



UNIVERSITY OF SWAZILAND

Faculty of Health Sciences

(BSC) IN ENVIRONMENTAL HEALTH

FINAL EXAMINATION PAPER 2006

TITLE OF PAPER : INTRODUCTION TO TOXICOLOGY

COURSE CODE : EHS 524

DURATION : THREE HOURS

MARKS : 100

INSTRUCTIONS : ANSWER ONLY FIVE QUESTIONS

: EACH QUESTION CARRIES 25MARKS

: NO QUESTION PAPER SHOULD BE BROUGHT INTO
NOR OUT OF THE EXAMINATION ROOM

: BEGIN EACH QUESTION ON A SEPARATE SHEET
OF PAPER

**DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED
BY THE INVIGILATOR**

Question 1

Section A; Multiple-choice questions (1 mark each Total = 10 marks)

A. Select which of the following letters is a correct answer for each of the following multiple-choice questions.

1. A particular dose of chemical A, is toxic to animals *in vivo*. Another chemical B, is not toxic even when given at doses several orders of magnitude higher than the dose of A. when A and B are given together at the same dose, the toxic response is greater than the dose of A alone. Is this an example of:
 - a) Antagonism
 - b) Synergism
 - c) Additivity
 - d) Potentiation
 - e) None of the above

2. Which information may be gained from acute toxicity studies
 - a) The No Effect Level
 - b) The LD₅₀
 - c) The therapeutic index
 - d) The target organ
 - e) All of the above

3. The absorption of which of the following is facilitated by the prevailing pH in the stomach:
 - a) Weak organic bases
 - b) Strong acids
 - c) Weak organic acids
 - d) Strong bases
 - e) None of the above

4. The term 'first-pass effect' means which of the following:
 - a) The drug is excreted unchanged
 - b) The drug is mostly metabolized by the gastrointestinal tract and/or liver before reaching the systemic circulation
 - c) The drug is completely absorbed from the gastrointestinal tract
 - d) The drug is excreted completely and very quickly by the kidneys
 - e) None of the above

5. Metabolism of a foreign chemical will lead to:
 - a) Accumulation of the chemical in the tissues

- b) Increased excretion in urine
- c) Decreased toxicity
- d) Altered chemical structure
- e) Increased toxicity

6. Phase 2 metabolism usually involves;

- a) Microsomal enzymes
- b) Decreasing the polarity of a chemical
- c) Increasing the toxicity of compounds
- d) The addition of an endogenous moiety
- e) Hydrolysis

7. Which of the following is the most important in determining the extent of toxicity of a chemical:

- a) Chemical structure
- b) Dose
- c) Metabolism of the compound
- d) Excretion of the compound
- e) Metabolic detoxification of the compound

8. The liver is target organ for toxic effects of chemicals because of;

- a) Its highly complex structure
- b) Its ability to metabolize chemicals
- c) Its blood supply
- d) Its excretory function
- e) Its low levels of glutathione

9. Chemicals which are active during the first week of pregnancy after fertilization of the egg are most likely to cause which effect in the embryo;

- a) Death
- b) Malformations
- c) Functional abnormalities
- d) Growth retardation
- e) Sterility

10. Which of the following is caused by both cadmium and vinyl chloride?

- a) Testicular damage
- b) Kidney damage
- c) Bone damage
- d) Ischaemia
- e) All of the above

B. Short answer question

1. Organophosphates are used in chemical warfare and for pesticides in gardens and agriculture.

- a. What is the basic structure of organophosphates and the differences in structure?
 - b. What is the difference between the action agent used in chemical warfare versus a common pesticide
- (15 marks)

Question 2.

Short answer questions

- a) Describe the difference between axonopathy, myelinopathy, and neuronopathy. Give examples of agents causing each type of neurotoxicity (9 marks)
- b) Why is the central nervous system, especially the brain, vulnerable to toxicants (4 marks)
- c) List the four (4) stages of toxicity and a brief description of each (8 marks)
- d) What is meant by **DISPOSITION** of a xenobiotic (4 marks).

Question 3

A. multiple-choice question (2 marks each)

1. Which of the following produces fatty infiltration in the liver and centrilobular increased try
 - a) Benzene
 - b) Phosphorus
 - c) Beryllium
 - d) Carbon tetrachloride
 - e) Allyl alcohol
2. Which characteristic is not associated with long term inflammatory lung disease called pneumoconiosis?
 - a) Fibrotic nodules in the lung
 - b) An inflammatory response that may worsen with time
 - c) Black lung disease associated with carbon particle desposition in miners
 - d) Can be caused by asbestos, silica, or beryllium
 - e) Has a severe acute onset.
3. which of the following produces proximal tubular damage in the kidney in acute poisonings?

- a) Kerosene
- b) Carbon tetrachloride
- c) Carbon disulphide
- d) Tetraethyl lead
- e) Carbon monoxide

4. A blood supply of the hepatic acinus is drained by the;

- a) Central vein
- b) Hepatic arterioles
- c) Bile ductules
- d) Lymphatic ducts

5. Examples of human teratogens include;

- a) Rubella infections.
- b) Thalidomide
- c) Antineoplastic or anti-cancer drugs
- d) Ethyl alcohol
- e) Antiepileptic drugs such as valproic acid
- f) All of the above
- g) Only a, b, c, and d

B. Case Study

Analyze the case below and explain the following;

- a) What organ toxicity is being expressed?
- b) What is the toxicant and its mechanism of toxicity (in detail) is responsible for the effect; and
- c) What normal detoxification system is being overwhelmed?

Case: A factory worker in a watch battery factory went to his physician for a routine physical examination. The doctor called to say he found a high Blood urea nitrogen (BUN) level and significant levels of albumin in his urine. The man is 45 years old and this is the first time there has been such a finding. He has worked at the factory for five years. He has been noticing lately that he has no void often and seems to be gaining weight or retaining water

(15 marks)

Question 4.

1. Briefly discuss the relative merits and disadvantages of four clinical assessment methods for renal function or nephritic effects **(15 marks)**
2. Why is the kidney particularly susceptible to toxic damage **(5 marks)**
3. What are the three basic assumptions of the dose-response curve or measurement? **(5 marks)**

Question 5.

A. Case Study:

A man and woman working in a plastic industry are responsible for plastic coating of paper charts to be distributed as instruction sheets for Xerox machines. After working in the coating room for about six months, where they allow the plastic to coat the paper a six carbon hydrocarbon solvent evaporates under hoods and they begin to find difficulty in separating out individual sheets. They also develop a stiffness in the bottom of their legs. They think it is from standing so much and having to move so many peaces of paper

- a) What could be another explanation for their clumsiness or stiffness
- b) What would be the biological and chemical process that might be going on?

(10 marks)

B. Define the following terms that are used in toxicology:

- a) Safety of the chemical
- b) Electrophile
- c) Idiosyncrasy
- d) Apoptosis
- e) Cytochrome P450

(15 marks)