UNIVERSITY OF SWAZILAND

Faculty of Health Sciences
Department of Environmental Health Science

MAIN EXAMINATION PAPER MAY 2016

TITLE OF PAPER	:	VECTOR CONTROL
COURSE CODE	:	EHS 104
DURATION	:	2 HOURS
MARKS	:	100
INSTRUCTIONS	:	READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
	:	ANSWER **QUESTION 1 AND ANY THREE OTHER** QUESTIONS
	:	EACH QUESTION **CARRIES 25** MARKS.
	:	WRITE NEATLY & CLEARLY
	:	NO PAPER SHOULD BE BROUGHT INTO OR OUT OF 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.

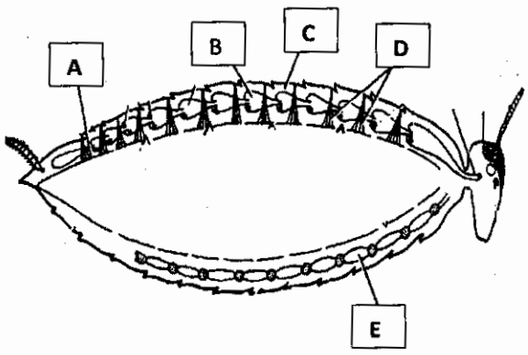
QUESTION 1 COMPULSORY : ALL STUDENTS MUST ANSWER THIS QUESTION

a. **MULTIPLE CHOICE:** Write down the letter corresponding to your chosen response among the choices listed for each question.

i. Which one of the following vectors commonly transmit pathogens to humans through mechanical or physical means only?
   A. mosquitoes
   B. body lice
   C. houseflies
   D. fleas
   E. ticks

ii. A young boy excises the head of a bee and returns after 3 days to find that the legs on the abdomen are still moving. He thinks that the abdomen of the bee is still alive yet he recalls that after the head of a chicken is cut, the body dies and becomes motionless in a few seconds. The most appropriate reason for the motion observed on the legs of the abdomen of the bee and not on the body of the chicken is that:
   A. the bee does not have a brain yet the chicken has a brain
   B. the brain does not serve as an important coordinating centre in the bee yet it does in the chicken
   C. the bee does not have blood yet the chicken has blood
   D. the bee has hormones that facilitate motion of the legs which the chicken does not have
   E. the brain of the bee in on the abdomen and not on the head like in the chicken

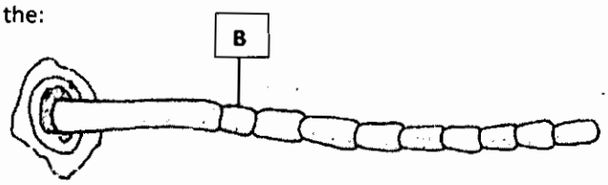
iii. Shown below is a diagram showing part of the internal anatomy of an insect. Which of the parts marked A – E represents the heart of the insect:



iv. Which one of the following parts of an arthropod is responsible for collection and removal of nitrogenous waste materials from the body of the arthropod?
   A. malpighian tubules
   B. gastric caecum
   C. anus

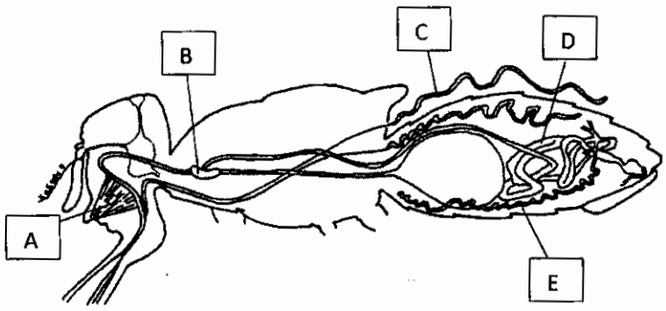
D. gizzard
E. the crop

v. Shown below is the antenna of an insect. The part marked B on the antenna is known as the:



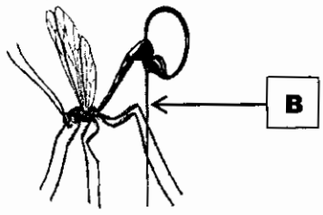
A. flagellum
B. scape
C. pedicel
D. antennal sclerite
E. flagelomere

vi. Shown below is a diagram showing part of the internal anatomy of an insect. Which of the parts marked A – E represents the salivary gland of the insect:



vii. Insects have compound eyes or simple eyes that they use to see predators. What name is given to the independent eye units of the compound eye?
A. ocelli
B. ommatidia
C. elytra
D. hemelytra
E. sensilla

viii. The part of the insect marked B on the diagram below is:



A. a stinger

B. the aedeagus
C. an ovipositor
D. a cercus
E. the antenna

ix. Cockroaches are without wings during birth and wings develop later in their growth. This type of development in known as:
A. complete, complex or indirect metamorphosis or holometabolous development
B. ametabolous development
C. incomplete metamorphosis or hemimetabolous development
D. gradual metamorphosis or paurometabolous development
E. ecdysis

x. Discharge of body fluid that cause blisters on the skin or mucosa membranes of humans by arthropods is known as:
A. sensitization
B. vesication
C. urtication
D. envenomation
E. allergic reaction

b. Write **T** (for true) or **F** (for false) on each of the statements below:
i. All arachnids have four pairs of legs, antennae and eyes
ii. All arachnids live in a variety of terrestrial habitats
iii. The Culicidae family include mosquitoes and have wings that develop from inside the body
iv. Eyes of insects that are so large that they occupy almost all of the head and either touch each other on top of the head or are very narrowly separated, are said to be holoptic
v. The larvae of houseflies have wings and appendages

[25 marks]

QUESTION 2

a. Even though cockroaches are not involved in the biological transmission of pathogenic agents of disease, they remain important public health pests whose population has to remain under strict control.
i. To what order are cockroaches classified? (1)
ii. Discuss FOUR reasons why cockroach populations should be controlled in human dwellings. (8)
iii. Discuss different ways/practices that result in cockroach introduction and population increase among domestic settings. (5)

b. Suppose you are assigned to assist the Mdzimba Army Barracks prevent re-infestation of the place by *Blatella germanica* cockroaches following successful riddance of the nuisance through chemical means. Discuss strategies you may suggest to the habitants of the Barracks under the following topics:

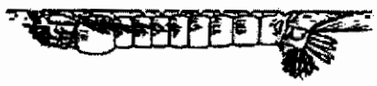
i. Sanitation (7)
ii. Prevention of cockroach entry (4)

[25 marks]

QUESTION 3

a. You are appointed by the World Health Organisation to assist outbreaks of zika virus in one community in Brazil. From literature, you source information that zika virus is transmitted through the bite of female *Aedes aegypti* mosquitoes.
   i. Describe sites, giving two examples, where you are likely to search for breeding sites of *Aedes aegypti.* (4)
   ii. Discuss the programme you are likely to put in place at the Brazilian community to try and avert incidence of more cases of zika virus disease through strategies directed at the vector. (8)

b. An entomology student studies characteristics of mosquitoes of a certain area. He collects several of the larvae shown below:



   i. Are these larvae of Anopheline or Culicine mosquitoes? Give reasons for your answer. (2)
   ii. What method is the entomology student likely to use to confirm the decision made in (i) above. (2)

c. Mosquito control has been achieved through indoor residual spray.
   i. Name two chemicals used during indoor residual spray in Swaziland. (2)
   ii. Explain why two different chemicals are used for indoor residual spray. (2)
   iii. How does indoor residual spray facilitate reduction of mosquito populations. (2)
   iv. Explain why the success of indoor residual spray has been limited against *Anopheles arabiensis* mosquitoes. (3)

[25 marks]

QUESTION 4

a. The housefly and tsetsefly bear morphological similarities.
   i. Explain how the wing venation may be used to differentiate the housefly from the tsetsefly. (4)
   ii. Explain the antenna may be used to differentiate the housefly from the tsetsefly. (4)

b. Name one disease transmitted by tsetseflies to man. (1)

c. Discuss two ways by which the housefly mechanically transmit pathogens to man. (4)

d. Explain why the structure of the mouthparts of the housefly are considered to be critical for the mechanical transmitter of pathogens. (4)

e. Discuss briefly the life cycle of the tsetsefly. (4)

f. Discuss briefly TWO methods you may recommend for the reduction of houseflies at their breeding habitats. (4)

[25 marks]

QUESTION 5

a. Lice are biological transmitters of disease besides many effects they cause in infected hosts.
   i. Other than disease transmission, what effects do lice have among infected human hosts? (5)
   ii. List three diseases that lice transmit to humans, mentioning the causative agent and the species of louse involved. (9)
   iii. Louse infestations are commonly diagnosed through visual inspection. However, studies conducted in Israel found that 76% of live lice infestations were missed by visual inspection (Muncuoglu et al., 2001; Hootman, 2002). What method would you suggest for confirmation of louse infestation? (2)
   iv. Head louse infestations are common among children in schools, day-care centres and other children's institutions. Discuss TWO methods you may recommend to parents or authorities of children's day-care centres to reduce head louse infestation. (4)

b. Bedbugs are common infestations in bedrooms of man all over the world.
   i. To what order do bedbugs belong. (1)
   ii. Explain how bedbugs get introduced into bedrooms. (2)
   iii. Discuss one method that householders may use to remove bedbug infestation in bedrooms once it has occurred. (2)

[25 marks]

QUESTION 6

a. Snails are biological vectors of diseases such as schistosomiasis or bilharzia hence they populations should be closely monitored and controlled.
   i. Name the genus of snail responsible for transmission of *Schistosoma mansoni* and that responsible for *S. haematobium*. (2)
   ii. Explain the importance of water plants in habitats of snail breeding habitats of snails. (4)

b. The National Bilharzia Control Unit in Swaziland undertakes to control breeding of snails in an irrigation canal using 70% Niclosamide wettable powder in drum-dispensers. They measure the depth of the canal and find that it was 1.5m, the width of the canal and find that it was 4m and the velocity of the water at 5m/s.
   i. Calculate the volume of water to be treated per second (3)
   ii. Calculate the total amount of niclosamide (in grams) needed if the 70% Niclosamide wettable powder is applied at 1mg/l (active ingredient) for 8 hours. (4)
   iii. Calculate the amount of solution (in grams) to be added into the dispenser given that the rate of discharge of the niclosamide from the drum dispenser was litres/second. (4)

c. Explain how the molluscicide effect of endod came to be discovered. (2)

d. Attempts to control snail populations through use of biological methods have been made. Discuss THREE methods of biological control of snails that have proved successful experimentally. (6)

[25 marks]