



NATIONAL OPEN UNIVERSITY OF NIGERIA
UNIVERSITY VILLAGE, PLOT 91 CADASTRAL ZONE, NNAMDI AZIKIWE
EXPRESSWAY, JABI - ABUJA.
FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY
2025_2 EXAMINATIONS.

COURSE CODE: CHM 406
COURSE TITLE: Nuclear and Radiochemistry
COURSE UNIT: 2
TIME: 2 Hours
INSTRUCTION: Answer question one and any other two questions.

QUESTION ONE

- a. What is the main factor that determines the stability of a nucleus? 1mark
- b. State the rules governing the writing of chemical equation of nuclear reactions. 4marks
- c. Briefly explain gamma ray emission. Show equation. 6marks
- d. According to collective nuclear model, if ^{238}U undergoes Coulomb excitation, explain the possible types of excitations it underwent. 6marks
- e. State the Schrodinger equation for Single Particle shell model. 3marks
- f. State the merit and demerit of liquid scintillator over other detectors. 6marks
- g. Briefly state the significance and the limitation of collective nuclear model. 3marks
- h. List two types of nuclear fusion reactor. 1mark

QUESTION TWO

- a. For a stable nuclei, state the relationship between,
 - (i) The radius and the mass number. 2marks
 - (ii) The binding energy and each nucleon. 2marks
 - (iii) Justify your answers in (i) and (ii). 4marks
- b. Discuss Quantitative Energy level in terms of nuclear model. 4marks
- c. What do you understand by the term "Induced Radioactivity"? 8marks

QUESTION THREE

- a. Mention the major treaty of regulation for safe disposal of radioactive wastes. 2marks
- b. What is the major challenge facing the treaty stated in (a) above? 2marks
- c. Discuss the established disposal method for Strontium-90. 3marks
- d. Write on the effect of exposing the whole body to radiation at different doses. 7marks
- e. Describe the process of nuclear fission. 6marks

QUESTION FOUR

- a. Explain with the aid of an equation the possible emission a nucleus, X with proton number of 88 could undergo. 4marks
- b. Explain the general characteristics of a Nuclear Detector. 6 ½ marks
- c. State the radioactive particle(s) that can be measured by
 - I. Ion Chamber 2marks
 - II. Proportional Counter 4marks
- d. What role does radioactivity play in the industry? 3 ½ marks

QUESTION FIVE

- a. How is naturally occurring radioactive form of carbon produced? Explain its significance to object dating. 10 marks
- b. The half-life of a radioactive element is 6.5 days. If the sample has an activity of 1.2μ after 30 days, what is the initial activity of the sample, and how long will it take for 98.2% of the sample to decay? 10marks