

UNIVERSITY OF SWAZILAND
FACULTY OF HEALTH SCIENCES

MAIN EXAMINATION PAPER – MAY, 2012

TITLE OF PAPER : VECTOR AND VERMIN CONTROL
COURSE CODE : EHS 215
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. Mites breath through
 - A. gill books
 - B. lung books
 - C. tracheal spiracles
 - D. cuticle
 - E. lungs

- ii. Mites have evolved to live in all of the following habitats except:
 - A. mould
 - B. soil
 - C. water
 - D. dust
 - E. air

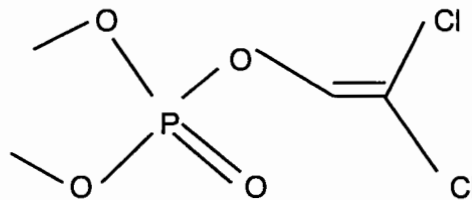
- iii. Which one of the mites below transmits *Rickettsia tsutsugamushi* which causes scrub typhus in man?
 - A. *Dermanyssus gallinae*
 - B. *Leptotrombidium akamushi*
 - C. *Allodermanyssus sanguineus*
 - D. *Sarcoptes scabiei*
 - E. *Haemogamasus pontiger*

- iv. *Rhipicephalus appendiculatus* is a(n)
 - A. one-host tick
 - B. two-host tick
 - C. three-host tick
 - D. soft tick
 - E. ornate tick

- v. Which of the following genera of ticks is a vector for African relapsing fever?
 - A. *Dermacentor*
 - B. *Ornithodoros*
 - C. *Otobius*
 - D. *Ixodes*
 - E. *Rhipicephalus*

- vi. A rodent is found to have the following characteristics: *a burrower, lives normally outdoors and occasionally indoors, can climb, is a very good swimmer, and is highly neophobic*. The rodent is:
 - A. *Rattus norvegicus*

- B. *Rattus rattus*
 C. *Mus musculus*
 D. None of the above
 E. Both *Rattus norvegicus* and *Rattus rattus*
- vii. Which one of the following is a first-generation rodenticide?
 A. Warfarin
 B. Brodifacoum
 C. Diphenacoum
 D. Bromodiolone
 E. Zinc phosphide
- viii. Which one of the following properties of pesticides DOES NOT determine the risk of the pesticide in water?
 A. The rate of decay or biodegradation of the pesticide in the environment
 B. Its solubility in the water
 C. The particle size of the pesticide
 D. The ability of microbes to break down the pesticide in the soil
 E. None of the above
- ix. The chemical structure shown in the diagram below is that of a(n):



- A. chlorinated hydrocarbon
 B. pyrethrin
 C. organophosphate
 D. carbamate
 E. It may be either a chlorinated hydrocarbon or organophosphate
- x. Which of the following mosquito species would be least affected by the indoor residual sprays with DDT control method?
 A. *Anopheles gambiae* s.s.
 B. *Anopheles arabiensis*
 C. *Anopheles funestus* s.s.
 D. Both *An. gambiae* s.s. and *An. funestus* s.s.
 E. Both *An. arabiensis* and *An. funestus* s.s.

QUESTION 2

- a. *Dermanyssus gallinae* occasionally give chicken farmers infestation problems inside fowl houses.
- Give two common names used to refer to *Dermanyssus gallinae*. (2)
 - Other than chickens, write down two other examples of domesticated animals that may be infested with mites. (2)
 - Mention FOUR effects that infestation with *Dermanyssus gallinae* may have on chickens. (4)
 - Devise a strategy a rural farmer may employ to remove or prevent re-infestation with *Dermanyssus gallinae* in his stock of chickens. (5)
- b. Consider the diagram of the mite shown below:

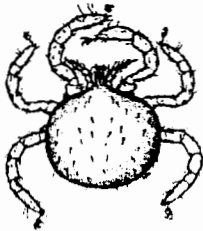


- Write down the technical name of the mite. (1)
- Write down the common name of the mite. (1)
- Write down two examples of body parts of humans commonly infested by this type of mite. (2)
- Mention three effects infestation with these mites may have in man. (3)

[20 marks]

QUESTION 3

- a. Write down FOUR factors that make ticks potent transmitters of pathogens of man and animal disease. (4)
- b. Shown below is a diagram of *Argus persicus* tick.

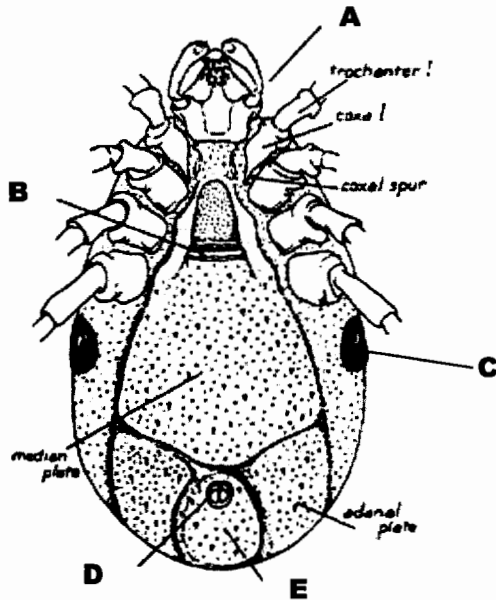


- What developmental stage of the tick is shown in the diagram? Explain your answer. (3)
- Argus persicus* is a soft tick. How does it differ from a hard tick? (2)
- Mention three animals that are possible hosts of Argus ticks. (3)
- Write down two diseases of man that may be transmitted by Argus ticks. (2)
- Discuss three steps you may follow to remove Argus tick infestation at your homestead. (6)

[20 marks]

QUESTION 4

a. Shown below is a diagram of *Ixodes ricinus* tick.



- i. Label the parts marked A to E (5)
- ii. Copy and complete the table below comparing characteristics of *Ixodes ricinus* and *Dermacentor andersoni*. (4)

Characteristic	<i>Ixodes ricinus</i>	<i>Dermacentor andersoni</i>
Palpi		
Scutum		
Eyes		
Festoons		

- iii. Explain the difference between exsanguination and tick paralysis as they apply to tick infestation. (4)
- b. During control of ticks, sampling is an important pre-control procedure.
 - i. Why is sampling important before implementation of measures to control ticks. (2)
 - ii. Explain how pasture burning may be used to control ticks from cattle grazing areas. (2)
 - iii. Explain how natural enemies are used in Swaziland to control tick infestation among cattle. (3)

[20 marks]

QUESTION 5

- a. Discuss why, besides preventing disease transmission, it is important for families to prevent rodent infestation in their houses. (4)
- b. Discuss FOUR signs of rodent infestation that you may investigate to confirm infestation at a homestead. (8)
- c. A ship enroute to the United States of America from Cape Town in South Africa is found to be infested with rodents. It is said that the passengers are in danger of being infected with plague, a very deadly disease that killed millions of people in the past.
 - i. What is the name of the pathogen that causes plague in man? (1)
 - ii. What is the name of the species of rodent involved in its transmission to man? (1)
 - iii. How could infestation of the ship been prevented in Cape Town when the ship was still docking? (4)
 - iv. A possible rodenticide that may be used to control the rodents in the ship is Brodifacoum. Explain how brodifacoum kills rodents. (2)

[20 marks]

QUESTION 6

- a. Define the following terms as they apply to pesticide use:
 - i. Acute effect (2)
 - ii. Systemic effect (2)
 - iii. LC_{50} (2)
 - iv. Hazard (2)
 - v. Occupational Exposure Limit (2)
- b. A householder is spraying his house with a poisonous insecticide and finds that he has accidentally poisoned himself.
 - i. What are the possible ways the householder could have poisoned himself?(3)
 - ii. How could he have prevented this self-poisoning? (3)
 - iii. What steps would you recommend the householder follows to remedy the poisoning situation? (4)

[20 marks]

QUESTION 7

- a. An indoor residual sprayer employed by the Swaziland National Malaria Control Programme prepares for the spraying of a village using 75% water-dispersible powder of DDT.
 - i. Will this insecticide preparation be used for painted or unpainted surfaces.(1)
 - ii. Name the size of nozzle that will be used for the DDT spray. (1)
 - iii. What is the distance that the DDT has to be released at in order to deliver a 75 cm swath on the spray surface? (2)
 - iv. Besides distance from the nozzle tip to the spray surface, what other factors are important to determine the amount of DDT that will be sprayed on the surface? (4)
 - v. List FOUR factors that determine the efficacy of wall spraying with the DDT. (4)

- b. Explain why DDT is likely to have a more deleterious effect in children than adults? (2)
- c. The village has 100 houses. The average surface that will be sprayed per house is 200 m^2 . The recommended dosage of DDT is $2\text{g}/\text{m}^2$ and it is available as a 75% water-dispersible powder.
- i. Calculate the total mass of DDT required to spray the whole village. (3)
 - ii. Calculate the mass of DDT to be dissolved into a 15L sprayer. (3)

[20 marks]