



UNIVERSITY OF SWAZILAND
Faculty of Health Science

Department of Environmental Health
Sciences

Final Examination 2007

- TITLE OF PAPER : INTRODUCTION TO ENVIRONMENTAL TOXICOLOGY
- COURSE CODE : EHS 524
- DURATION : 3 HOURS
- MARKS : 100
- INSTRUCTIONS :
- READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
 - ANSWER ^{FOLLOW} ~~FIVE~~ QUESTIONS: QUESTION 1 IS COMPULSORY
 - EACH QUESTION CARRIES ²⁵ ~~20~~ MARKS
 - NO PAPER SHOULD BE BROUGHT INTO NOR OUT OF THE EXAMINATION ROOM
 - BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER

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

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Question 1

(A) Multiple choice question **one mark each** - Choose the BEST answer that fits the question

1. A particular dose of a 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 that of the dose of A. 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 an acute toxicity study?
 - a. The No Effect Level
 - b. The LD₅₀
 - c. The therapeutic index
 - d. The target organ
 - e. All of the above

3. What is 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

4. The liver is a target organ for the toxic effects of chemicals because of :
 - a. its highly complex structure
 - b. its ability to metabolise chemicals
 - c. its blood supply
 - d. its excretory functions
 - e. its low level of Glutathione

5. The most common toxic response the liver shows after exposure to chemicals is:
 - a. cancer
 - b. cholestasis
 - c. blebbing
 - d. necrosis of the sinusoidal cells
 - e. steatosis

6. Chemicals that 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
7. Thalidomide is a drug that:
- a. causes malformations only in rats
 - b. causes morning sickness in women
 - c. causes phocomelia in babies when taken by pregnant women
 - d. is only toxic when the R isomer is taken
8. Skin sensitisation is an important occupational disease and can be caused by:
- a. vinyl chloride
 - b. cadmium
 - c. nickel
 - d. asbestos
9. Which of the following industrial chemical are known human carcinogens
- a. cadmium
 - b. vinyl chloride
 - c. 2-naphthalene
 - d. asbestos
 - e. All of the above
10. The toxicity of asbestos is affected by which of the following?
- a. fibre size
 - b. form of asbestos
 - c. route of exposure
 - d. dose
 - e. all of the above
11. Which of the following is caused by both cadmium and vinyl chloride?
- a. testicular damage
 - b. kidney damage
 - c. bone damage
 - d. ischaemia
 - e. None of the above
12. Carbon monoxide is poisonous because:
- a. it binds to cytochrome in the mitochondria
 - b. it binds to haemoglobin
 - c. it cause respiratory alkalosis
 - d. it forms methamoglobin
 - e. all of the above
13. The therapeutic index is usually defined as?

- a. TD_{50}/LD_{50}
 - b. ED_{50}/LD_{50}
 - c. LD_{50}/ED_{50}
 - d. ED_{50}/TD_{50}
 - e. LD_1/ED_{99}
14. 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
15. The blood supply of the hepatic acinus is drained by the:
- a. Central vein
 - b. Hepatic arterioles
 - c. bile ductules
 - d. Lymphatic ducts

(1 mark each Total = 15 marks)

Short answer questions:

(10) ~~Question~~

- a. What is meant by the first-pass metabolism (4 marks)
- b. Write short notes on the Blood Brain Barrier (6 marks)

(10 marks)

(Total = 25 marks)

Question 2 (1)

Write the word from the list below that best completes the statement. (There are more words than statements and some words are used twice). Each question is one (1) mark

Margin of safety	LD_{50}	Birth defects
LC_{50}	Potentiation	tetraethyl lead
Apoptosis	necrosis	pinocytosis
Mitosis	vinyl chloride	hypersensitivity

1. The dose at which half of the test subjects are killed is denoted _____.
2. Phase I reactions convert more potentially toxic substances to _____.
3. _____ occurs when an inactive substance enhances the action of an active one.
4. Very high susceptibility to a poison is called _____.

5. Teratogens causes _____.
6. The most notable toxic organometallic compound is _____.
7. An organochlorines compound known to be a human carcinogen _____.
8. _____ is programmed cell death.
9. _____ is characterised by dramatic changes in the cell and nuclear membrane leading to spilling of cell contents containing hydrolytic enzymes such as DNAases, proteases, etc.
10. _____ Is the difference between the effective and lethal dose of toxic substances employed for useful purposes, such as pharmaceutical uses.

(10 marks)

~~20~~

1. What is a dose-response curve? (5 Marks)
2. Define the term threshold and explain its significance in establishing toxicity. (3 marks)
3. What is the difference between a toxic substance that has a threshold and one that does not? (4 Marks)
4. What are the basic assumptions of the dose response curve ? (3 Marks)

(Total = 25 marks)

15 marks

Question 3

Case Study:

Case 1. A friend returned from the gymnasium in the afternoon only to find a friend in the condo passed out in a chair near the oil burning stove and very difficult to rouse she calls the management and they say to take the person outside and let her breathe fresh air. She insist on calling the hospital for an emergency ambulance and asking for an oxygen for her friend as soon as possible. The management doesn't want to alarm anyone and says it is unnecessary.

- a. What type of gas was involved?
- b. Who was right and why? Explain your answer with diagrams

(10 marks)

Case 2. A factory worker comes into the factory first aid room complaining of feeling light headed and having trouble with quick motions of hands and feet. Upon a quick examination by the doctor it is evident that the worker does have slow reflexes in the lower limbs and trouble concentrating. If you were an industrial worker

- a. What toxicants within the factory would you search for as possibilities of exposure for this worker?
- b. What body system is probably affected in this worker?
- c. What would be the mechanism of toxicity causing this symptoms

d. What confounding factors would you check in the worker's lifestyle that might be factored into the expression of his symptoms?

(15 marks)

Question ~~6~~ **4**

25 marks

- a. What unique characteristics of the central nervous system that makes it vulnerable to xenobiotics? (5 marks)
- b. Describe the differences between axonopathy, myelinopathy, and neuropathy. Give one examples of agents causing each type of neurotoxicity (10marks)
- c. What is the mechanism of action of organophosphates that makes them toxic) (2 marks)
- d. What is meant by disposition of a xenobiotic (3marks)
- e. Explain in detail the difference between necrosis and apoptosis (5marks)

Question **5**

~~25 marks~~

Discuss the reasons why children are particularly vulnerable to chemicals?

(25 marks)