

**UNIVERSITY OF SWAZILAND**  
FACULTY OF HEALTH SCIENCES

**MAIN EXAMINATION PAPER – DECEMBER, 2012**

TITLE OF PAPER : VECTOR AND VERMIN CONTROL  
COURSE CODE : EHS 214  
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]

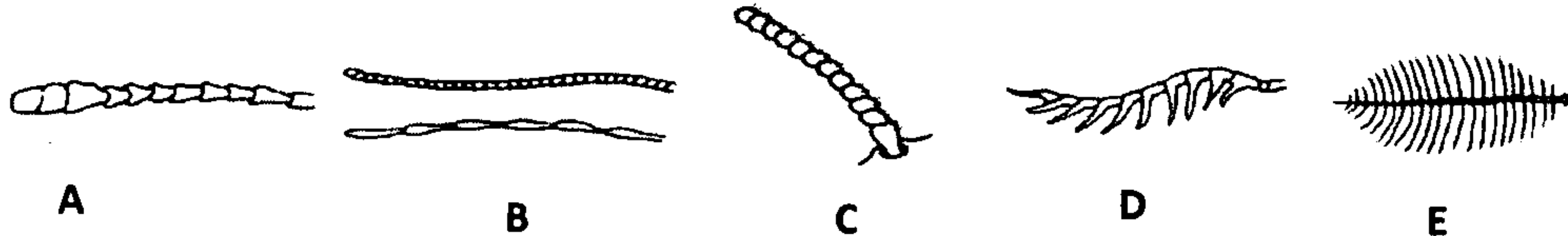
Indicate your response to the items in this question by writing down the letter corresponding to your chosen answer among those provided for each sub-question.

- 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*

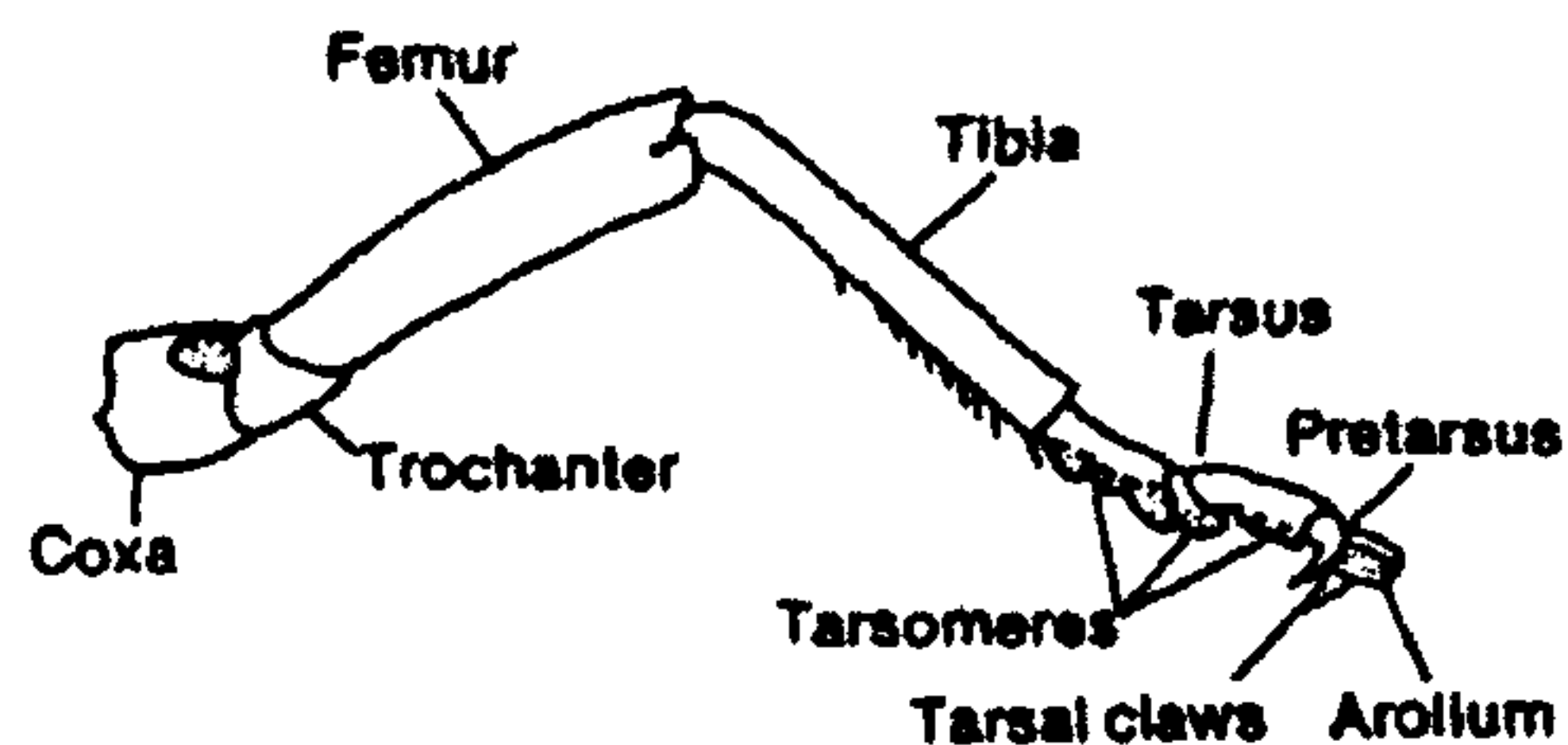
The arthropod is likely to belong to the Family:

- A. Cimicidae  
 B. Tabanidae  
 C. Culicidae  
 D. Glossinidae  
 E. Muscidae
- ii. Which of the structures of antennae of insects shown below is said to be filiform?



- iii. The mouthparts of housefly are said to be
- A. piercing-sucking type  
 B. siphoning type  
 C. sponging type  
 D. chewing-lapping type  
 E. rasping-sucking type

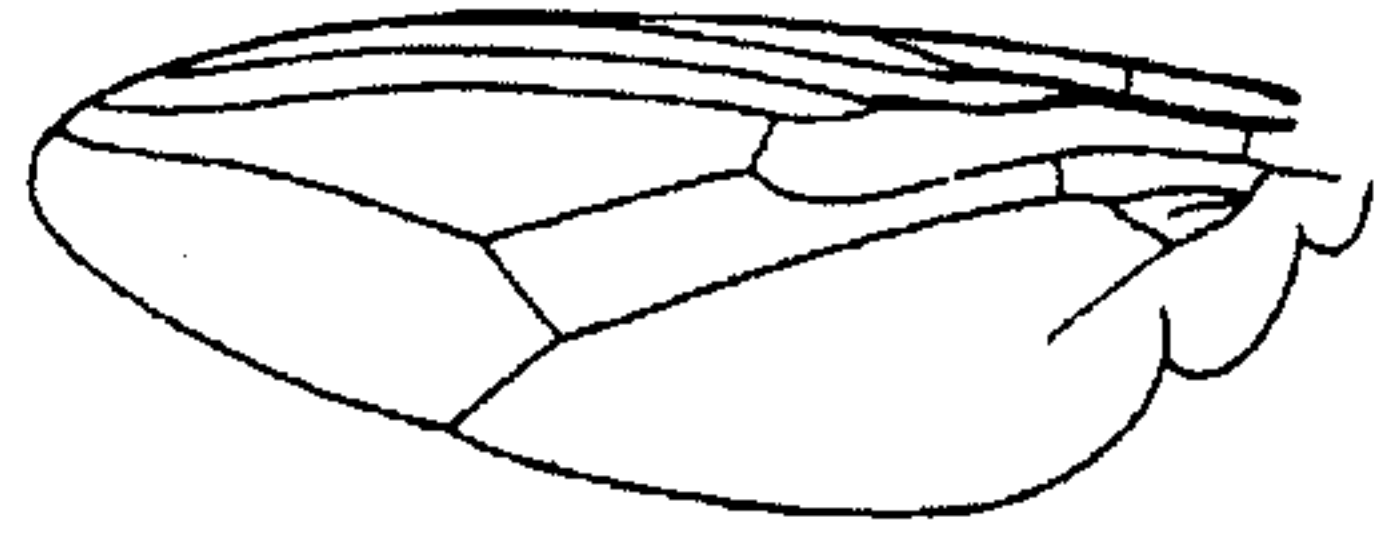
- iv. Shown below is the generalised diagram of the leg of an insect.



The part(s) that enable(s) 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

- v. Shown below is the structure of the wing of a named insect. Carefully study the venation of the wing and decide which one of the genera among those given below is represented on the diagram.



- A. *Anopheles*  
B. *Culex*  
C. *Musca*  
D. *Glossina*  
E. *Aedes*
- vi. 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*
- vii. Which one of the following suggested methods of transmission is NOT a predisposing factor for infection with the human head louse, *Pediculus humanus capitis*.
- A. overcrowding  
B. sexual contact with an infested partner  
C. using a head comb previously used by an infested individual  
D. poor personal hygiene  
E. sleeping on a bed previously occupied by an infested individual
- viii. Which one of the diseases below may be transmitted through the bite of a flea?
- A. bubonic plague  
B. epidemic typhus  
C. heartwater  
D. Q fever  
E. babesiosis

ix. Shown below is the stage of an arthropod.



The stage and arthropod shown is the

- A. larva of *Simulium damnosum*
  - B. pupa of *Simulium damnosum*
  - C. larva of *Tabanus latipes*
  - D. pupa of *Glossina morsitans*
  - E. Pupa of *Musca domestica*
- x. Shown below is the life cycle of a fly often involved in myiasis of human skin.

The female fly captures and glues its eggs on the proboscis of a flying blood-sucking arthropod which inserts larvae into the skin of a suitable host such as a human when the fly takes a blood meal. The larva grows and develops in the skin of the host after which they drop to the ground, develop into pupa that produces the adult fly

The fly is likely to be:

- A. *Dermatobia hominis*
- B. *Cordylobia anthropophaga*
- C. *Cochliomyia hominivorax*
- D. *Oestrus ovis*
- E. *Hypoderma lineatum*

[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 of 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. Both male and female bedbugs blood-feed.

- b. Describe briefly 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]

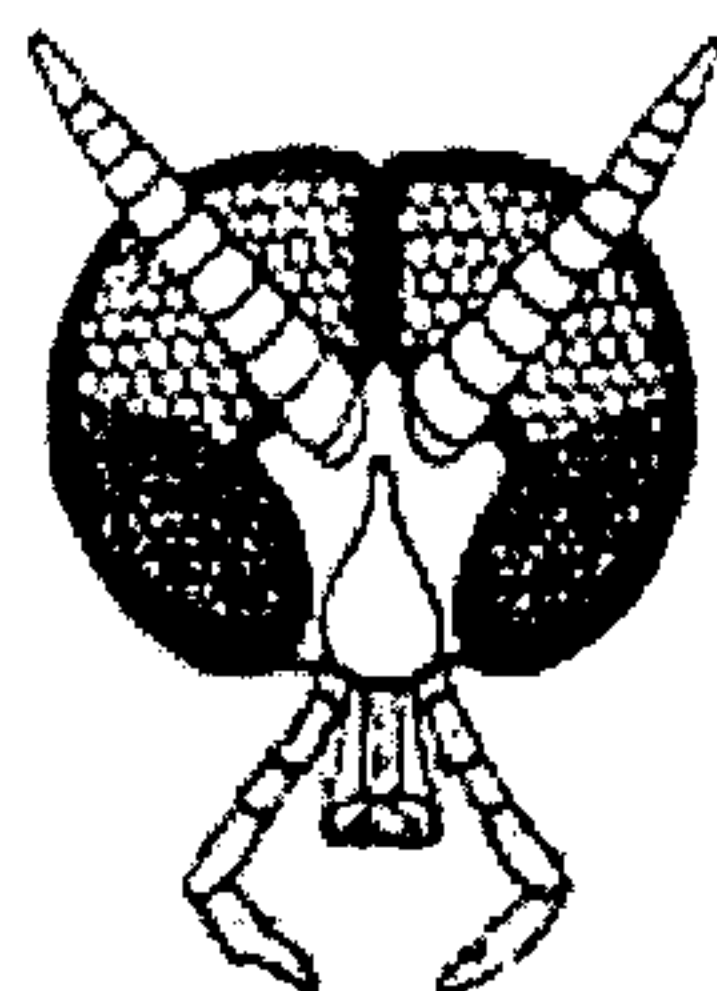
### QUESTION 3

- 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. Shown below is the head of a blackfly showing the compound eyes.



- i. Is this a female or male fly? (1)
  - ii. Explain your answer. (2)
- b. *Simulium damnosum* is responsible for transmission of onchocerciasis, a filarial disease of man, in West Africa. The global coalition to control onchocerciasis advised

people near forested areas to engage methods to protect themselves and their families from bites of the flies while the partners also engaged larvicidal programmes in the fly breeding areas.

- i. Describe the areas where larviciding of *Simulium damnosum* was done. (3)
  - ii. Explain what the larviciding programme involves (the actual methods). (4)
  - iii. Name two methods the residents were advised to use in order to protect themselves from bites of the flies. (2)
- c. A small percentage of spiders are venomous to humans.
- i. Name two types of spiders that are venomous to humans. (2)
  - ii. The effects of the venom of a spider on humans vary depending on several factors. List four such factors. (4)
  - iii. List two methods by which humans may reduce the opportunity of envenomation by spiders. (2)

[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. Name two areas in an urban house that are most likely to be infested by cockroaches. (2)
- d. Other than disease transmission, discuss four effects of cockroaches in homesteads which warrant a control of their population. (4)
- e. Young cockroaches often look like bedbugs. Explain two ways you may distinguish a young cockroach from a bedbug. (2)
- f. Design a strategic approach that you may utilise to assist the homestead remove the infestation and to prevent future infestation with cockroaches. (7)

[20 marks]

### QUESTION 6

- 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. Describe four ways the *OlysetPlus* net protects a child that is lying on a bed under the net. (4)
- d. List two ways by which a family may protect their child if they do not have an insecticide treated net. (2)

[20 marks]

### QUESTION 7

- a. The housefly is said to be a “synanthrope”. Explain the meaning of this statement. (2)
- b. Explain why a housefly is an efficient mechanical transmitter of pathogens resulting in several diseases of humans. (6)
- c. Discuss two methods you may recommend to a rural homestead to reduce the population of houseflies in its domestic settings. (4)
- d. The tsetsefly was originally classified under the same family as that of the housefly, Muscidae.
  - i. Explain the characteristics that made early scientists to classify the tsetsefly with the housefly. (4)
  - ii. Explain why the tsetsefly was eventually classified under a different family, Glossinidae, from that of the housefly. (4)

[20 marks]