

UNIVERSITY OF SWAZILAND
FACULTY OF HEALTH SCIENCES

MAIN EXAMINATION PAPER – DECEMBER, 2012

TITLE OF PAPER : RODENTS AND VECTOR CONTROL

COURSE CODE : EHM 200

TIME : 2 HOURS

MARKS : 100

INSTRUCTIONS : ANSWER QUESTION 1 AND ANY FOUR QUESTIONS

: EACH QUESTION IS 20 MARKS

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

: BEGIN THE ANSWER TO EACH QUESTION ON A SEPARATE SHEET OF PAPER

: CALCULATORS MAY BE USED BUT THEY MUST BE THE SILENT TYPE

: ALL CALCULATIONS/WORK-OUT DETAILS SHOULD BE SUBMITTED WITH YOUR ANSWER SHEET

QUESTION 1 MULTIPLE CHOICE [ALL STUDENTS MUST ANSWER THIS QUESTION]

Indicate your response to the items in this question by writing down the letter corresponding to your chosen answer among those provided for each sub-question.

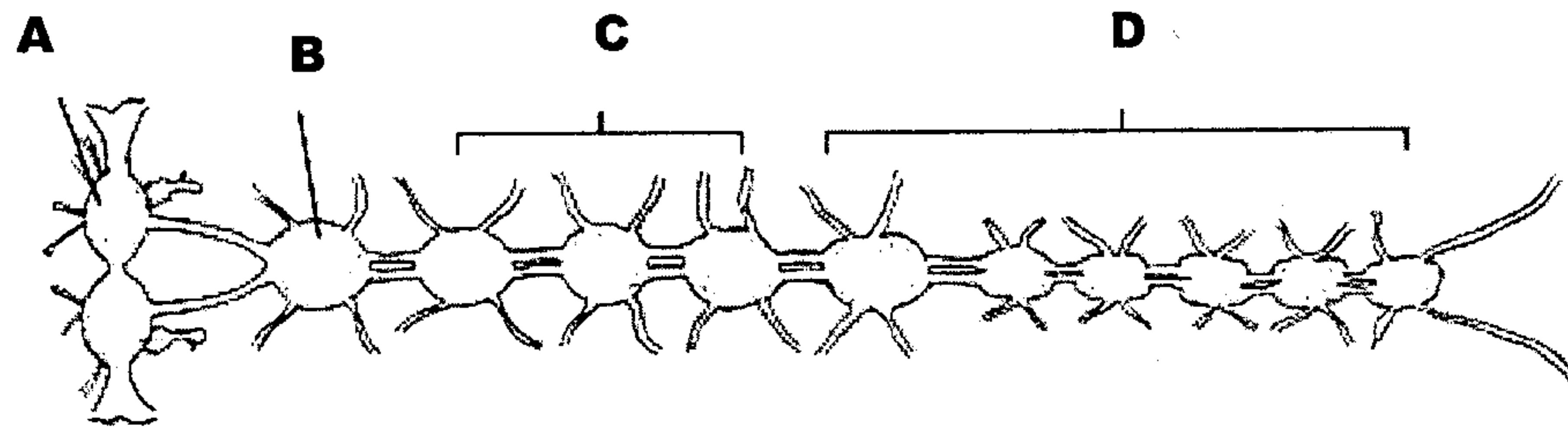
- i. A young entomologist collects arthropods. He collects an arthropod that has the following characteristics:

Has 2 wings that develop from within the body, small spherical head, clear division into head, thorax and abdomen, scales on the legs and wings, slender body and a forward projecting proboscis

The arthropod is likely to belong to the Family:

- A. Cimicidae
 - B. Tabanidae
 - C. Culicidae
 - D. Glossinidae
 - E. Muscidae
- ii. The wings of insects are attached on the
- A. metathorax and abdomen
 - B. prothorax and metathorax
 - C. mesothorax and prothorax
 - D. mesothorax and metathorax
 - E. mesothorax and pleurum
- iii. An independent eye unit of an insect is called a(n)
- A. ommatidium
 - B. compound eye
 - C. ocellus
 - D. pedicel
 - E. spiracle
- iv. What is the part of the leg of an insect that has considerable suction force, and enables the insect to cling to objects with little or no aid from the claws?
- A. pulvilli
 - B. arolium
 - C. empodium
 - D. tarsomere
 - E. trochanter

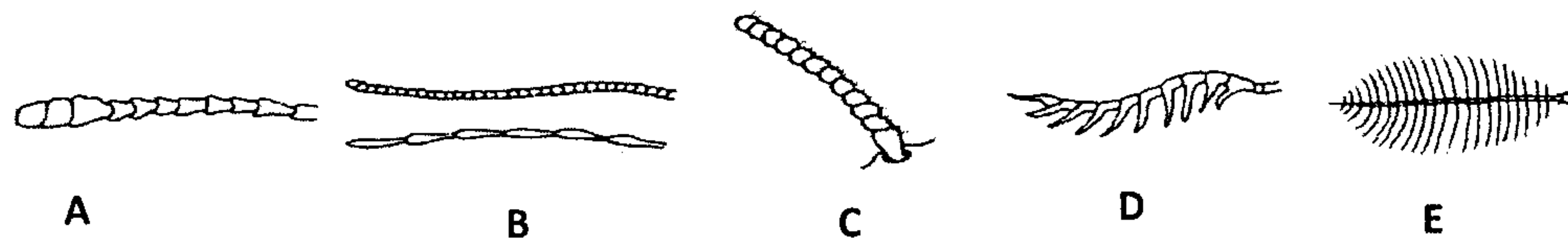
- v. Shown below is a diagram of the nervous system of a cockroach. The part marked **C** is called the



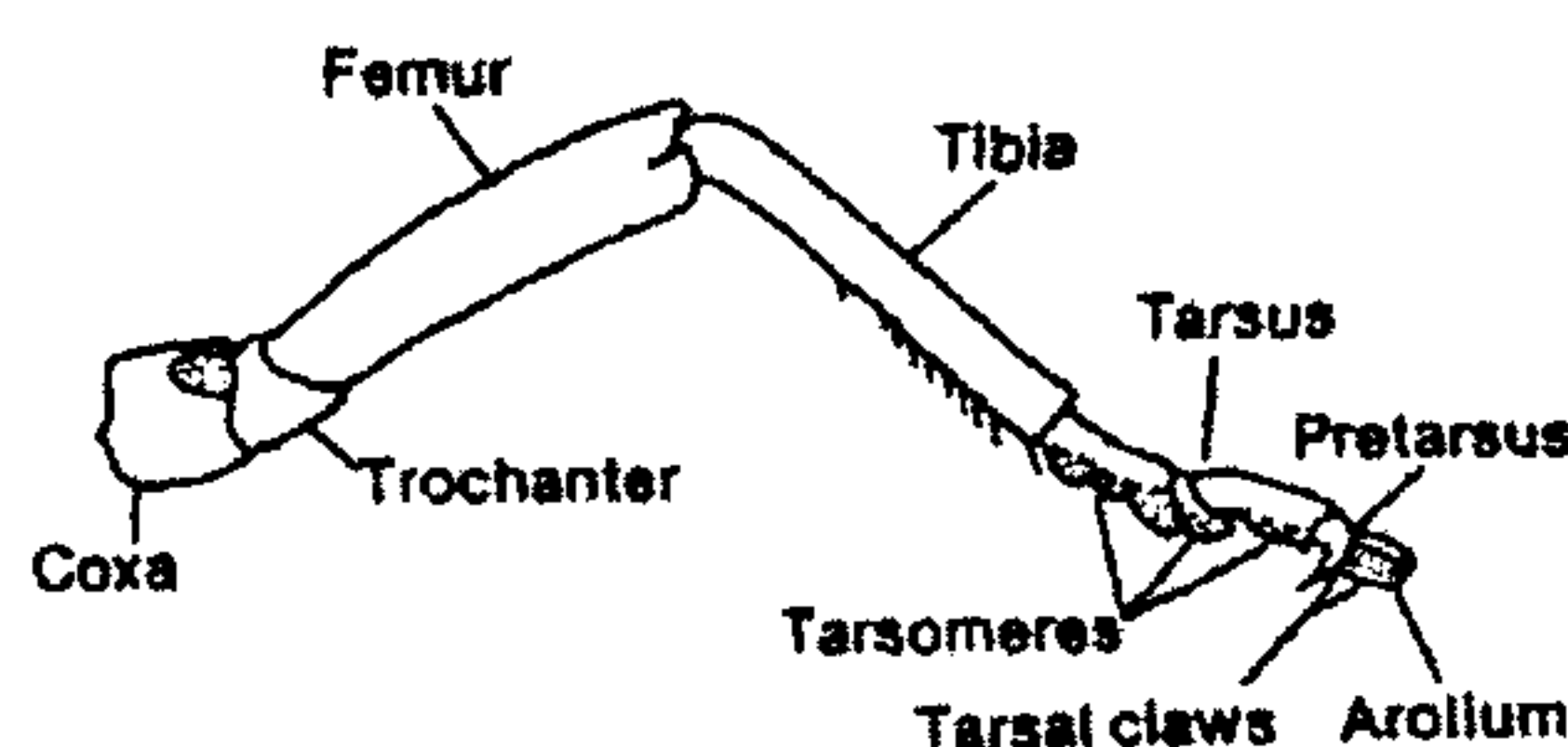
- A. abdominal ganglion
 B. suboesophageal ganglion
 C. thoracic ganglion
 D. brain
 E. cerebral ganglion
- vi. The type of reproduction in which eggs with well-developed shells hatch within the body of the female and active young are then produced is called
- A. parthogenesis
 B. oviparous
 C. viviparous
 D. conjugation
 E. ovoviviparous
- vii. A rodent control specialist is collecting evidence to aid him in deciding the species of rodents infesting a homestead. He collects the following information about one of the rodents infesting the homestead:
- droppings laid in groups but some found scattered and all are spindle-shaped
 - gnawings at entrances to stores, packaging wires and pipes
 - burrows outdoors and around sewer points
 - greasy stains along walls where they run

The rodent is likely to be:

- A. either *Rattus norvegicus* or *Rattus rattus*
 B. *Rattus norvegicus*
 C. *Rattus rattus*
 D. *Mus musculus*
 E. Either *Rattus norvegicus* or *Mus musculus*
- viii. Which of the structures of antennae of insects shown below is said to be filiform?



- ix. Shown below is the generalised diagram of the leg of an insect.



The part(s) that enable the insect to cling onto objects by creation of a suction force is (are) the

- A. tarsal claws
 - B. tarsomeres
 - C. tarsus
 - D. arolium
 - E. femur
- x. A field entomologist collects mosquitoes near Big Bend in Swaziland and uses a microscope to study the mouthparts for the purpose of characterising them. He finds that in one of the mosquitoes “the palps are as long as the proboscis but the palps are not clubbed”. The mosquito is likely to be:
- A. either *Aedes* or *Culex*
 - B. a female *Culex*
 - C. a female *Aedes*
 - D. a female *Anopheles*
 - E. a male *Anopheles*

[20 marks]

QUESTION 2

- a. Examine each of the statements below and write **T** (for True) and **F** (for false) as you deem applies to the information stated: (6)
- i. More than 75% of the animal species of the Animal Kingdom comprise of members of the Phylum Arthropoda.
 - ii. Tsetse flies rest with their wings crossed behind the abdomen and they have long proboscis that extend forward further than that houseflies.
 - iii. The reproduction of *Glossina* (tsetseflies) is oviparous
 - iv. In a three-host tick all instars engorge on the same host i.e. larvae, nymph and adult but each time falling onto the ground to moult
 - v. Chlorophacinone and diphacinone are significantly more toxic than the anticoagulants developed earlier and during rodent control they kill rodents following a single feed (acute poisoning).
 - vi. Intensive and constant use of insecticides almost always certainly result to development of resistance
- b. Describe the habitats preferred by the following vectors of human disease for egg laying:
- i. Fleas (2)
 - ii. *Anopheles* mosquitoes (2)

- c. A man spends a night at a motel and wakes up with bites that he thinks could be due to bedbugs. He reports to your office of Environmental Health responsible for the area where the motel is situated. Outline the steps you would take to assist the man and the motel, making sure you defuse the conflict between the two to bring about an amicable solution. (6)
- d. Fleas are often transmitted from domestic pets to humans. Describe two methods you may use to prevent flea infestation on a domestic pet such as a dog that you may be keeping in your homestead. (4)

[20 marks]

QUESTION 3

- a. Write down one disease of humans that may be transmitted by the following vectors:
 - i. Mosquito (1)
 - ii. Tsetsefly (1)
 - iii. Housefly (1)
 - iv. Body louse (1)
 - v. Triatomine bugs (1)
 - vi. Fleas (1)
- b. Describe two ways by which a housefly may transmit disease to humans. (4)
- c. Describe two activities a rural homestead may engage to reduce fly infestation in the house. (4)
- d. Describe one way a reduviid bug such as *Panstrongylus megistus* transmits disease to humans. (2)
- e. Besides disease transmission, fleas may cause other deleterious effects to man which warrants their control. Using examples, list two effects fleas may have on man other than disease transmission. (4)

[20 marks]

QUESTION 4

- a. A student is collecting *Anopheles* larvae for further development into adult mosquitoes before they can be characterised.
 - i. What characteristic can the student use at the point of collection to make sure that he or she collects only Anopheline, and not Culicine larvae. (2)
 - ii. The student further wants to confirm that the larvae collected are indeed Anopheline. Describe one characteristic the student is likely to use in the laboratory to make the confirmation. (2)
 - iii. If the student allows the larvae to develop into adults, describe two characteristics that he or she is likely to use to confirm that they are *Anopheles*. (4)
- b. Mosquito control often involves indoor residual spraying.
 - i. Explain how indoor residual spraying results in reduction of mosquito populations. (3)
 - ii. Name one species of *Anopheles* mosquito that has survived indoor residual spraying and explain how the mosquito species has survived. (3)

- c. *OlysetPlus* is a Japanese company that manufactures Long Lasting Insecticidal Nets (LLINs). Recently, *OlysetPlus* reported that it had launched a new net consisting of 2% permethrin combined with 2% piperonyl butoxide.
- i. To what group of insecticides does permethrin belong? (1)
 - ii. Other than through insecticidal action, explain one way the *OlysetPlus* net protects a child that is lying on a bed under the net. (2)
 - iii. What is the advantage of adding 2% piperonyl butoxide in the newly developed *Olysetplus* nets? (3)

[20 marks]

QUESTION 5

A homestead complains of infestation with cockroaches.

- a. Name the order and Family to which cockroaches belong. (2)
- b. List three possible ways the homestead could have acquired the infestation. (3)
- c. Other than disease transmission, discuss four effects of cockroaches in homesteads which warrant a control of their population. (4)
- d. Young cockroaches often look like bedbugs. Explain two ways you may distinguish a young cockroach from a bedbug. (2)
- e. Design a strategic approach that you may utilise to assist the homestead remove the infestation and to prevent future infestation with cockroaches. (8)

[20 marks]

QUESTION 6

- a. Define resistance as it applies to insecticides. (2)
- b. Mention FOUR factors that are considered when choosing an insecticide to replace one to which resistance has been confirmed. (4)
- c. A farmer is applying an insecticide to control pests inside his house. He accidentally poisons himself.
 - i. What are the possible ways the farmer could have poisoned himself? (3)
 - ii. What could the farmer have done to prevent self-poisoning? (3)
 - iii. Other than the poison getting into that farmer, what is the fate of the particulate of the insecticide once released from the sprayer? (8)

[20 marks]

QUESTION 7

- a. Rodents are said to be “neophobic”. Explain the meaning of neophobic and how it interferes with rodent control. (3)
- b. Control and maintenance of low populations of domestic rodents in buildings is very important. Explain what effects rodents may have in domestic houses other than disease transmission to the occupants. (4)
- c. Explain how you would go about investigating the type of species and level of infestation of rodents in a homestead. (7)
- d. Cholecalciferol is a potent rodenticide that was used extensively in rodent control.
 - i. Is cholecalciferol an anti-coagulant or a non-anticoagulant? (1)
 - ii. Explain how cholecalciferol effects the killing of a rodent during control. (2)
 - iii. Cholecalciferol is a slow-acting rodenticide, causing death in 3 to 4 days. What advantage is the slow-action of cholecalciferol in rodent control? (2)
 - iv. What happens to the feeding of a rodent after it acquires a lethal dose of cholecalciferol? (1)

[20 marks]