



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
OCTOBER/NOVEMBER 2019, SECOND SEMESTER 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

- 1ai. Define the term *Radioactivity* (1 marks)
- 1aii. Is radioactivity of elements in conformity with accepted Dalton postulate of indestructibility of an atom? (2 marks)
- 1aiii. Do all elements undergo natural radioactivity? Explain your answer. (2 marks)
- 1b. Why is the study of the radioactivity of elements important? (2 marks)
- 1c. State the three major types of radiations that are emitted during nuclear disintegration. (1 marks)
- 1d. With simple equations explain the following:
 i) Alpha decay (3 marks) (ii) Gamma ray emission (2 marks) (iii) Nuclear fission (2 marks)
- 1e. Arrange the radiations, α , β and λ in an increase order of their ionizing power. (2 marks)
- 1f. What is Quenching with respect to radioactivity. (2 marks)
- 1g. Define the term LD_{50} in terms of radiation exposure (2 marks)
- 1h. State two ways in which exposure to large dose radiation could occur. (2 marks)
- 1i. State the three basic principles recommended for keeping radiations exposure to a minimum level in a radiation laboratory. (2 marks)

QUESTION TWO

2a. Explain briefly each of the following terms:

- (i) Electron capture (3 marks)
- (i) Positron emission (3 marks)

2bi. What is nuclear fusion? (2 marks)

2bii. State the importance of nuclear fusion in the sun. (3 marks)

2c. Explain the term *potential well* in relation to nuclear property of an atom (4 marks)

QUESTION THREE

3a. Explain briefly each of the following techniques of radiation measurements:

- (i) Geiger-Muller Counter (3 marks)
- (ii) Ion Chamber (3 marks)

3b. Enumerate the applications of radioactivity in the following areas:

- (i) Agriculture (3 marks)
- (ii) Industries (3 marks)
- (iii) Medicine (3 marks)

QUESTION FOUR

4ai. Explain the importance of neutron to proton ratio to stability of element. (2 marks)

4aaii. State the rules that guide the prediction of nuclear stability. (3 marks)

4b. What are the differences between chemical reactions and nuclear reactions? (4 marks)

4ci. What are the two major rules guiding writing the chemical equation of nuclear reactions?
(2 marks)

4cii. A radioactive nucleus which decays with the emission of beta particles and gamma rays has a half-life of 5 years. How much of a 4.5 mg sample remain after 20 years. (4 marks)

QUESTION FIVE

5a. Complete and balance the equations below:



5b. Discuss various ways Nigerians can be exposed to radiation. (5 marks)

1c. Explain the general principles in a radiochemical laboratory design. (6 marks)