DEPARTMENT OF PURE AND APPLIED SCIENCE

2021_2 EXAMINATIONS

COURSE CODE: **PHY 402**
COURSE TITLE: **NUCLEAR PHYSICS**
CREDIT UNIT: **3**
TIME ALLOWED: **(2½ HRS)**

INSTRUCTION: *Answer question 1 and any other four questions*

CONSTANTS: Avogadro's number = 6.02×10^{23} atoms/g-mole; $c = 3\times10^{8}$ m/s; $m_e = 9.109\times10^{-31}$ kg (0.00054858u); $m_p = 1.673\times10^{-27}$ kg (1.007825u); $m_n = 1.675\times10^{-27}$ kg (1.008665u); $1\text{Å} = 10^{-10}$ m; 1fm $= 10^{-15}$ m; 1eV $= 1.602\times10^{-19}$ J; 1u $= 1.661\times10^{-27}$ kg; $R_0 = 1.3\times10^{-15}$ m (1.3fm)

QUESTION ONE

A. Briefly discus the term "Heavy Charged Particle Interaction"   **(4 marks)**

B. Mention any four types of charged particles interaction.   **(4 marks)**

C. List any three uses of the following gamma ray emitters

 (i) Cobat 60   **(3 marks)**   (ii) Caesium 137   **(3 marks)**

(iii) Technetium 99m   **(3 marks)**   (iv) americium 241   **(3 marks)**

D. What are the physical qualities that are conserved in any nuclear reaction (**2 marks**)

QUESTION TWO
A. Explain the terms: (i) isotopes (ii) Nuclear binding energy (iii) isotones (iv)isobars
                                                                (8 marks)
B. List any four properties of α – particles   **(4 marks)**

QUESTION THREE
    A.   State the relationship between the radius of nucleus (r) and the number of particle (A)

(3 marks)

B. Differentiate between excess mass and packing fraction **(3 marks)**
C. Write the conditions necessary for nuclear reaction to take place **(3 marks)**
D. Give the reasons for using radioactivity to determine the age of matter **(3 marks)**

QUESTION FOUR

A Briefly discus human and medical application of radioactivity **(8 marks)**

B. It is estimated that the Chernobyl disaster released 6.0 MCi of ^{137}Cs into the environment. Calculate the mass of ^{137}Cs released. **(4 marks)**

QUESTION FIVE

A Mention two types of Nuclear reaction **(4 marks)**

B Why is matter not conserve in public conserved **(4 marks)**

C What is meant by Q-value energy? **(4 marks)**

QUESTON SIX

A. Briefly define the term "mass defect of an atom" **(4 marks)**

B. Calculate the energy generated in kWh, when 100 gm of $_3Li^7$ are converted into $_2He^4$ by proton bombardment, given,

Mass of $_3Li^7 = 7.0183$ amu

Mass of $_2He^4 = 4.0040$ amu

Mass of $_3Li^1 = 1.0081$ amu **(8 marks)**