

UNIVERSITY OF SWAZILAND

Faculty of Health Science

Department of Environmental Health science

NOVEMBER 2014 Main Examination

Title of Paper: RADIATION HEALTH AND SAFETY
Course Code: EHM417
Time : 2 HOURS
Marks allocation: 100 Marks

Instructions:

- 1) Answer all questions
- 2) Each question is weighted 25 marks
- 3) Write neatly and clearly
- 4) Begin each question in a separate sheet of paper
- 5) Numbering within a question chosen should be in a sequential order

This paper is not to be opened until the invigilator has granted permission

QUESTION 1:

a) i) Fill in the blanks:

The two major categories of biological effects of radiation are
..... effects which occur in the exposed individual and
..... effects which results from damage to reproductive cells.
(2 marks)

ii) List the three (3) main routes of entry of radioactive material into the body.
(3 marks)

iii) List three (3) sources of natural radiation and briefly explain how exposure might vary with altitude or geographic location.
(6 marks)

iv) Name the three (3) principle measures used to control external exposure to radiation and tell how each factor relates to exposure.
(6 marks)

v) In nuclear short hand

A = Number = Number of

Z = Number = Number of

(4marks)

vi) List three (3) types of radiation that may be emitted from the unstable nuclear of an atom and tell if it is particulate or electromagnetic.
(4 marks)

(Total =25 marks)

QUESTION 2:

- a) Complete the following table regarding measurements units of ionizing radiation.

Quantity	Classical Unit	IS Units
1. Exposure		
2. Dose		
3. Effective Dose		
4. Radioactivity		

(8 marks)

- b) Briefly discuss the As Low As Reasonably Achievable (ALARA) Principle in radiation health and safety.

(5 marks)

- c) What is meant by the Half Value Layer (HVL) **(3 marks)**

- c) With reference to the carbon atom explain, what are radioisotopes.

(6marks)

- d) What is meant by half-life in radioactivity **(3marks)**

(Total = 25marks)

QUESTION 3:

Multiple choice questions. Write the correct letter that corresponds to the right answer (2marks each).

A.

1. The chain of events following radiation exposure proceeds from;
- a) Bond disruption to biochemical alteration to cellular transformation to whole-body effects.
 - b) Bond disruption to cellular transformation to biochemical alteration to whole-body effects
 - c) Biochemical alteration to bond disruption to cellular transformation to whole-body effects.
 - d) Biochemical alteration to cellular transformation to bond disruption to whole-body effects.

- 2) Most radiation interaction with tissue occurs with
- a) water
 - b) carbohydrates
 - c) proteins
 - d) nucleic acids
- 3) Which of the following human responses to radiation exposure is classified as an early effect?
- a) breast cancer
 - b) leukemia
 - c) chromosomal aberrations
 - d) cataracts
- 4) When tissue is oxygenated.
- a) a higher dose is required for a given effect
 - b) DNA becomes radiation resistant
 - c) Cell death is less likely
 - d) More free radicals are formed
- 5) Because radiation interaction is random, a dose equal to D_{37} is expected to kill what percentage of cells?
- a) 0
 - b) 37
 - c) 63
 - d) 100
- 6) An early effect of radiation exposure on humans that is of current concern in medical x-ray imaging is:
- a) chromosomal aberrations
 - b) cataracts
 - c) epilation (loss of hair)
 - d) skin erythema
- 7) Which of the following is considered a late radiation response?
- a) sterility
 - b) lung cancer
 - c) skin erythema
 - d) hematological depression

8) The RBE of diagnostic x-rays has a value of:

- a) 0.1
- b) 0.5
- c) 1.0
- d) 5.0

9) The principal target molecules in the body are:

- a) water
- b) carbohydrates
- c) proteins
- d) DNA

10) Which of the following is not a macromolecule?

- a) lipid
- b) carbohydrate
- c) protein
- d) water

(20 marks)

B. Briefly explain how you will deal with a minor radiation spill in a laboratory setting

(5 marks)

Question 4

a) Discuss the steps that you would undertake to inspect a hospital X ray facility. **(10 marks)**

b) Discuss the use of film badges, thermoluminescence detectors and pocket dosimeters in monitoring and measuring radiation **(15marks)**

(Total=25marks)