

UNIVERSITY OF SWAZILAND

FACULTY OF HEALTH SCIENCES

MAIN EXAMINATION PAPER – MAY, 2019

TITLE OF PAPER : VECTOR CONTROL

COURSE CODE : EHS104

TIME : 2 HOURS

MARKS : 100

INSTRUCTIONS :

- ANSWER QUESTION 1 AND ANY THREE OTHER QUESTIONS**
- EACH QUESTION CARRIES 25 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**

DO NOT OPEN THE QUESTION PAPER UNTIL PERMISSION TO DO SO 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 difference between arthropods belonging to the division Exopterygota and those belonging to Endopterygota is that:
- A. Exopterygota have an exoskeleton which Endopterygota do not have
 - B. Exopterygota have wings that develop from external structures and in Endopterygota these structures are located inside their bodies
 - C. Exopterygota have no wings while Endopterygota have wings
 - D. Exopterygota have jointed appendages and in Endopterygota the appendages are not jointed
 - E. In Exopterygota the first pair of appendages are modified into chelicerae while in Endopterygota they are legs
- ii. Which one of the following parts of the mouthparts of an insect are sometimes modified into jaws adapted into structures that assist insect catch their prey?
- A. maxillae
 - B. palps
 - C. mandibles
 - D. labrum
 - E. labium
- iii. An entomology student collects an arthropod from the Lowveld of Swaziland. He further studies the wing venation of the arthropod to assist in its identification and draws the following diagram:



The student would be correct in concluding the arthropod as:

- A. *Tabanus latipes*
 - B. *Simulium damnosum*
 - C. *Glossina palpalis*
 - D. *Musca domestica*
 - E. *Phlebotomus papatasi*
- iv. Some insects periodically cast their old external covering in a process known as moulting and develop a new exoskeleton. The period between moults is known as a(n):
- A. exuvia
 - B. stadium
 - C. aestivation

- D. hibernation
 - E. diapause
- v. Which one of the diseases below is transmitted by *Glossina* flies to humans and animals?
- A. leishmaniasis
 - B. onchocerciasis
 - C. malaria
 - D. ozzardiasis
 - E. trypanosomiasis
- vi. A student entomologist recovers the pupal stage of an arthropod shown below from rocks submerged below fast running water.



- The student will correctly identify the pupa as:
- A. *Chrysops* spp.
 - B. *Glossina* spp.
 - C. *Simulium* spp.
 - D. *Anopheles* spp.
 - E. *Musca* spp.
- vii. Which insect below has siphonaterous type of mouthparts?
- A. bugs
 - B. lice
 - C. horseflies
 - D. fleas
 - E. tsetseflies

- viii. Which one of the statements about the mosquito from which the mouthparts shown below were taken IS CORRECT?



- A. The mosquito is a female *Anopheles*
 B. The mosquito is capable of transmitting malaria parasites to humans
 C. The is a blood-feeder but cannot transmit malaria parasites to humans
 D. The mosquito feeds on plant juices and nectar only
 E. The mosquito is a male Culicine
- ix. Which of the statements below about the structure of fleas IS NOT CORRECT?
- A. The antennae of fleas are located inside the head in sunken grooves
 B. All fleas have genal and pronotal combs or ctenidia
 C. All fleas have strong hind legs that facilitate jumping
 D. The whole body of fleas is covered with bristles
 E. All the statements are not correct
- x. Which one of the following statements about the anatomy of molluscs is false?
- A. Some molluscs do not have a shell covering
 B. Molluscs have a radula for grinding food
 C. The tissue beneath the shell of molluscs is called the mantle
 D. The digestive gland of molluscs is connected to the stomach
 E. The digestive system of molluscs includes the gizzard, a stomach, a digestive gland and the intestine
- b. Write **T** (for True) or **F** (for false) against each of the statements below: (5)
- The development of lady beetles follows the process of egg, larvae, pupa, adult which is incomplete metamorphosis
 - Spiders, bees, wasps and ants are commonly involved in envenomation of human hosts
 - Diapause that enables an insect to withstand cold weather is known as aestivation
 - Some members of the Class Arachnida have no eyes
 - Respiration in molluscs is facilitated by gills known as ctenidia

[25 marks]

QUESTION 2

- a. Explain briefly the function of each of the parts of an insect listed below:
- Cerci (2)
 - Gastric caeca (2)
 - Malpighian tubules (2)

- iv. Arolium (2)
- b. Using a cockroach as an example, describe the general arrangement of the nervous system of an insect. (5)
- c. The tergites and sternites of insects are joined by thin membranous conjunctivae. Why are the conjunctivae thin and membranous? (2)
- d. Most insects exhibit an oviparous reproductive process. However, the reproductive cycle of tsetseflies is different.
 - i. How does the reproductive cycle of tsetseflies differ from that shown in other Dipteran flies? (4)
 - ii. Tsetseflies have a structure known as the hypopygium. What is the function of this structure? (2)
- e. Describe FOUR strategies you would recommend for personal protection against tsetsefly bites. (4)

[25 marks]

QUESTION 3

- a. "Eyes of blackflies and horseflies are holoptic in males and dichoptic in females". Explain the meaning of this statement. (2)
- b. Blackflies lay eggs below fast running water on rocks or pieces of vegetable material.
 - i. Explain why blackflies prefer running water for breeding? (2)
 - ii. How do larvae of blackflies prevent being washed off by fast water currents following emergence from the eggs? (2)
 - iii. The anterior end of blackfly larvae has a mouth brush. What purpose is served by the mouth brush? (2)
 - iv. Explain how the larvae of blackflies are able to move about to other microhabitats below the fast running water? (3)
- c. Most blackflies are *zoophagic* while others are *ornithophagic*.
 - i. What do the terms "*zoophagic*" and "*ornithophagic*" mean? (2)
 - ii. How do adult blackflies locate their hosts for blood-feeding purposes? (2)
- d. High blackfly infestation sometimes leads to major economic losses. What economic sources are associated with high blackfly infestations? (4)
- e. What measures would you suggest to a household that brings to your office a complaint of blackfly infestation and frequent bites during the night in order to reduce frequency of bites? (6)

[25 marks]

QUESTION 4

- a. Mosquitoes are classified under the Insecta class and not under the Arachnida class. Discuss THREE characteristics that support inclusion of mosquitoes under Insecta and not under Arachnida. (6)
- b. *Anopheles* mosquitoes are well known for transmitting malaria to humans and their breeding habitats should be limited at all times.

- i. Describe briefly the type of habitats preferred by *Anopheles* mosquitoes for egg-laying? (3)
- ii. List THREE examples of the habitats that fit the description above. (3)
- iii. How can you differentiate eggs of *Anopheles* from those of *Culex* or *Aedes*. (4)
- c. Personal protection is key in avoiding mosquito bites and preventing infection with malaria. Describe TWO methods used as personal protection to prevent mosquito bites. (5)
- d. Describe TWO biological methods that have been used in the field to maintain low populations of mosquitoes at their breeding habitats. (4)

[25 marks]

QUESTION 5

- a. A 15-year old boy has pubic louse infestation and claims he acquired the infestation after using the bedding of an infested friend.
 - i. Is the claim that the boy acquired infestation following the use of a friend's bedding possible? Give reasons for your answer. (3)
 - ii. What problems may arise from untreated pubic louse infestation? (6)
 - iii. Besides stopping the use of other people's bedding what strategies would you suggest to the boy to prevent future infestations with pubic lice? (4)
- b. Bedbug infestation into households is very difficult to remove once it occurs and therefore, strategies to prevent household infestation must be continuously implemented.
 - i. To what order are bedbugs classified? (1)
 - ii. What is the meaning of the order name of bedbugs? (2)
 - iii. Name the two species of bedbugs that commonly infest households. (2)
 - iv. What are the different ways through which households may acquire bedbug infestation? (5)
 - v. List TWO strategies that you would advise for implementation in households to prevent bedbug infestation. (2)

[25 marks]

QUESTION 6

Snails belong to the Phylum Mollusca and some are vectors of trematode infections of man and animals

- a. Explain the origin of the name "mollusca". (2)
- b. Most molluscs have a shell covering the body. Explain how the shell is formed. (2)
- c. Molluscs are dioecious, hence fertilisation occurs during reproduction.
 - i. Explain how fertilisation occurs in aquatic snails. (2)
 - ii. Describe the habitats utilised by snails to lay their eggs. (2)
 - iii. Name the two larval stages that develop from hatched fertilised eggs of snails. (2)
- d. The Class Gastropoda includes shell-bearing species and those with reduced shell. Name the two types of shells seen in gastropods? (2)
- e. Cephalopods (head-footed snails) have a different locomotory and reproductive mechanisms from other classes of snails.
 - i. How is movement facilitated in the class Cephalopoda? (2)

- ii. How is reproduction different in the Class Cephalopoda compared to other snail classes?
(3)
- f. Write down the Genus of snail responsible for the transmission of each of the following trematode infections:
(4)
 - i. fascioliasis hepatica
 - ii. schistosomiasis mansoni
 - iii. schistosomiasis haematobium
 - iv. schistosomiasis japonicum
- g. Discuss how chemical control of snails may be effected in infested stagnant or slow moving water habitats.
(4)

[25 marks]