ELIZADE UNIVERSITY ILARA-MOKIN
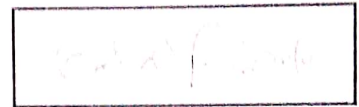
FACULTY: Basic and Applied Sciences
DEPARTMENT: Physical and Chemical
SECOND SEMESTER B.Sc DEGREE EXAMINATIONS
2017/2018 ACADEMIC SESSION

COURSE CODE: AGP 418

COURSE TITLE: RADIOMETRIC PROSPECTING METHOD

DURATION: 2 Hours

TOTAL MARKS: 60 MARKS

Matriculation Number: _____

INSTRUCTIONS:

1. Write your matriculation number in the space provided above and also on the cover page of the exam booklet.
2. This question paper consists of 2 pages including this page.
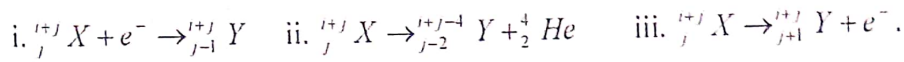3. Attempt any three (3) questions.

1 (a) Discuss various modes of interaction of gamma rays with matter.

(b) Write on the following:

  i. Quenching agent; and ii. Ionization chamber

20 Marks

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

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

  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

20 Marks

3 (a) Describe the term half-life of a radionuclide and show that the half-life of an

  element, $T_{1/2} - 0.693\lambda^{-1}$

(b) Discuss various modes of interaction of gamma rays with matter.

20 Mark

4 (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.

20 Marks

5 (a) Discuss in detail, the operational principles of Geiger – Muller counter.

  (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.

20 Marks

6. The table given shows the readings obtained with a γ-ray spectrometer along a traverse

  perpendicular to foliation across a granite-gneiss outcrop. Given that $k_1 = 0.6$, $k_2 = 0.13$, $k_3 = 0.02$,

  $S_1 = 1.0$, $S_2 = 1.5$, and $S_3 = 1.7$;

    (i)   determine the Th, U and K content at each station

    (ii)   plot profiles for each element as well as a profile of the Th : U ratio.

Station	Spectrometer readings (cpm)		
	Tc	Uc	Kc
0	13	28	198
100	8	27	243
200	25	36	218
300	15	30	193
400	15	30	197
500	8	21	233

20 Marks