



MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS 2017/2018 ACADEMIC YEAR FOURTH YEAR, SECOND SEMESTER

SCHOOL OF SCIENCE BACHELOR OF SCIENCE CHEMISTRY

COURSE CODE: CHE 424

COURSE TITLE: RADIO AND NUCLEAR CHEMISTRY

DATE: 26TH APRIL 2018

TIME: 1100 - 1300 HRS

INSTRUCTIONS TO CANDIDATES

1. Answer Question **ONE** and any other **TWO** questions
2. No writing on the Question paper
3. Use of mobile phone in the exam room is prohibited

Question one (30 mks)

- a. Define the following terms (12mks)
- Radiation
 - Radionuclide
 - Ionizing radiation
 - Radioactivity
 - Half-life
 - Isotopes
- b. List four differences between nuclear and chemical reactions (4mks)
- c. With the help of a diagram explain the characteristics of radioactive rays (4mks)
- d. Suppose you have 10grams Radium-226 whose half-life is 1.5×10^{-4} years. How much of it would be left after; (6mks)
- 3.0×10^{-4} years
 - 1.5×10^{-4} years
 - 1.5×10^{-3} years
- e. Complete the following equations and identify X in each case (4mks)
- ${}^{26}_{12}\text{Mg} + {}^1_1\text{P} \longrightarrow {}^4_2\alpha + \text{X}$ X
 - ${}^{235}_{92}\text{U} + {}^1_0\text{n} \longrightarrow {}^{94}_{36}\text{Kr} + {}^{139}_{56}\text{Ba} + 3\text{X}$
 - ${}^{20}_8\text{O} \longrightarrow {}^{20}_9\text{F} + \text{X}$
 - ${}^{32}_{16}\text{S} + {}^1_0\text{n} \longrightarrow {}^1_1\text{P} + \text{X}$

Section B: Choose any two questions

Question two (20 mks)

- a. Using equations explain the following types of radioactivity (12mks)
 - i. Positron emission
 - ii. Beta radiation
 - iii. Electron capture
 - iv. Gamma radiation
- b. The half-life of Tritium is 12.0years. If 48.0mg of Tritium is released from a nuclear power plant, what mass of this nuclide will remain after 48 years? (3mks)
- c. Explain the difference between nuclear fission and nuclear fusion (2mks)
- d. List three principles that are used in the management of radioactive waste (3mks)

Question three (20 mks)

- a. The following are instruments used in detecting and measuring radioactivity. Explain how each works. (12mks)
 - i. The Ion Chamber
 - ii. Geiger-Muller Counter
 - iii. Solid state detectors
 - iv. Scintillation counters
- b. The half-life of Tritium is 12years.
 - i. What fraction of the element will be remaining after 48 years (2mks)
 - ii. What fraction would have decayed after 72 years (3mks)
- c. Identify element X in the following equation (3mks)

Question four (20 mks)

- a. State and explain at least four applications of nuclear chemistry
(12mks)
- b. List four advantages of isotope dilution analysis over other methods of analysis
(4mks)
- c. For a certain material, the average count rate is found to be 82 counts per second. After a time of 210 seconds, the counts had dropped to 19 counts per second. The average background count rate remained constant at 10 counts per second. What is the half-life of the material?
(4mks)

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