



UNIVERSITY OF SWAZILAND

Faculty of Health Sciences
Department of Environmental Health Science

DEGREE IN ENVIRONMENTAL HEALTH SCIENCE

MAIN EXAMINATION PAPER 2016

TITLE OF PAPER : RODENTS AND VECTOR CONTROL

COURSE CODE : EHM 200

DURATION : 2 HOURS

MARKS : 100

INSTRUCTIONS :

READ THE QUESTIONS & INSTRUCTIONS CAREFULLY

: **QUESTION ONE IS COMPULSORY, THEN ANSWER ANY OTHER THREE QUESTIONS**

: EACH QUESTION **CARRIES 25** MARKS.

: WRITE NEATLY & CLEARLY

: NO PAPER SHOULD BE BROUGHT INTO 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.

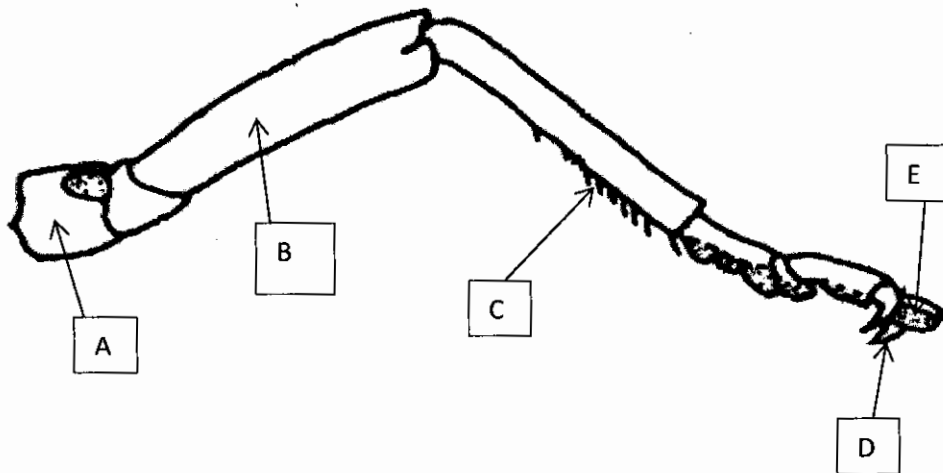
QUESTION 1 :COMPULSORY [You should answer this question]

- a. **MULTIPLE CHOICE:** Indicate your response to the items in this question by writing down the letter corresponding to your chosen answer. (20)
- i. The small openings occurring on the abdomens of most insects to facilitate breathing or gaseous exchange are called:
 - A. cerci
 - B. spiracles
 - C. ocelli
 - D. tarsi
 - E. gastric caeca

 - ii. The digestion of food in the gut of an insect occurs in a section called the:
 - A. stomodaeum
 - B. crop
 - C. mesenteron
 - D. gastric caecum
 - E. ileum

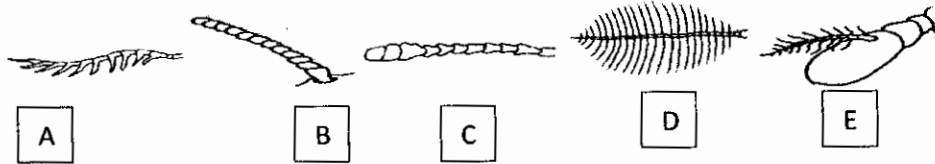
 - iii. Which one of the following is NOT a function of the malpighian tubules of insects?
 - A. removal of uric acid
 - B. removal of water
 - C. adjustment of the ionic concentration of the 'blood' of the insect
 - D. removal of carbon dioxide and other waste gases
 - E. All of the above

 - iv. Shown below is part of the leg of an insect. Which one of the parts marked A to E is responsible for holding onto smooth surfaces such as window panes to prevent the insect from falling off?



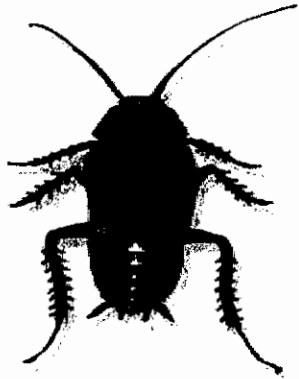
- v. Insects have different types of mouthparts adapted for their method of feeding. Which one of the types of mouthparts below are those of a housefly?
- A. piercing-sucking type
 - B. rasping-sucking type
 - C. sponging type
 - D. siphoning type
 - E. chewing-lapping type

- vi. The antennae of insects differ in terms of the shape of the arista. Which one of the shapes below is that of a mosquito?



- vii. Eggs of insects may bear viable off-springs even if not fertilised such as in bees and wasps. This process of reproduction is known as:
- A. ovoviparity
 - B. parthenogenesis
 - C. larviparity
 - D. viviparity
 - E. ovoviviparity

- viii. The cockroach shown below was identified in a house.

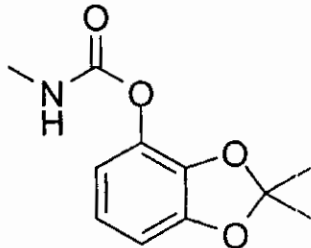


Which one of the following statements is true about the cockroach?

- A. The cockroach is a male oriental cockroach
- B. The cockroach is a female oriental cockroach
- C. The cockroach is a male American cockroach
- D. The cockroach is a female American cockroach
- E. The cockroach is a German cockroach

- ix. Arthropods have different important effects on human and animal hosts. Which one of the arthropods below causes allergic reactions?
- Anopheles arabiensis*
 - Glossinamorsitans*
 - Sarcoptes scabiei*
 - Tungapenetrans*
 - Muscadomestica*

- x. A pesticide has the following structure:



The compound is likely to be classified under:

- Pyrethroids
 - Organophosphates
 - Chlorinated hydrocarbons
 - Carbamates
 - None of the above
- b. **TRUE OR FALSE:** Write **T** (for True) or **F** (for False) against each of the statements below to indicate your response. (5)
- The palps of *Anopheles* mosquitoes are as long as the proboscis in both males and females
 - The larvae of tsetsefly hatch from eggs under 2cm of muddy soil where they are deposited
 - Fasciola hepatica* and *F. gigantica* are transmitted by snails belonging to the genera *Lymnaea* and *Stoignicola*
 - Soil microbial activity and pesticide breakdown is partly linked to the temperature of the soil or ground
 - The recommended bait material for mice are meat scraps or fish

[25 marks]

QUESTION 2

- a. The female reproductive system of a tsetsefly consists of a spermatheca.
- What purpose is served by the spermatheca? (2)
 - List FOUR habitats preferred by tsetsefly for its reproduction. (4)
 - Discuss, briefly, the process of reproduction of the tsetsefly until an adult emerges. (5)
 - Describe ONE method used to reduce populations of tsetsefly in a heavily infested area. (2)

- b. Even though cockroaches are seldom involved in disease transmission, their control remains an important public health consideration.
- Other than for reasons of mechanical transmission of disease agents, give two reasons why it is important to control cockroach populations in households? (2)
 - In Swaziland, the most common species of cockroaches are *Blattagermanica* and *Periplaneta Americana*. Describe TWO characteristics you would use to differentiate between these two species of cockroaches. (4)
 - Discuss THREE methods you may use to reduce cockroach populations in a kitchen and prevent future infestations. (6)

[25 marks]

QUESTION 3

- a. Mosquitoes are most important insects because of their potential to transmit several pathogenic agents of disease to man.
- Other than malaria and Zika virus, name two diseases transmitted to man through the bite of infected mosquitoes. (2)
 - Name the Genus of mosquito frequently involved in the transmission of Zika virus. (1)
 - Describe THREE characteristics used to distinguish mosquitoes from other biting flies. (3)
 - List two characteristics you may use to identify adult Anopheline from Culicine mosquitoes. (4)
- b. When conducting larviciding, it is advisable to confirm the presence of *Anopheles* larvae in potential breeding places before any method is implemented.
- Describe the type of habitats you would search for *Anopheles* larvae? (3)
 - Describe THREE characteristics you would use to distinguish Anopheline larvae from Culicine larvae. (6)
 - Name one chemical you would recommend for effective larviciding of *Anopheles* breeding habitats. (1)
 - Describe TWO methods recommended by the National Malaria Control Programme in Swaziland to prevent bites of Anopheles mosquitoes inside sleeping areas. (3)
 - Describe ONE biological method you could use to control population of Anopheles larvae. (2)

[25 marks]

QUESTION 4

- a. Snails are vectors of several diseases of man. Write down the genus of snail involved in the transmission of each of the following diseases of man: (3)
- schistosomiasis mansoni
 - schistosomiasis haematobium
 - fascioliasis
- b. Name TWO orders under which snails may be classified. (2)
- c. Give FOUR reasons why the presence of plants is important in snails breeding habitats.

- (4)
- d. Discuss the FOUR stages of the life cycle of snails including the length of time between the stages. (6)
- e. Discuss how you would set up a snail control programme using a named molluscicide in a flowing river to be effective over a period of time. (6)
- f. In Swaziland, experiments on the use of indod to control snail populations have been conducted.
- i. Explain how the molluscicidal effects of indod was discovered. (2)
- ii. Explain what was done in the experiments conducted in Swaziland using indod. (2)

[25 marks]

QUESTION 5

- a. Give THREE reasons why rodent entry into households must be prevented. (3)
- b. List FIVE measures you may use to determine or confirm that a household has rodent infestation. (5)
- c. Discuss rodent control under the following topics:
- i. Elimination of food and water (6)
- ii. Prevention of entry into households (6)
- d. A householder wants to use a rodenticide to control rodents inside her kitchen. She purchases a rodenticide marked: *Rattex: active ingredient: Brodifacoum/anticoagulant 0.05g/kg.*
- i. Explain how this rodenticide kills rodents. (2)
- ii. The rodenticide is also marked, "After a single feed, death of a rodent takes 4 – 12 days". What advantage does this length of time have on the control of the rodents? (3)

[25 marks]

QUESTION 6

- a. Give the Food and Agricultural Organisation (FAO) definition of a pesticide. (2)
- b. A farmer sprays his crops with a pesticide to control aphids and in the process accidentally poisons himself.
- i. What are the different ways the farmer could have poisoned himself? (3)
- ii. Discuss the possible fate of the insecticide following spraying on the crops. (7)
- c. A spray-man employed by the National Malaria Control Programme sprays the wall of a house with Dichloro-diphenyl-trichloroethane (DDT) during indoor residual spraying to control mosquito populations.
- i. What type of surface should the DDT be used on in order for it to be effective? (2)
- ii. Explain how this type of surface is suitable for insecticidal action of the DDT on the insect. (3)
- iii. Explain what is likely to happen if the spray-man moves the nozzles of the spray too fast up and down the wall during spraying. (3)

- iv. Explain what disadvantage is associated with moving the nozzle too slow over the surface during spraying. (2)
- v. Why is DDT use banned for agricultural purposes? (3)

[25 marks]