

UNIVERSITY OF SWAZILAND
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF ENVIRONMENTAL HEALTH
BSc IN ENVIRONMENTAL HEALTH SCIENCE
DEGREE IN ENVIRONMENTAL HEALTH SCIENCES
(MAIN EXAMINATION, DECEMBER 2015)

TITLE OF PAPER : RADIOACTIVITY, RADIATION, HEALTH AND SAFETY

COURSE CODE : EHM 417

TIME : 2 HOURS

TOTAL MARKS : 100

INSTRUCTIONS:

- **QUESTION 1 IS COMPULSORY**
- **ANSWER ANY OTHER THREE QUESTIONS**
- **ALL QUESTIONS ARE WORTH 25 MARKS EACH**
- **FORMULAE AND OTHER DATA IS PROVIDED**
- **NO FORM OF PAPER SHOULD BE BROUGHT IN OR OUT OF THE EXAMINATION ROOM**
- **BEGIN THE ANSWER TO EACH QUESTION IN A SEPARATE SHEET OF PAPER.**

DO NOT OPEN THIS EXAMINATION PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR.

QUESTION 1

I. Multiple choices: for the following statements as applied in radioactivity, radiation, health and safety write whether they are True or False.

- a) An atom is the smallest portion of an element that retains all the properties of the element.
- b) Protons are located outside the nucleus of an atom.
- c) Atomic weight is the relative weight of an atom and one atomic mass unit (a.m.u) has a mass (weight) of 1.6605×10^{-24} kg.
- d) Mass number is equal to the total number of protons and neutrons in the nucleus.
- e) Electrons are located in energy levels.
- f) There are 3 types of radiation: alpha, beta and gamma.
- g) A nuclear reaction is when a particle penetrates and changes a nucleus.
- h) If an object gains energy its mass decreases.
- i) When an atom emits an alpha particle, its mass number decreases by 2 and its atomic number decreases by 1.
- j) The standard unit is the curie, the number of nuclear disintegrations occurring per second in 1 kg of uranium.

(20 marks)

II. Briefly describe ultrasonography.

(5 marks)

QUESTION 2

- i. Describe beta particles and how they are formed.

(15 marks)

- ii. What is the health and safety importance of alpha particles and how can they be distinguished among other particles?

(5 marks)

- iii. Describe the arrangement of electrons in an atom and the importance attached to such an arrangement.

(5 marks)

QUESTION 3

- a) Describe gamma rays and how they are formed.

(15 marks)

- b) What is the health and safety importance of gamma rays and how can they be distinguished among other particles?

(5 marks)

- c) Describe a nuclear reaction

(5 marks)

QUESTION 4

- i. Describe nuclear waste and how it can be safely dealt with to safeguard public health.

(15 marks)

- ii. Write a nuclear reaction indication when a uranium atom - atomic number 92 and mass number 238 loses an alpha particle. Use the periodic table to find out what the resulting element from such a reaction is.

(10 marks)

QUESTION 5

- a. Describe how a scan is produced.

(4 marks)

- b. Describe the use of radioisotopes in medicine.

(15 marks)

- c. Briefly describe sources of radiation

(3 marks)

- d. Briefly describe irradiation of food

(3 marks)