

UNIVERSITY OF SWAZILAND
FACULTY OF HEALTH SCIENCES

MAIN EXAMINATION PAPER – DECEMBER, 2011

TITLE OF PAPER : VECTOR AND VERMIN CONTROL
COURSE CODE : EHS 214
TIME : 2 HOURS
MARKS : 100

INSTRUCTIONS : ANSWER **QUESTION 1 AND ANY FOUR**
OTHER QUESTIONS
:
QUESTION 1 IS COMPULSORY
:
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
:
ALL CALCULATIONS/WORK OUT DETAILS
SHOULD BE SUBMITTED WITH YOUR
ANSWER SHEET

ANSWER QUESTION 1 AND ANY FOUR QUESTIONS FROM THIS SECTION.

QUESTION 1 : MULTIPLE CHOICE

Write down the letter corresponding to your chosen answer to indicate your response to each sub-question e.g. xv. E

- i. The activity of diapause that allows an insect to resist the cold weather is called
 - A. aestivation
 - B. moulting
 - C. complete metamorphosis
 - D. hibernation
 - E. gradual metamorphosis

- ii. During the reproduction process of an insect, the eggs develop internally until the stage of hatching or just beyond. Such species are said to be
 - A. oviparous
 - B. viviparous
 - C. ovoviviparous
 - D. parthenogenetic
 - E. paedogenetic

- iii. The two functions of the malpighian tubules in insects is to:
 - A. digest and absorb food
 - B. accumulate (store) metabolic waste products
 - C. remove waste products of metabolism and to adjust the ionic concentration of the "blood".
 - D. provide a good and sufficient surface area for gaseous exchange
 - E. produce eggs and it is the area where fertilisation of eggs occurs before they move to the uterus for further development

- iv. Which one of the characteristics below is not of the Phylum Arthropoda?
 - A. Free living forms, aquatic (fresh water or marine) or terrestrial or aerial. Some parasitic forms also.
 - B. Body is elongated and segmented, usually distinguished into regions like head, thorax and abdomen.
 - C. Body has exoskeleton made up of a hard, impermeable substance called chitin.
 - D. Circulatory system is of open type. Blood flows freely in the body cavity (hemocoel).
 - E. The digestive system is incomplete.

- v. The discharge of body fluid that cause blisters on the skin or mucosa membranes by arthropods is called
 - A. sensitisation
 - B. vesication
 - C. urtication

- D. envenomation
 - E. defence secretions
- vi. Which of the following flea(s) is/are responsible for the transmission of plague to humans?
- A. *Tunga penetrans*
 - B. *Pulex irritans*
 - C. *Ctenocephalides canis*
 - D. *Xenopsylla cheopis*
 - E. Both B and D
- vii. *Anopheles arabiensis* mosquitoes
- A. bite both animals and humans
 - B. bite indoors only
 - C. bite outdoors only
 - D. bite humans only
 - E. bite both animals and humans and both indoors and outdoors
- viii. The reproductive organs of a typical insect are located in the
- A. 8th segment of the abdomen
 - B. 9th segment of the abdomen
 - C. 8th and 9th segments abdomen
 - D. 10th segment of the abdomen
 - E. thorax
- ix. Which one of the parts of an American cockroach listed below has a partly auditory function in the detection of air movements through sensilla?
- A. cerci
 - B. ovipositor
 - C. hemocoel
 - D. aedeagus
 - E. halteres
- x. The "resting" of an insect in winter to protect itself against the cold weather is specifically referred to as.....
- A. diapause
 - B. hibernation
 - C. aestivation
 - D. metamorphosis
 - E. ecdysis

[20 marks]

QUESTION 2

- a. Phlebotomine sandflies have one unique characteristic that differentiates them from other flies. Describe one feature of Phlebotomine sandflies that you would use to identify it among other flies. (2)
- b. The life cycle of Phlebotomine sandflies consists of the egg, larva, pupa and adult stages.
 - i. Where do Phlebotomine sandflies lay their eggs? Mention 3 habitats. (3)
 - ii. Describe or illustrate using a diagram, the appearance of the larval stage of a Phlebotomine sandfly. (3)
- c. Choose one in each of the following as it applies to the feeding of sandflies:
 - iii. exophagic or endophagic? (1)
 - iv. Nocturnal feeder or diurnal feeder? (1)
- d. Besides disease transmission, what other effects do sandflies have on man? (2)
- e. Discuss FOUR methods by which an individual may protect himself/herself from bites of sandflies. (8)

[20 marks]

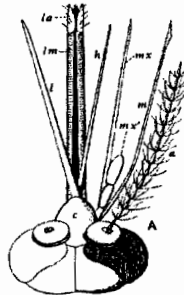
QUESTION 3

- a. Cockroach infestation is a common problem among countries in Southern African including many Swazi homesteads.
 - i. Why is the prevalence of cockroach infestation in Swaziland more or less the same in the Highveld and Lowveld of Swaziland despite differences in average temperatures in the two regions? (2)
 - ii. Name three species of cockroach that commonly infest homesteads in Swaziland. (3)
 - iii. Using the wings only, how can you differentiate between the three species of cockroaches mentioned in (i) above. (3)
 - iv. Discuss three factors that predispose households towards cockroach infestation. (6)
- b. The most common louse infecting children in Swaziland is the head louse.
 - i. What is the technical name of the head louse? (1)
 - ii. Also, write down the technical name of pubic louse, a species that commonly infest adult persons in Swaziland. (1)
 - iii. Explain two methods by which children acquire head louse infestation. (2)
 - iv. Discuss two methods children may prevent infestation with lice. (2)

[20 marks]

QUESTION 4

- a. Mosquitoes may be collected in their adult stages or larval stages.
- When collecting larvae of mosquitoes a white coloured dipper is preferred. Explain what advantage using a white coloured dipper has over, say, a black coloured one. (2)
 - Explain why you have to approach a larval collection area from the direction of the sun when going to do a collection. (2)
 - List FOUR methods you may use to collect adult mosquitoes for study purposes. (4)
- b. Carefully study the diagram of the mouthparts of an adult mosquito shown below.



- Are these mouthparts of an Anopheline or Culicine? Give reasons for your answer. (3)
 - Is this a male or female mosquito? Give reasons for your answer. (3)
- c. Discuss mosquito control under the following headings:
- Indoor residual spraying (IRS) (3)
 - Long lasting insecticide treated nets (LLINs) (3)

[20 marks]

QUESTION 5

- a. Write T (for true) or F (for false) for each of the following statements about fleas: (5)
- Some species of fleas have no eyes. T
 - The three larval stages of fleas can leave freely in the host's environment. T
 - One of the larval stages of the flea covers itself in dirt, dander and debris forming a cocoon to make itself unrecognisable F
 - Flea cocoons generally only hatch in the presence of a host animal T
 - Fleas are very small animals and no matter how heavy the infestation, it can never cause anaemia on any animal host F
- b. Besides money spent in the control of fleas and on treatment of disease, how can flea infestation be an economic problem to the pet owner? (2)
- c. Both fleas and bedbugs bite in the house resulting to skin dermatitis.
- By using the body structure of a flea and a bedbug, how can you differentiate between the adult stages of the two pests? (2)
 - Other than appearance, what characteristic would you use to differentiate between an adult flea and an adult bedbug? (2)
- d. Explain how flea traps function to bring about control of flea infestation in a household. (3)

- e. Flea collars containing chlorfenvinphos or dichlorvos may be placed around the necks of dogs and cats to treat an infestation. How does the action of chlorfenvinphos differ from that of dichlorvos? (2)
- f. Discuss how you may use alteration of environmental conditions to lower flea infestations in a house. (6)

[20 marks]

QUESTION 6

- a. An insect has clear head, thorax and abdomen divisions. Explain how the class Arachnida differ from the class Insecta in terms of this division. (2)
- b. Discuss the external anatomy of a typical arthropod under the following headings:
 - i. Thorax (4)
 - ii. Digestive system (3)
 - iii. Respiratory system (3)
- c. The housefly is a common nuisance in many homesteads, particularly those also rearing cattle.
 - i. Explain why houseflies are more common among families practising cattle farming than other homesteads. (2)
 - ii. Mention two methods you may use to differentiate a housefly from other household flies. (2)
 - iii. The tip of the tarsus of houseflies has structures called pulvilli. Explain the importance of pulvilli to the fly and in disease transmission. (4)

[20 marks]

QUESTION 7

- a. Discuss the life cycle of *Dermatobia hominis* and highlight how it has an effect on human health through myiasis. (A drawing may be used if it makes your answer clearer). (4)
- b. Write down:
 - i. the common name for *Dermatobia hominis*; and (1)
 - ii. the technical name for tumbu flies (1)
- c. The Congo floor maggot, *Auchmeromyia luteola*, is the only blood-sucking maggot in tropical sub-Saharan Africa.
 - i. Explain how Congo Floor maggots feed on humans. (2)
 - ii. Explain how an individual may prevent Congo Floor maggot bites during sleep. (2)
- d. Shown below is a dorsal view diagram of the head of a tabanid female fly.



- i. From this diagram, are the eyes of female tabanid holoptic or dichoptic? Explain your answer. (3)

- ii. Tabanid flies are also said to be good fliers. Describe one characteristic of the wing of tabanid flies that make them good fliers. (2)
- e. Match each vector on the left with the corresponding disease it transmits among those listed on the right by simple writing the number (Greek numeral) and the corresponding Roman numeral e.g. 9-ix.

Vectors

1. Mosquito
2. Tsetsefly
3. Reduviid bug
4. sandfly
5. blackfly

Diseases

- i. Chaga's disease
- ii. leishmaniasis
- iii. onchocerciasis
- iv. trypanosomiasis
- v. Yellow fever

(5)

[20 marks]