FACULTY: BASIC AND APPLIED SCIENCES
DEPARTMENT: PHYSICAL AND CHEMICAL SCIENCES
SECOND SEMESTER EXAMINATIONS
2016/2017 ACADEMIC SESSION

COURSE TITLE: RADIOMETERIC PROSPECTING METHODS   **COURSE CODE: AGP 418**

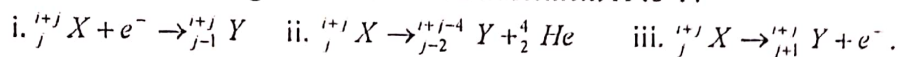**DURATION: 2 Hours**

TOTAL MARKS: 60 MARKS

HOD's SIGNATURE

Matriculation Number: _____

INSTRUCTIONS:
- Write your matriculation number in the space provided above and also on the cover page of the exam booklet.
- Attempt **any three (3) questions.**

1 (a)   From the following transition of a radioelement X to Y:

   i. $_j^{i+j}X + e^- \rightarrow _{j-1}^{i+j}Y$ ii. $_j^{i+j}X \rightarrow _{j-2}^{i+j-4}Y + _2^4He$ iii. $_j^{i+j}X \rightarrow _{j+1}^{i+j}Y + e^-$.

   i.   Identify the type of transition involved in each of the above reactions
   ii. Describe the condition of the atom X before and after its transformation to the element Y.

   (b) Explain concisely nuclear disintegration
   (c) Discuss various modes of interaction of gamma rays with matter.

                                                                    20 Marks

2   (a) Discuss the significant roles of γ – ray spectrometry in the following areas:
    (i) Oil and gas industries (ii) Environmental impact assessment (iii) Exploration for Uranium deposits
    (b) Describe the term half-life of a radionuclide
    (c) Show that the half-life of an element, $T_{1/2} = 0.693 \lambda^{-1}$

                                                                    20 Mark

3 (a) Describe a 4 - channel gamma – ray spectrometer using a block diagram.
   (b) Explain with a graph how a Geiger – Muller counter will respond to different voltage during radioactive measurement.
   (c) Write on the following:
      (i) Quenching agent (ii) Dead Time (iii) Ionization chamber (iv) Calibration

                                                                    20 Marks

4 (a) Discuss in detail, the operational principles of (i) Geiger – Muller counter. (ii) Scintillation meter.
   (b) Explain in relationship to mode of γ-ray interaction with matter, the γ-ray absorption efficiency in sodium iodide crystal. Use diagram where applicable.
   (c) Discuss the sources of the background in radiometric survey.

                                                                    20 Marks