



**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**  
**SEPTEMBER 2020\_1 EXAMINATION**

**COURSE CODE:** CHM 406  
**COURSE TITLE:** Nuclear and radiochemistry  
**COURSE UNIT:** 2  
**TIME:** 2 Hours  
**INSTRUCTION:** Answer question one and any three questions.

**QUESTION ONE**

- 1a. Compare and contrast the ordinary chemical reaction with nuclear reaction. 6 mks
- 1b. Write short explanation notes on
- i) Natural radioactivity (3 mks) (ii) Artificial radioactivity (3 mks) (iii) Electron capture (3 mks)
- 1c. Write brief explanatory notes on Ionization chamber. 3 mks
- 1di. The nucleus of an atom is dense explain. 2 mks
- 1dii.  ${}^{97}_{40}\text{Zr} \rightarrow {}^{97}_{41}\text{Nb} + ?$  2 mks
- 1e. Explain extensively the effect of radiation on human health 3 mks

**QUESTION TWO**

- 2a. Show with examples the rule that guide prediction of nuclear stability. 4 mks
- 2bi. Complete and balance the equations below
- i)  ${}^2\text{D}_1 + {}^3\text{T}_1 \rightarrow {}^4\text{He}_2 + ? + \text{Energy} + \gamma \text{ ray}$  2 mks
- ii)  ${}^4\text{He}_2 + {}^{14}\text{N}_7 \rightarrow {}^1\text{H}_1 + ?$  2mks

- 2bi. Describe Beta ray. 3 mks
- 2c. In what proven ways has larger dose radiation occurred? 4 mks

### QUESTION THREE

- 3a. With two supporting relevant equation, explain Gamma ( $\gamma$ ) ray emission. 8 mks
- 3b. Explain what you understand by chain reaction. 4 mks
- 3c. Write short note on Proportional counter. 3 mks

### QUESTION FOUR

- 4a. With simple chemical equation explain the type of reaction that occur in the sun. 4 mks
- 4b. In simple term explain the main function of a fusion reactor. 2 mks
- 4c. In nuclear models reactions, the facilitator intends to achieve certain objectives, list them  
5 mks
- 4d. What does the symbol Q represent in the particles below?
- (i)  ${}^0_{-1}\text{Q}$  (2 mks)    (ii)  ${}^4_2\text{Q}$  (2 mks)

### QUESTION FIVE

- 5a. List some human health challenges and radio nuclear treatment option. 8 mks
- 5b. Explain briefly the management of radioactive waste and associated problems. 7 mks