UNIVERSITY OF SWAZILAND

Faculty of Health Sciences
Department of Environmental Health Science

DEGREE IN ENVIRONMENTAL HEALTH SCIENCES

MAIN EXAMINATION PAPER MAY 2018

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. Which one of the following characteristics is not used to differentiate between members of the Class Insecta and those of the Class Arachnida?
   A. The number of divisions in the body
   B. Presence or absence of antennae
   C. Presence or absence of wings
   D. Number of legs in the larval or nymphal stages
   E. Presence or absence of an exoskeleton

ii. The antennae of insects can detect all of the following except:
   A. sound
   B. odour
   C. humidity
   D. orientation
   E. heat

iii. The part of the antenna of insects that is used for characterising of the insect is the:
   A. pedicel
   B. flagellum
   C. scape
   D. antennifer
   E. antennal suture

iv. Shown below is a diagram of the larva of a fly of medical importance.

The larva is of a:
   A. housefly
   B. tsetsefly
   C. blackfly
   D. horsefly
   E. sandfly

v. Which one of the antennae shown below is from the housefly?

A B C D E

vi. Ecdysis refers to:
   A. the process of laying eggs without any fertilization
   B. the process by which smaller organisms such as flies withstand adversely cold temperatures
   C. the process by which smaller organisms such as flies withstand extremely high temperatures
   D. the process of shedding of the outer skin by arthropods and development of a new skin during growth
   E. the process by which arthropods withstand extreme dessication or dry conditions

vii. Which one of the following is used to characterise the wing of a sandfly?
   A. Vein 2 branches twice
   B. The 3rd vein branches characteristically
   C. The medial veins completely enclose a hexagonal discal shaped cell at the centre
   D. Veins 2 and 3 are close together almost throughout the wing
   E. The branching of the M_{1+2} encloses a characteristic hatchet shaped cell

viii. Which one of the Dipteran flies below is an important vector of *Loa loa*, a filarial worm?
   A. sandly
   B. horsefly
   C. blackfly
   D. tsetsefly
   E. housefly

ix. One of the flies below is larviviporous i.e. reproduces by depositing one larva into the soil. Which one is it?
   A. Sandfly
   B. Horsefly
   C. Blackfly
   D. Tsetsefly
   E. Housefly

x. Which one of the statements below about bedbugs is true?
   A. Bedbugs are not insects because they have no wings and cannot fly
   B. Bedbugs are not insects because they undergo complete metamorphosis during development
   C. Bedbugs are not insects because they lack a clear head, thorax and abdomen division
   D. Bedbugs are insects because they have three pairs of legs at all stages of development
   E. Bedbugs are not insects because they have a hard exoskeleton like members of the Class Mollusca

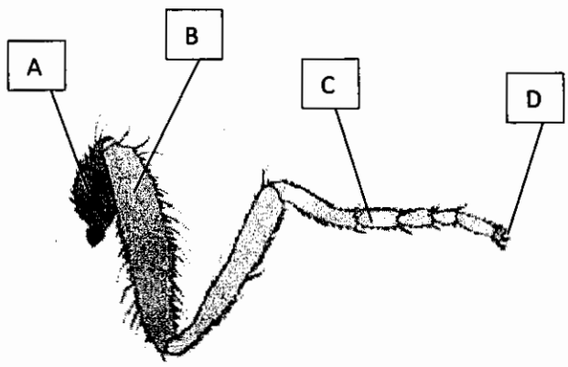
(b) TRUE OR FALSE: Write **T** (for true) or **F** (for false) to indicate your responses to each of the items below: (5)

i. The forewings of members of Dipteran insects are attached to the prothorax
ii. The small simple eyes of an insect are referred to as ommatidia
iii. *Blatella germanica* (german cockroaches) are commonly found in sewer areas
iv. The pupa stage of mosquitoes is a resting and non-feeding stage
v. Head lice may transmit louse-borne typhus to humans

[25 marks]

QUESTION 2

(a) Shown below is a diagram of the leg of a housefly. Use the diagram to answer the questions i-v below:



i. Which one of the parts marked A-D is important in supporting the flight of the housefly? (1)
ii. Which one of the parts marked A-D is partly responsible for picking up dirt and pathogens and their transmission onto human food? (1)
iii. Which one of the parts marked A-D is important in supporting attachment of the housefly onto smooth vertical surfaces such as window panes? (1)
iv. What is the name of the part named in (iii) above? (1)
v. Give two explanations how the part named in (iii) is able to support the housefly during attachment onto smooth surfaces such as window panes. (4)

(b) The housefly is morphologically similar to the tsetsefly. Describe THREE morphological features that are used to differentiate the housefly from the tsetsefly. (8)

(c) The mouthparts of the housefly are specially adapted for imbibing fluid and semi-fluid materials that may contain pathogens. What characteristics of the mouthparts make them best suited for this purpose? (4)

(d) Because of their involvement in mechanical transmission of pathogens onto human food material, housefly populations must be kept low at all times around the household, particularly in the kitchen where food is prepared and kept. In a point form, describe the contents of a health talk you would deliver to householders to prevent or reduce housefly infestations without relying on insecticidal control of adults. (5)

[25 marks]

QUESTION 3

(a) A 22-year old young man recovers the louse shown below from his pubic area.

i. Discuss two characteristics he is likely to use to determine whether this is body louse or pubic louse. (4)

ii. How do you think the young man acquired infestation with this louse species? (2)

iii. Name three diseases,including the causative agents of each;the young man is in danger of contracting as a result of infestation with lice of these species. (6)

iv. Describe two methods you would recommend for this young man to remove this infestation? (4)

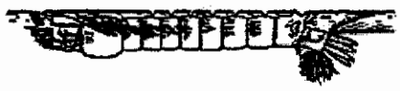
v. Give TWO pieces of advice you are likely to provide to this young man to prevent future infestation with this species of lice. (4)

(b) Bedbugs do not commonly transmit disease to humans and other animals but infestations should always be prevented particularly in sleeping areas such as bedrooms, hotels, motels and inns. Other than to prevent disease transmission, why should bedbug infestation be prevented? (5)

[25 marks]

QUESTION 4

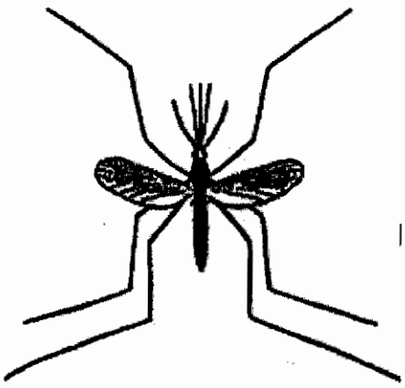
(a) A student entomologist collects mosquito larvae. He collects the larva shown below:



i. Name the Genus of this mosquito. Give reasons for your decision. (3)

ii. Describe the breeding habitat where these larvae may have been collected. (2)

(b) In order to facilitate further characterisation, the student entomologist rears the larvae in the laboratory and identifies the adults shown below:



Giving reasons for your response, answer each of the questions below based on this adult mosquito:

i. Is this a male or female mosquito?Give reasons. (3)
ii. Can this mosquito transmit malaria? Give reasons. (3)

(c) Other than disease transmission, list two reasons for the control of mosquito populations.(4)
(d) In Swaziland, populations of *Anopheles gambiae s.s.* and *An. funestus* have been reduced while populations of *An. arabiensis* have persisted. Give reasons for this assertion. (4)
(e) Control of mosquitoes commonly depend on use of chemicals to reduce populations of adult mosquitoes. Discuss these interventions. (6)

[25 marks]

QUESTION 5

Tsetsefly infestations are still a major problem in certain areas in Africa where they cause major public health and economic problems.

(a) Discuss the distribution pattern of tsetsefly species in Africa. (4)
(b) What public health and economic problems result from tsetsefly infestations in Africa? (5)
(c) Like many other members of the Insecta Class, the tsetsefly digestive system is divided into foregut, midgut and hindgut. Explain what digestive processes occur at each of the three sections of the digestive system when a blood-feeding female tsetsefly takes a meal. (6)
(d) One act of mating renders a female tsetsefly fertile for life. Explain how the female fly is able to reproduce several times after just one act of mating. (2)
(e) Tsetsefly problems are largely prevented through personal protection methods. Discuss FOUR methods that may be used to prevent tsetsefly bites in infested areas. (8)

[25 marks]

QUESTION 6

Cockroaches are common pests of many households and food establishments.

i. What factors contribute to cockroach infestations in many households following introduction? (4)
ii. Discuss the THREE stages of the life cycle of cockroaches. (9)
iii. Describe the steps you are likely to follow when assisting a household with heavy cockroach infestation to remove the infestation and prevent future infestations. (12)

[25 marks]