



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

DEGREE IN BACHELOR OF SCIENCE ENVIRONMENTAL
HEALTH

RE-SIT EXAMINATION PAPER MAY 2017

- TITLE OF PAPER : VECTOR CONTROL
- COURSE CODE : EHS 104
- 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]: ALL STUDENTS MUST ANSWER THIS QUESTION

- a. **MULTIPLE CHOICE:** Write down the letter corresponding to your chosen response among the choices listed for each question. (20)
- i. Cockroach populations should be maintained low inside households for all of the following reasons **EXCEPT** that they:
- A. cause destruction of household materials due to the urine deposit
 - B. are unpleasant pests
 - C. are involved in mechanical transmission of pathogenic agents of disease
 - D. are sometimes involved in biological transmission of pathogenic agents of disease to humans
 - E. may cause bites in young children during their sleep
- ii. The main difference between members of the Class Insecta and the Class Arachnida of the Phylum Arthropoda is that:
- A. Insects have an exoskeleton which does not exist among arachnids
 - B. The body of insects is clearly divided into head, thorax and abdomen while the head and thorax of arachnids are fused together into a cephalothorax
 - C. Insects have segmented appendages while the appendages of arachnids are not segmented
 - D. Insects have three pairs of legs at all stages while arachnids all have four pairs of legs at all stages
 - E. Insects lay eggs during reproduction while arachnids do not
- iii. Some Dipteran insects have a modified hind pair of wings into structures used to facilitate change of direction and maintenance of balance of the insect during flight. These structures are known as:
- A. cerci
 - B. halteres
 - C. hemelytra
 - D. elytra
 - E. sensillae
- iv. The mouthparts of bugs, mosquitoes and tsetseflies are said to be of the:
- A. rasping-sucking type
 - B. sponging type
 - C. siphoning type
 - D. piercing-sucking type
 - E. chewing-lapping type
- v. The shape of the antennae of insects is largely characterised and differentiated by shape of the:
- A. flagellomeres
 - B. pedicel
 - C. scape

- D. antennifer
 - E. maxillae
- vi. Which of the following statements about the pupal stage of development of mosquitoes is NOT true?
- A. The pupa is a resting, non-feeding development stage
 - B. The pupa is non-motile
 - C. The pupa is sensitive to light
 - D. Development of the mosquito is arrested in the pupal stage when environmental temperatures are too low
 - E. The pupa stage is part of a complete metamorphosis developmental cycle of the mosquito
- vii. Which one of the insects below has long dense hairs covering the body, wings and abdomen?
- A. mosquitoes
 - B. horseflies
 - C. sandflies
 - D. tsetseflies
 - E. fleas
- viii. The parts of the digestive system of an insect responsible for production of digestive enzymes are known as:
- A. spiracles
 - B. salivary glands
 - C. the proventriculus or crop
 - D. gastric caeca
 - E. malpighian tubules
- ix. *Anopheles arabiensis* mosquitoes remain the chief vectors involved in the transmission of malaria parasites in Swaziland. The reasons why this vector remains the current vector are that:
- A. *An. arabiensis* breeds in aqua-marine environments and has the ability to survive long periods in many forms of transport from neighbouring countries that have conditions supporting its breeding
 - B. *An. arabiensis*, unlike the other vectors, breed in cans and other temporary containers that are spread throughout the country's peri-urban and rural areas
 - C. *An. arabiensis* is an indoor and outdoor vector and has survived indoor residual spraying which has reduced the populations of other vectors in Swaziland
 - D. *An. arabiensis* has developed resistance to the insecticides used while the other vectors have remained susceptible
 - E. *An. arabiensis* breeds in both cooler and warmer climates and breeding has been maintained in malaria non-endemic regions that do not support the breeding of other vectors

- x. Which one of the following is true for mollusciciding of ponds or rivers during the control of snail vectors?
- A. During mollusciciding of large ponds, the whole surface of the pond should be sprayed
 - B. Application of molluscicides is better in flowing water than in stagnant water
 - C. The depth of a pond is not important to consider during mollusciciding
 - D. The width of the river is not important because snails only breed on the shallow banks
 - E. The molluscicide has to be in contact with the snail for 8 hours or more
- b. Write **T** (for true) or **F** (for false) on each of the statements below: (5)
- i. Ovoviviparous insects produce eggs with well-developed shells that hatch within the body of the female
 - ii. Houseflies have an arolium which have a considerable suction force that allows the houseflies to cling on smooth surfaces such as window panes
 - iii. The antennae of cockroaches is long, feathery and said to be plumose
 - iv. The female tsetsefly mates once in its lifetime
 - v. Snails involved in the transmission of *Schistosoma* species belong to the Prosobranchiata

QUESTION 2

- a. A housefly and a tsetsefly bear close similarities mainly because they belong to the same Order and Suborder yet one is a mechanical transmitter of disease while the other is a biological vector.
- i. What is the difference between a mechanical vector and a biological vector? (4)
 - ii. Explain why a housefly is an efficient mechanical vector. (4)
 - iii. Name one disease transmitted by the tsetsefly to humans and how transmission of the disease commonly occurs. (3)
 - iv. Name the Order and Suborder to which houseflies and tsetseflies belong. (2)
 - v. Describe two methods you may use to structurally differentiate a housefly from a tsetsefly. (4)
- b. Outline a strategic plan for the control of housefly populations in a rural homestead in order to reduce mechanical transmission of pathogenic elements of disease onto human food. (8)

[25 marks]

QUESTION 3

- a. Write down the genera of mosquitoes involved in the transmission of the following diseases of man: (4)
- i. Yellow fever
 - ii. Bancroftian filariasis
 - iii. Zika virus
 - iv. Dengue

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- b. Other than disease transmission, explain why mosquitoes are unwanted pests among human communities. (2)
- c. During collection and characterization of mosquitoes, it is always important to be able to use certain characteristics to differentiate between different stages of the genera in order to identify the threat of specific diseases. How would you differentiate between each of the stages of mosquitoes shown below through the use of described morphological features?
- i. Eggs of *Aedes* and *Anopheles* species (2)
 - ii. Eggs of *Aedes* and *Culex* species (2)
 - iii. Larvae of *Culex* and *Anopheles* species (4)
 - iv. Adults of *Culex* spp. from those of *Anopheles* spp. (4)
- d. Explain why females and not male mosquitoes are involved in the transmission of diseases of humans. (2)
- c. The REX Mosquito Trap is an innovative designed device that is used to control mosquito populations.
- i. Describe how the REX Mosquito Trap works. (3)
 - ii. What is the major disadvantage of the REX Mosquito Trap in field control of mosquito populations? (2)
- [25 marks]**

QUESTION 4

- a. The understanding of the anatomy of insects has been derived from detailed studies of the cockroach. Using the cockroach to illustrate, discuss:
- i. the arrangement of the circulatory system of an insect. (4)
 - ii. the arrangement of the respiratory system of an insect such as a cockroach (4)
- b. A visitor spends a night at an inn in a remote area of a country. In the morning, the visitor notices bite marks all over the body. The inn calls you, as an Environmental Health Officer for assistance. You suspect that the bites are due to bedbugs.
- i. Describe THREE effects that bites from bedbugs are likely to cause in man. (5)
 - ii. What investigation procedures are you going to engage to determine if the biting arthropods are bedbugs or not. (2)
 - iii. Suppose you confirm that the biting arthropods are indeed bedbugs. How would you handle the problem between the visitor and the Inn? (4)
 - iv. What measures would you put in place to remove the bedbug infestation from the inn and to prevent future infestations? (6)
- [25 marks]**

QUESTION 5

- a. A housefly and a tsetsefly bear close similarities mainly because they belong to the same Order and Suborder, yet one is a mechanical transmitter of disease while the other is a biological vector.
- i. What is the difference between a mechanical vector and a biological vector? (4)
 - ii. Explain why a housefly is an efficient mechanical vector. (4)
 - iii. Name one disease transmitted by the tsetsefly to humans and how transmission of the disease occurs. (3)

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- iv. Name the Order and Suborder to which houseflies and tsetseflies belong. (2)
- v. Describe two methods you may use to structurally differentiate a housefly from a tsetsefly. (4)
- d. Outline a strategic plan for the control of housefly populations in a rural homestead in order to reduce mechanical transmission of pathogenic elements of disease into human food. (8)

[25 marks]

QUESTION 6

- a. Snails are important members of the Phylum Mollusca because of their ability to serve as intermediate hosts of several human diseases.
 - i. What two features commonly characterise and classify members of the Phylum Mollusca? (4)
 - i. Name the three Orders to which snails are classified and show how they are classified using the foot. (6)
 - ii. Name TWO different parasitic genera of man that develop in members of the Phylum Mollusca which serve as intermediate hosts. (2)
- b. Explain the method of feeding of the largest Class of snails commonly involved as intermediate hosts of human disease. (2)
- c. Snails that breed in freshwater require the presence of plants within their breeding habitats. What purpose is served by the plants? (4)
- d. Discuss briefly the life cycle of a typical snail to include also the typical development of each stage. (5)
- e. Discuss ONE environmental measures you may initiate in a community that has high incidence of diseases whose intermediate hosts are snail to reduce populations of snail vectors. (2)

[25 marks]