



**UNIVERSITY OF SWAZILAND**  
Faculty of Health Sciences  
Department of Environmental Health Science

**RESIT EXAMINATION PAPER JULY 2018**

- TITLE OF PAPER : RODENTS AND VERMIN CONTROL
- COURSE CODE : EHS 307
- DURATION : 2 HOURS
- MARKS : 100
- INSTRUCTIONS :
- : READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
  - : ANSWER QUESTION 1 AND ANY THREE OTHER QUESTIONS
  - : EACH QUESTION CARRIES 25 MARKS.
  - : WRITE NEATLY & CLEARLY
  - : NO PAPER SHOULD BE BROUGHT INTO OR OUT OF THE EXAMINATION ROOM.
  - : BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.

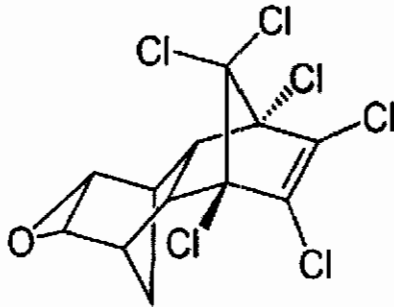
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DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.

**QUESTION 1**

- a. **MULTIPLE CHOICE:** Write down the letter corresponding to your chosen answer among the options provided for each item in this question.
- i. Hypodermatosis caused by cattle grubs
    - A. is primarily a disease of the tropics
    - B. maybe acquired through oviposition on human hair followed by skin penetration from hatched larvae
    - C. only results in skin penetration and does not penetrate the eye or spinal cord
    - D. only result in small ulceration at the point of larval penetration but does not cause ulceration
    - E. affects only the arms and legs of infested humans
  
  - ii. The effects of snake venom on humans is influenced by all of the following except:
    - A. the species of the snake
    - B. the size of the snake
    - C. the type of venom involved
    - D. how much venom has been released
    - E. the age of the victim
  
  - iii. Which one of the following IS NOT an indirect effect of pesticides in the environment or in humans?
    - A. Reduction of plant diversity
    - B. Reduced bird or fish species
    - C. Reduction of food needed by insects
    - D. Reproductive abnormalities such as an increased rate of miscarriage in people with chronic exposure to pesticides
    - E. Reduced reproduction of insects
  
  - iv. Which one of the following factors DOES NOT influence pesticide pollution in water, soil and air?
    - A. Drainage of the area where pesticide is applied
    - B. The type of pesticide involved
    - C. Presence of other pests in the soil, water or air
    - D. Soil temperature
    - E. The rate of application of the pesticide
  
  - v. Which of the following statements about arthropod envenomation IS TRUE?
    - A. Nearly three times as many males as females are involved
    - B. Spiders and scorpions are responsible for most envenomation
    - C. Honey bees only sting once and leave the stingers and venom sac embedded in the skin
    - D. Some millipedes secrete a toxin on their skin, other large species can squirt secretions from up to 80 cm
    - E. All the above statements are true

- vi. The the ability of a chemical substance to produce injury once it reaches a susceptible site in or on the body is known as
- its toxicity
  - its danger
  - its hazardousness
  - its risk
  - none of the above
- vii. Which of the rodents below commonly occur in sewer systems and may swim against these to earn access into human dwellings?
- House mouse and Roof rat
  - House Mouse and Norway rat
  - Only the Norway rat
  - Roof rat and Norway rat
  - Only the Roof rat
- viii. During analysis to determine occurrence of insecticide resistance, several procedures are followed. Which one of the following findings suggest occurrence of resistance?
- The chemical dilution rate was not performed correctly
  - The sprayer did not apply the chemical at the correct rate
  - The chemical used had expired
  - Large numbers of insects survived when the WHO cylinder test was conducted
  - The spray equipment was faulty
- ix. A chemical compound used as an insecticide has the following structure.



The chemical is likely to be a(n):

- pyrethrin
  - organophosphate
  - chlorinated hydrocarbon
  - carbamate
  - petroleum larvicidal oil
- x. Which one of the statements about DDT IS NOT true?
- DDT has a long residual effect
  - DDT is banned for public health and agricultural use

- C. The damaging effects of DDT use during indoor residual spray have not been proved
  - D. Some insects of public health importance including mosquitoes have been reported to show resistance to DDT
  - E. DDT can be taken into the body by ingestion with food, through the skin on contact and through inhalation
- b. Write **T** (for true) or **F** (for false) to indicate your response to each of the items in this question.
- i. *Dermatobia hominis* larvae burrow more deeply resulting in subcutaneous nodules that persist for months before breaking down to form troublesome painful abscesses or lesions
  - ii. The venom associated with arthropods is relatively rapid
  - iii. *Rattus rattus* can survive well outside and is generally restricted to outdoor situations or to upper floors and roof spaces
  - iv. Infants and children may develop toxic outcomes from smaller quantities of insecticides compared to adults
  - v. Allowable pesticide levels for water are calculated on the basis of child and infant exposure

[25 marks]

**QUESTION 2**

- a. Explain the difference between primary and secondary myiasis. (2)
- b. Explain the processes involved when individuals acquire infection with dermal or nasopharyngeal myiasis. (3)
- c. Chemicals possessed by arthropod venoms may be divided into three major groups based on function. List and explain the three groups. (6)
- d. A 14 year old boy living in your community of jurisdiction is brought to you with severe bee stings all over the head. Describe the measures you'd give to the boy to prevent development of complications. (4)
- e. A householder brings a complaint of infestation with large numbers of scorpions in his yard.
  - i. Does the large number of scorpions pose any danger to the householders? Explain. (4)
  - ii. Suppose you decide to give a health talk to all the householders and your talk includes emergency measures to give to a victim of scorpion envenomation. List FOUR (4) points your talk on emergency measures is likely to contain. (4)
  - iii. List TWO pieces of advice you are likely to give to the householder in (ii) to reduce infestation with spiders. (2)

[25 marks]

**QUESTION 3**

Rodent entry into ships must be prevented by all means because of diseases that may be transmitted by vectors using the rodents as hosts, particularly plague which has a high fatality rate or because the rodents may cause problems in the ship.

- a. With regard to plague, name the host rodent, vector and pathogen of the disease. (3)
- b. Explain briefly how the following diseases are transmitted from rats or their parasites to humans:
  - i. Murine typhus fever (2)
  - ii. Leptospirosis (2)
  - iii. Salmonellosis (2)
  - iv. Rat bite fever (2)
- c. List FIVE (5) methods that may be used to prevent rodent entry into a docked ship. (5)
- d. Other than disease transmission, what problems could be caused by rodents in a ship during long travel? (3)
- e. Suppose brodifacoum is used to control rodents in the ship and left overs are dumped into the ocean.
  - i. What is the effect of brodifacoum on marine species in the ocean? (2)
  - ii. Is brodifacoum safe for use inside households? (2)
  - iii. Brodifacoum is referred to as a "second-generation anticoagulant". What does that mean? (2)

[25 marks]

#### QUESTION 4

Rodenticides are products intended to kill rodents and are typically sold containing a bait or tracking powder.

- a. List FIVE (5) signs you may use to confirm presence of rodent infestation in a house. (5)
- b. What is the purpose of the bait in the rodenticide? (2)
- c. Why are tracking powders included in the rodenticide? (3)
- d. What limitations are commonly encountered when baits are used with rodenticides? (4)
- e. Chlorophacinone (Rozol®) is a rodenticide that has been used in both indoor and outdoor settings.
  - i. Explain briefly how chlorophacinone works. (2)
  - ii. Chlorophacinone is a single feed rodenticide. What is the advantage of the rodenticide being a single feed? (2)
  - iii. A rodent poisoned with chlorophacinone dies after about 5 days following ingestion of the rodenticide. What is the advantage of the delayed death of the poisoned rodent? (2)
  - iv. Chlorophacinone should not be applied when rain is forecasted. Explain why? (2)
- f. Sometimes accidental poisoning of humans, particularly children, occurs during use of rodenticides. What remedy would you suggest for a child accidentally poisoned through ingestion of an anticoagulant rodenticide? (3)

[25 marks]

#### QUESTION 5

- a. Many rodenticides are anticoagulant toxicants. List FOUR (4) advantage of anticoagulant insecticides? (4)
- b. Cholecalciferol is a non-anticoagulant rodenticide.

- i. Explain the method of functioning of cholecalciferol. (3)
- ii. Does cholecalciferol remain in bait for long? Explain. (3)
- c. Dichlorvos is an active ingredient sometimes combined with pyrethrins in commercial insecticide cans for the destruction of houseflies and other household pests.
  - i. Why is dichlorvos included in insecticide formulations containing pyrethrins? (2)
  - ii. What is the method of functioning of dichlorvos? (2)
  - iii. Dichlorvos is metabolised in the liver in two pathways. Describe the two pathways. (2)
  - iv. Are there any long-term effects of exposure of humans to dichlorvos? Explain. (2)
- d. Lindane (HCH) has been used extensively where there is resistance to DDT.
  - i. List THREE disadvantages of lindane that have limited its use ahead of DDT during indoor residual spray activities to control mosquitoes. (3)
  - ii. What is the method of function for lindane? (2)
  - iii. Is lindane currently available for insecticide use? Explain. (2)

[25 marks]

### QUESTION 6

- a. Piperonylbutoxide is one of the compounds used as a synergist in vector control insecticide formulations and in the new mosquito nets.
  - i. What is a synergist? (2)
  - ii. What purpose does the addition of piperonyl butoxide serve in the new insecticide treated mosquito nets? (3)
- b. Monitoring levels of susceptibility of insects to insecticides is essential in order to enable timely and rational decision making to substitute a product and/or class of insecticide.
  - i. What are the three main objectives of monitoring of insecticide susceptibility in a vector control programme? (6)
  - ii. Discuss briefly principle of the WHO Test Kit for monitoring resistance of adult mosquitoes to a given insecticide. (A diagram may be used to enhance clarity) (4)
  - iii. Discuss briefly the principle of the CDC Bottle Test Kit for monitoring resistance of adult mosquitoes to a given insecticide. (4)
- c. An entomologist wants to detect insecticide resistance against a mosquito population early and uses the WHO Test Kit to determine the resistance factor. He finds that the  $LC_{50}$  of the susceptible mosquito population is 0.032 and that of the resistant mosquito population is 1.056. By calculating the resistant factor of the insecticide, determine if resistance has occurred in the resistant population. (6)

[25 marks]