



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN APPLIED CHEMISTRY (BTAC14S & BTAC 15S2)

ACH 4211: : Nuclear Chemistry and Radiochemistry PAPER II

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: Pick Date Select Month Pick Year

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of Choose No questions. Attempt Choose instruction.

Do not write on the question paper.

Question ONE

QUESTION ONE

(a) Describe the origins and characteristics of each of the following:

- | | | |
|-------|------------|-----------|
| (i) | Alpha rays | (2 marks) |
| (ii) | Beta rays | (2 marks) |
| (iii) | Gamma rays | (2 marks) |
| (iv) | Positrons | (2 marks) |
| (v) | Neutrinos | (2 marks) |

(b) Tabulate the differences between Chemical reactions and Nuclear reactions. (10 marks)

© Give any **two** contributions of each of the following persons to Nuclear chemistry:

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|-------|-------------------------|-----------|
| (i) | Antoine Henri Becquerel | (2 marks) |
| (ii) | Marie Curie | (2 marks) |
| (iii) | Ernest Rutherford | (2 marks) |

(d) Define and give examples of:

- | | |
|----------------|----------|
| (i) Isotopes | (1 mark) |
| (ii) Isobars | (1 mark) |
| (iii) Isotones | (1 mark) |
| (iv) Isomers | (1 mark) |

Question TWO

Write notes on biological effects of ionizing radiation with reference to:

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|--|-----------|
| (a) The interaction of ionizing radiation with biological materials. | (5 marks) |
| (b) Factors Influencing Biological effects | (5 marks) |
| (c) Terminology | (5 marks) |
| (d) Stochastic and Non-stochastic effects | (5 marks) |

Question THREE

(a) Describe the use of radio isotopes in elucidation the reaction mechanisms of:

- | | |
|---|-----------|
| (i) Photosynthesis | (4 marks) |
| (ii) The hydrolysis of esters | (4 marks) |
| (b) (i) What is Poston Emission Tomography (PET)? | (2 marks) |
| (ii) Describe the basic PET processes | (6 marks) |

© Write notes on the advantages and disadvantages of:

- | | |
|--|-----------|
| (i) Positron Emission Tomography (PET) | (2 marks) |
| (ii) Magnetic Resonance Imaging (MRI) | (2 marks) |

Question FOUR

Give a succinct account on Nuclear Energy as a development and environmental necessity with special Reference to:

- | | |
|---|------------|
| (a) Catastrophic climate change | (2 marks) |
| (b) Human dimensions of Environmental crisis. | (2 marks) |
| (c) The crucial Premise for Action. | (6 marks) |
| (d) Legitimate Public Concerns. | (10 marks) |

Question FIVE

Figure 1 is a basic diagram of a Pebble Bed Modular Reactor (PBMR)

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|--|-----------|
| (a) Annotate the diagram indicating: the fuel elements movement; steam generator; steam and t; water movements; pump; blower, gas; type of containment vessel; and temperatures in various areas | (5 marks) |
| (b) Describe the salient operations of a PBMR | (7 marks) |
| (c) Discuss the basic and subsystem characteristics that provide high Safety levels for a PBMR. | (8 marks) |