

UNIVERSITY OF SWAZILAND

FACULTY OF HEALTH SCIENCES

MAIN EXAMINATION PAPER – DECEMBER, 2013

TITLE OF PAPER : RODENTS AND VECTOR CONTROL
COURSE CODE : EHM 200
TIME : 2 HOURS
MARKS : 100

INSTRUCTIONS : ANSWER QUESTION 1 AND ANY FOUR
QUESTIONS
: 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
: CALCULATORS MAY BE USED BUT THEY MUST BE
THE SILENT TYPE
: ALL CALCULATIONS/WORK-OUT DETAILS SHOULD BE
SUBMITTED WITH YOUR ANSWER SHEET

This question paper consists of 6 printed pages including this one

QUESTION 1 MULTIPLE CHOICE [COMPULSORY]

Indicate your response to this question by writing the letter corresponding to your chosen answer among those given.

- i. The part of the leg most important in achieving a great jump of an insect is the:
 - A. tibia
 - B. trochanter
 - C. tarsus
 - D. femur
 - E. arolium

- ii. Which of the insects below is equipped with sponging mouthparts?
 - A. Tsetseflies
 - B. Houseflies
 - C. Mosquitoes
 - D. Bees
 - E. Wasps

- iii. Which of the statements below about insect is NOT true?
 - A. The legs of insects that dig into soil or wood are usually long and narrow.
 - B. Aquatic insects have legs modified and adapted for swimming
 - C. A rapid running insect usually has long and slender legs
 - D. The pulvilli are structures that offer greater purchase against smooth objects or surfaces
 - E. The sucking lice and some biting lice have only a single claw on the tarsus

- iv. The part of a flying insect modified to achieve greater balance during flight is the:
 - A. wing
 - B. elytra
 - C. cercus
 - D. haltere
 - E. sensilla

- v. Which one of the parts of an insect listed below is responsible for production of digestive enzymes?
 - A. Salivary glands
 - B. Proventriculus
 - C. Malpighian tubules
 - D. Gizzard
 - E. Gastric caeca

- vi. The development of an insect through the egg-larva-pupa-adult is an example of development:
- A. without metamorphosis or ametabolous
 - B. through gradual metamorphosis or paurometabolous
 - C. through incomplete metamorphosis or hemimetabolous
 - D. through complete metamorphosis or holometabolous
 - E. None of the above
- vii. The flea responsible for transmission of plague from rodents to humans is
- A. *Xenopsylla cheopis*
 - B. *Yersinia pestis*
 - C. *Ctenocephalides cati*
 - D. *Tunga penetrans*
 - E. *Pulex irritans*
- viii. Which one of the mites below is responsible for the transmission of *Rickettsia tsutsugamushi* that cause scrub typhus in man?
- A. *Sarcoptes scabiei*
 - B. *Leptotrombidium akamushi*
 - C. *Demodex folliculorum*
 - D. *Dermanyssus gallinae*
 - E. *Allodermanyssus sanguineus*
- ix. An entomologist identifies ticks from a cow suffering from babesiosis. He identifies the following characteristics from all the ticks: ornate scutum, have eyes, eleven festoons, short hypostome, short, broad or moderate palps and comma shaped spiracles. The tick is likely to be:
- A. *Argus persicus*
 - B. *Ixodes pilosus*
 - C. *Boophilus annulatus*
 - D. *Rhipicephalus appendiculatus*
 - E. *Dermacentor reticulatus*
- x. Which one of the following is NOT true about the toxic effects of pesticides on man?
- A. A dose-effect relationship does not exist for most pesticides
 - B. A concentration-effect relationship exists for most pesticides
 - C. Pesticide poisoning has more deleterious effects on a child than on an adult
 - D. Pesticides that have a high toxicity but are readily metabolized result to an acute type of hazard
 - E. Some rapidly eliminated pesticides may induce persistent, long-term biological effects even at low doses

[20 marks]

QUESTION 2

- a. The female reproductive system of a tsetsefly consists of a spermatheca.
- i. What purpose is served by the spermatheca? (2)
 - ii. List FOUR habitats preferred by tsetsefly for its reproduction. (4)
 - iii. Discuss, briefly, the process of reproduction of the tsetsefly until an adult emerges. (5)
- b. The housefly possesses several similarities with other members of the order Diptera.
- i. Describe two characteristics you may use to identify houseflies from other Diptera. (4)
 - ii. Explain why homesteads that rear cattle are prone to housefly infestation? (3)
 - iii. Describe one method cattle farmers may use to maintain low population of houseflies in the vicinity of their homesteads other than through regular insecticidal means. (2)

[20 marks]**QUESTION 3**

- a. Mosquitoes are most important insects because of their potential to transmit several pathogenic agents of disease to man.
- i. Name two diseases transmitted to man through the bite of infected mosquitoes. (2)
 - ii. List two characteristics used to distinguish mosquitoes from other biting flies. (2)
 - iii. List two characteristics you may use to identify adult Anopheline from Culicine mosquitoes. (4)
- b. When conducting larviciding, it is advisable to confirm the presence of *Anopheles* larvae in potential breeding places before any method is implemented.
- i. Describe the type of habitats you would search for *Anopheles* larvae? (3)
 - ii. Describe THREE characteristics you would use to distinguish Anopheline larvae from Culicine larvae. (6)
 - iii. Name one chemical you would recommend for effective larviciding of *Anopheles* breeding habitats. (1)
 - iv. Describe ONE biological method you could use to control population of *Anopheles* larvae. (2)

[20 marks]

QUESTION 4

- a. Mites are said to belong to a different Class from insects.
- To what class do mites belong? (1)
 - How do members of this class differ from members of the Insecta Class? (3)
 - Complete the table below on mite disease by writing the roman numeral and your response e.g. ix. *Leptotrombidium akamushi*. (6)

Disease	Mite	Pathogen transmitted
Rickettsial pox	----- (i) -----	----- (ii) -----
----- (iii) -----	Gamasid mites	----- (iv) -----
Fowl spirochaetosis	----- (v) -----	----- (vi) -----

- b. Define the following terms:
- Two-host ticks (2)
 - Three-host ticks (2)
 - Exsanguination (2)
 - Otocariasis (2)
- c. Briefly discuss ONE method used by Swazi farmers on Swazi Nation Land to control tick populations on their stock of cattle. (2)

[20 marks]**QUESTION 5**

- a. Only the body louse is involved in transmission of disease to man. However, ability to control lice infestation remains an important skill for every environmental health officer.
- List two diseases transmitted through the bite of an infected body louse to man. (2)
 - Write down two reasons why lice other than body louse have to be controlled. (2)
 - Sometimes visual inspection for adult head lice does not yield positive results even when infestation is present. What other method would you use to confirm infestation if visual inspection is negative? (2)
 - Describe two methods for preventing infestation with body lice. (2)
 - Describe two methods for preventing infestation with pubic lice. (2)
- b. Even though cockroaches are seldom involved in disease transmission, their control remains an important public health consideration.
- Other than for reasons of mechanical transmission of disease agents, why is it important to control cockroach populations in households? (3)
 - In Swaziland, the most common species of cockroaches are *Blatta germanica* and *Periplaneta Americana*. Describe two characteristics you would use to differentiate between these two species of cockroaches. (4)

- iii. Use of pyrethrins containing piperonyl butoxide or dichlorvos is commonly a method used by homesteads to reduce cockroach populations. Explain the importance of the three insecticides: pyrethrins, piperonyl butoxide and dichlorvos. (3)

[20 marks]

QUESTION 6

A woman has severe infestation of rodents in her house. She decides to purchase a rodenticide that could reduce the population within a short time. She purchases a rodenticide marked: *Rattex: active ingredient: Brodifacoum/anticoagulant 0.05g/kg.*

- a. Explain how this rodenticide kills rodents. (2)
- b. The rodenticide is also marked, "After a single feed, death of a rodent takes 4 – 12 days". What advantage does this length of time have on the control of the rodents?(3)
- c. Another rodenticide available to the woman was Zinc phosphide.
 - i. How does Zinc phosphide kill rodents? (3)
 - ii. Suppose a cat eats muscle tissues of a rodent killed by Zinc phosphide. Do you think the cat is likely to die? Explain. (3)
 - iii. If the cat eats the whole of several rodents including the offals, is it likely to be killed by the Zinc phosphide? Explain. (3)
- d. The woman also wants to maintain a rodent-free house after removing the nuisance and approaches your office to request for advice on measures to maintain a rodent-free house. What measures would you discuss with the woman? List, do not discuss. (6)

[20 marks]

QUESTION 7

- a. A farmer sprays his crops with a pesticide to control aphids and in the process accidentally poisons himself.
 - i. What are the different ways the farmer could have poisoned himself? (3)
 - ii. Discuss the possible fate of the insecticide following spraying on the crops.(7)
- b. A sprayman sprays the wall of a house with Dichloro-diphenyl-trichloroethane (DDT) during indoor residual spraying to control mosquito populations.
 - i. What type of surface should the DDT be used on in order for it to be effective? Explain how this type of surface is suitable for insecticidal action of the DDT on the insect. (3)
 - ii. Explain what is likely to happen if the sprayman moves the nozzles of the spray too fast up and down the wall during spraying. (3)
 - iii. Explain what disadvantage is associated with moving the nozzle too slow over the surface during spraying. (2)
 - iv. Why is DDT use banned for agricultural purposes? (2)

[20 marks]