



Student Name:

STAV Publishing Pty Ltd

2002

BIOLOGY

Trial Examination Unit 3

Total writing time: 1 hour 30 minutes

QUESTION AND ANSWER BOOK

Structure of book

<i>Section</i>	<i>Number of marks allocated</i>	<i>Style of question</i>	<i>Number of questions</i>	<i>Number of questions to be answered</i>
A	25	Multiple choice	25	25
B	50	Written response	7	7

Directions to students

Materials

Question and answer book of 17 pages with a detachable Multiple Choice Answer Sheet inside the front cover. You should have at least one pencil and an eraser.

The task

Please ensure that you write your **name** in the space provided on the cover of this book and in the space provided on the Multiple Choice Answer Sheet.

Answer **all** questions.

The marks for each question give an idea of how much time you should spend and how much information you should provide. There is a total of 75 marks available for this task.

Section A questions should be answered in pencil on the Multiple Choice Answer Sheet provided.

Section B questions should be answered in ink or ball point pen in the spaces provided in this book.

All written responses should be in English.

At the end of the task

Place the Multiple Choice Answer Sheet inside the front cover of this book.

Published by STAV Publishing Pty Ltd. STAV House, 5 Munro Street, Coburg VIC 3058 Australia.
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JUNE 2002

STAV Publishing Pty Ltd

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BIOLOGY

Trial Examination Unit 3

MULTIPLE CHOICE ANSWER SHEET

STUDENT NAME:	
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INSTRUCTIONS:USE PENCIL ONLY

- Write your name in the space provided above.
- Use a **PENCIL** for **ALL** entries.
- If you make a mistake, **ERASE** it – **DO NOT** cross it out.
- Marks will **NOT** be deducted for incorrect answers.
- **NO MARK** will be given if more than **ONE** answer is completed for any question.
- Mark your answer by placing a **CROSS** through the letter of your choice.

1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D
11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D
21.	A	B	C	D
22.	A	B	C	D
23.	A	B	C	D
24.	A	B	C	D
25.	A	B	C	D

SECTION A – Multiple choice questions**Specific instructions for Section A**

This section consists of 25 questions. You should attempt **all** questions.

Each question has four possible correct answers. Only **one** answer for each question is correct. Select the answer that you believe is correct and indicate your choice on the multiple choice answer sheet by crossing the letter that corresponds with your choice of the correct answer.

If you wish to change an answer, erase it and cross your new choice of letter.

Each question is worth **one** mark. **No** mark will be given if more than one answer is completed for any question. Marks will **not** be deducted for incorrect answers.

The first 4 questions relate to the following information.

The photo below is of the lower epidermis of an ivy leaf viewed under a light microscope. The eyepiece of the microscope was marked as X10 and the objective lens was marked as X40.

Question 1

The magnification of the image in this photo is:

- A. X4
- B. X10
- C. X40
- D. X400

Question 2

Which of the structures in the diagram is a cell's nucleus?

- A. A
- B. B
- C. C
- D. D

Question 3

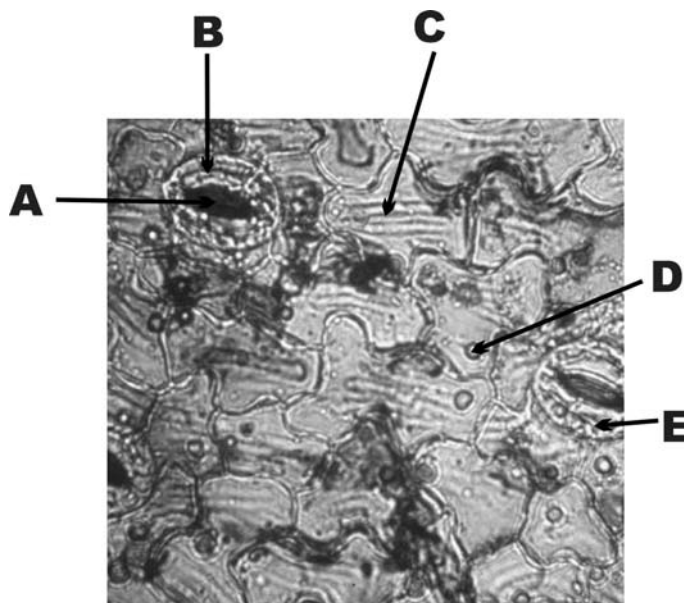
Structure E is an organelle within a cell. The major function of structure E is:

- A. the production of proteins.
- B. the packaging of molecules for export from the cell.
- C. photosynthesis.
- D. cellular respiration.

Question 4

How many different types of cells can be seen in this photo?

- A. 1
- B. 2
- C. 3
- D. more than 3



Question 5

You would be unlikely to see which of the following human cells dividing?

- A. red blood cell
- B. cancer cell
- C. skin cell
- D. cell from an embryo

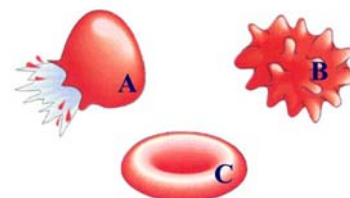
Question 6

Bacteria and yeast are both microscopic single celled organisms with cell walls. However, biologists place them in different Kingdoms because:

- A. bacteria have organelles bound by a single-layered membrane, yeast cells do not have organelles bound by a single-layered membrane.
- B. yeast have no membrane bound organelles, bacteria do have membrane bound organelles.
- C. yeast possess DNA in a membrane-bound nucleus, bacteria do not possess DNA in a membrane-bound nucleus.
- D. bacteria are heterotrophs, but yeast are autotrophs.

Questions 7 to 9 relate to the following information.

The concentration of salts in normal human tissue is 0.154 moles/L. Scientists carried out a series of experiments using red blood cells that were placed in salt solutions of varying concentrations. The red blood cells A, B and C in the diagram at right show the possible results of these experiments.

**Question 7**

When red blood cells were placed in pure water, the cells looked most like which cell in the diagram?

- A. Cell A
- B. Cell B
- C. Cell C
- D. Cannot tell from the information provided.

Question 8

When red blood cells were placed first in salt solution of 0.154 moles/L and then in salt solution of 0.308 moles/L, the cells looked most like which cell in the diagram?

- A. Cell A
- B. Cell B
- C. Cell C
- D. Cannot tell from the information provided.

Question 9

The process that accounts for the different appearances of cells A, B and C is:

- A. adaptation.
- B. active transport.
- C. facilitated diffusion.
- D. osmosis.

Question 10

Here is a diagram of two blocks.

Block would have the greatest surface area to volume ratio and block would be best able to retain water in a hot, dry environment.



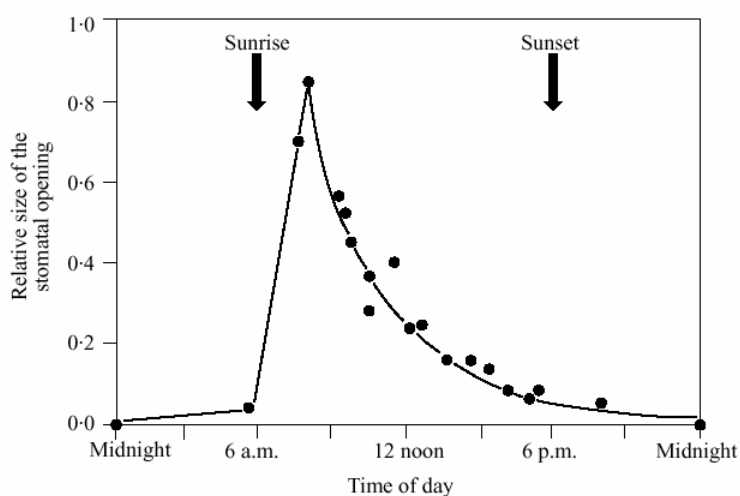
- A. A, A
- B. B, B
- C. A, B
- D. B, A

Question 11

The graph at right shows the stomatal opening of Eucalyptus leaves during 24 hours in an Australian autumn. There was no rain on the day the measurements were taken.

The reason that the stomata are less than fully open at midday is:

- A. the rate of photosynthesis is less than the rate of cellular respiration at this time.
- B. the rate of photosynthesis is greater than the rate of cellular respiration at this time.
- C. the plant has an adaptation to conserve water at this time.
- D. there is insufficient sunlight present at this time.

**Question 12**

Normally, when the concentration of glucose in the blood falls below a certain level, stored glycogen re-enters the blood until a suitable level of glucose is reached again. This regulation of the concentration of blood glucose is part of the process known as:

- A. pinocytosis.
- B. respiration.
- C. homeostasis.
- D. metabolism.

Question 13

Every hormone:

- A. is produced as a response to stress.
- B. is able to enter a cell and interact with DNA.
- C. acts as a signal between cells.
- D. is under the control of the pituitary gland.

Question 14

Humid weather makes you feel warmer because humid air:

- A. interferes with heat loss by conduction.
- B. increases heat production by metabolism.
- C. prevents counter current heat exchange.
- D. interferes with heat loss by evaporation.

Question 15

Every time you eat a chocolate bar or a sweet biscuit your blood glucose concentration increases. This will trigger an increase in the blood of the hormone:

- A. insulin.
- B. thyroxine.
- C. glucagon.
- D. glycogen.

Question 16

Nerve impulses carried by a mammalian motor neuron travel:

- A. towards the central nervous system.
- B. away from the central nervous system.
- C. between neurons in the brain.
- D. from a receptor in the skin.

Question 17

In homeostasis, pairs of hormones often have opposite effects. An example of such a pair is:

- A. glucagon and insulin.
- B. pepsin and pepsinogen.
- C. lactose and lactase.
- D. antidiuretic hormone and aldosterone.

Question 18

A difference between a disease caused by a virus and a disease caused by a bacterium is that:

- A. antibiotics can successfully treat viral diseases but bacterial diseases cannot be treated with antibiotics.
- B. viral diseases do not bring about an immune response in mammals but bacterial diseases do stimulate an immune response in mammals.
- C. viruses can cause disease in plants but bacteria cannot infect plants.
- D. viruses can only cause disease by entering into specific types of cells but bacteria do not have to enter cells to cause disease.

Question 19

Many bacteria that enter the blood circulatory system are engulfed and destroyed by:

- A. phagocytic white blood cells.
- B. pinocytic red blood cells.
- C. plasma cells.
- D. platelets.

Question 20

Prions are disease-causing agents. Prions are:

- A. very small virus-like molecules.
- B. a harmless protein that has changed to form an infectious protein.
- C. short pieces of DNA that are transferred by eating nerve tissue.
- D. pieces of naked RNA that have escaped from a harmless virus.

Question 21

The purpose of vaccination is to induce:

- A. inflammation, which prepares the patient for infection.
- B. a primary immune response without the patient becoming ill.
- C. the strengthening of non-specific defenses.
- D. passive immunity in case the person becomes ill later.

Question 22

B-lymphocytes:

- A. produce interferon.
- B. attack cells that have been infected by viruses.
- C. engulf and destroy bacteria and viruses.
- D. differentiate into antibody producing plasma cells.

Question 23

Researchers are developing many chemicals that can modify the immune system. Which of the following would have potential as a drug for **inhibiting** transplant rejection?

- A. Compound W that acts like histamine
- B. Compound X that suppresses cytotoxic T cells
- C. Compound Y that stimulates cytotoxic T cells
- D. Compound Z that suppresses B cells

Question 24

An antigen is:

- A. an invading virus or bacterium.
- B. a protein molecule that helps defend the body against disease.
- C. a molecule that initiates a specific response by the immune system.
- D. a type of white blood cell.

Question 25

The antigen binding sites of an antibody molecule are formed from the molecule's variable regions. These regions called variable because:

- A.** they can be different shapes on different antibody molecules.
- B.** their sizes vary considerably from one antibody to another.
- C.** they change their shape when they bind to an antigen.
- D.** their specific shapes are unimportant.

END OF SECTION A

SECTION B - Short answer questions

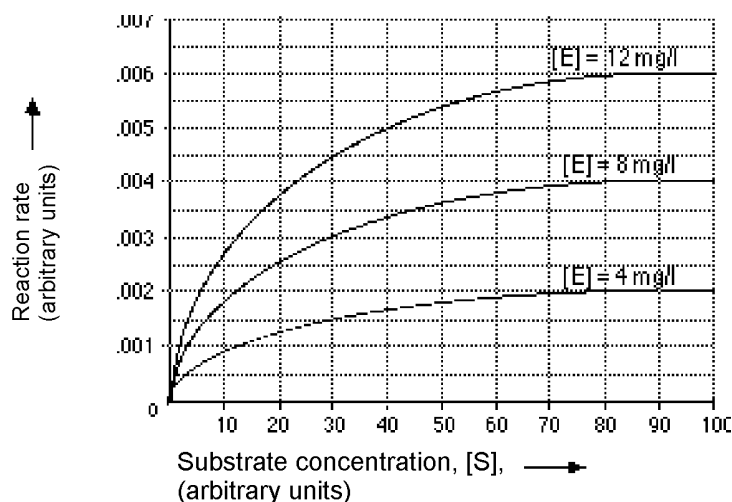
Specific instructions for Section B

This section consists of 7 questions. There are 50 marks in total for this section.

Write your responses in the spaces provided. You should attempt **all** questions. Please write your responses in **blue** or **black ink**.

Question 1

An experiment was carried out to investigate the effect of substrate concentration on the rate of reaction of the enzyme *lactate dehydrogenase*. Three different concentrations of the enzyme were tested. The results of the experiment are shown on the graph on the right.



- a Why are enzymes important in cell metabolism?

(1 mark)

- b Describe the effect of change of substrate concentration on reaction rate at an enzyme concentration, $[E] = 8 \text{ mg/l}$.

(1 mark)

- c At an enzyme concentration, $[E] = 12 \text{ mg/l}$ what is the highest reaction rate observed?

(1 mark)

- d Using your knowledge of enzyme function, explain why addition of substrate above a concentration of 80 arbitrary units is unlikely to increase the reaction rate at any given enzyme concentration.

(2 marks)

In another experiment, the enzyme was heated at 75°C for fifteen minutes before being tested at an enzyme concentration, $[\text{E}] = 4 \text{ mg/l}$ as before.

- e Predict the maximum reaction rate that would be obtained in this experiment. Explain your answer.

Prediction: _____

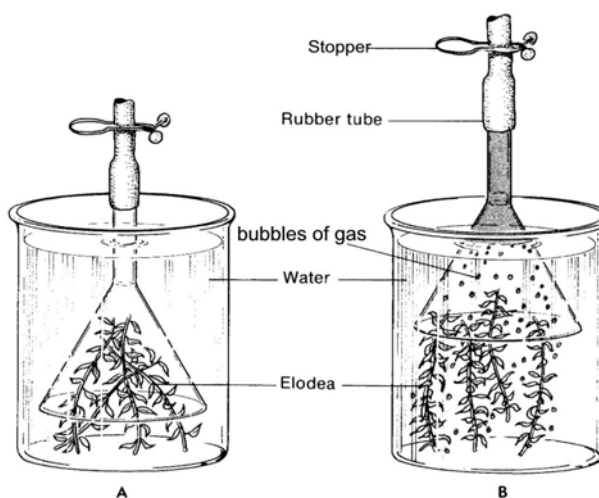
Explanation: _____

(1 + 2 = 3 marks)

Total 8 marks

Question 2

In a simple laboratory experiment, VCE students set up the apparatus shown in the diagram below. Elodea (a freshwater plant) was placed in a beaker of tap water. A funnel was inverted over the Elodea as shown in beaker A. The funnel was raised slightly and the beaker was placed in bright sunlight near a window. Beaker B shows the result obtained after 15 minutes in bright sunlight.



- a Write a balanced chemical equation for the process that is producing the gas in beaker B.

(2 marks)

- b The Elodea cells use some of the gas forming the bubbles in beaker B. Name the process that uses this gas.

(1 mark)

- c What is the purpose of a control in a scientific experiment?

(1 mark)

- d What would be a suitable control in the experiment described in Question 2?

(1 mark)

Total 5 marks

Question 3

Ethylene is a plant hormone that speeds up the ripening of fruits. Ethylene also has the Unwanted effect of speeding up the drooping of flowers grown for their ornamental use. EthylBloc is a new product that slows down the harmful effects of ethylene in flowers and plants. The effectiveness of EthylBloc is seen in the demonstration at the right.

- a Why did the researchers choose an ethylene concentration of 1 ppm for the treatment of the plants?

(1 mark)



Without EthylBloc

With EthylBloc

Plants were treated with EthylBloc for 4 hours at room temperature. All plants were then left overnight in an atmosphere of 1 ppm ethylene. (This is the ethylene level commonly found in the fruit and vegetable section of a supermarket.)

It is thought that EthylBloc interferes with the binding of ethylene to receptors on plant cell membranes.

- b Explain what sort of molecules on plant cell membranes would be likely to act as receptors for ethylene.

(2 marks)

Ethylene is the plant hormone that is generally responsible for the saying "one bad apple ruins the whole barrel of apples".

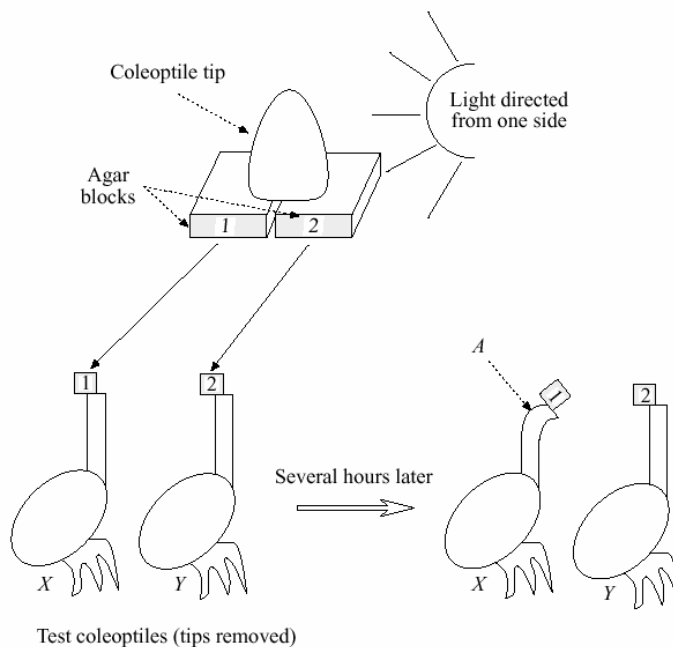
- c** Suggest how EthylBloc might be used to slow down this "one bad apple..." effect.

(2 marks)

Total 5 marks

Question 4

The diagram below shows an experiment on the growth of coleoptile tips from seedlings.



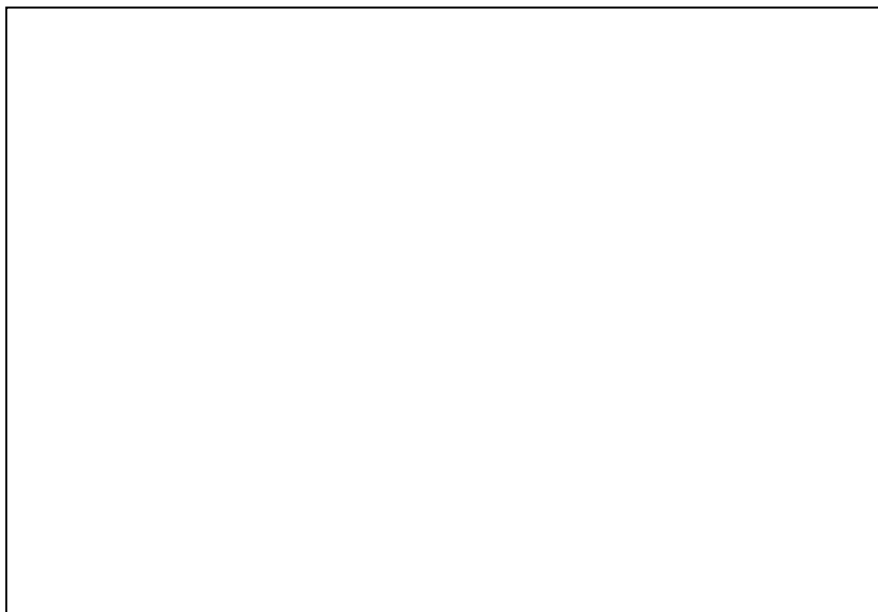
- a** Name the plant hormone that is being investigated in this experiment.

(1 mark)

- b** Explain why the coleoptile stem of plant X bent, but the coleoptile stem of plant Y did not bend.

(2 marks)

- c** In the box below, draw the cells at point A in the coleoptile stem labelled X



(2 marks)

- d** What is the advantage of this response to growing plants?

(1 mark)

Total 6 marks

Question 5

The Alaskan musk rat (*Ondatra zibethicus*) is a water rat with a body length of 25-35 cm and with a flattened tail 20-28 cm long for swimming. The muskrat spends a good deal of its time in water that is around 2°C.

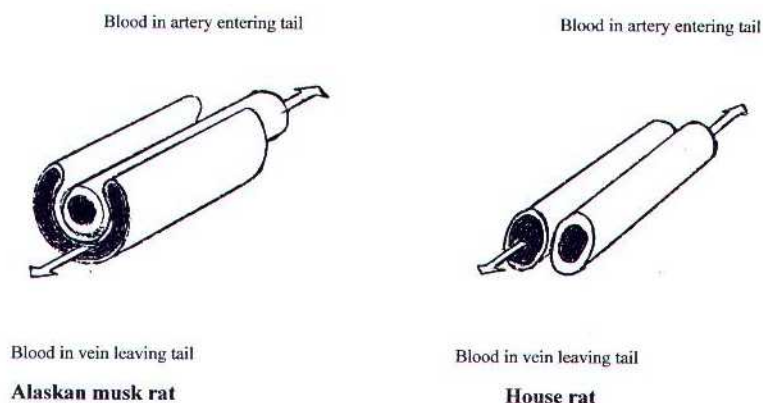
- a** Name the mechanism of heat loss from an animal swimming in water.

(1 mark)

- b** The total surface area of the tail is a large proportion of the total surface area of the muskrat. What effect would this flattened tail have on heat loss for the animal swimming in ice-cold water?

(1 mark)

The arrangement of blood vessels entering the tail of a muskrat was compared with the arrangement of blood entering the tail of an ordinary house rat.



Examine the diagrams above.

- c Are these animals endotherms or ectotherms?

(1 mark)

- d Explain the advantage that this arrangement of blood vessels gives to the muskrat.

(2 marks)

Total 5 marks

Question 6

One of the major functions of the mammalian kidney is to maintain homeostasis. Osmoreceptors in the hypothalamus detect a fall in concentration of water in the blood. They in turn stimulate neurosecretory cells in the hypothalamus to synthesize and secrete antidiuretic hormone (ADH). ADH increases the permeability of the kidney collecting ducts to water, so that more water is absorbed into the bloodstream.

- a What is homeostasis?

(1 mark)

An increase in the rate of urine production occurs following the drinking of a large volume of water. Usually the increase in urine production cannot be detected for more than 30 minutes after consumption of the water. This is an example of a negative feedback mechanism.

b What is meant by a negative feedback mechanism?

(1 mark)

c Outline the biological steps that lead to the increase in urine production and negative feedback after a person has drunk a large amount of water.

(4 marks)

d Alcohol has the effect of inhibiting ADH release. Explain the effect that an excessive alcohol intake would have on an individual's water balance.

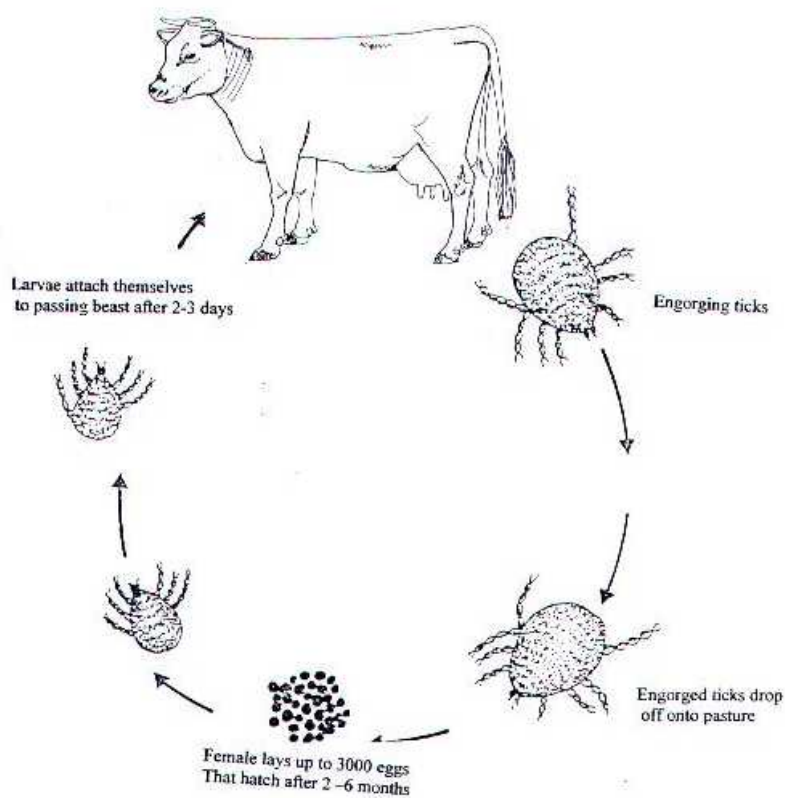
(2 marks)

Total 8 marks

Question 7

Cattle ticks are blood-sucking organisms that attach themselves to cattle as they walk through and feed on grass containing the tick larvae.

The diagram below shows the life cycle of the tick.



The ticks live for about 3 weeks on the cattle passing through the stages of larva to adults. The female adult attaches herself to the cattle and sucks blood until she is fully engorged with blood. She then falls off and lays up to 3000 eggs in the grass.

a List **two** features of the tick that makes it a successful parasite.

Feature 1: _____

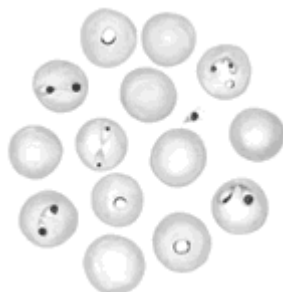
Feature 2: _____

(2 marks)

b Choose **one** of these features and explain how this feature enables the tick to be a successful parasite.

(1 mark)

A particular species of cattle tick (*Boophilus microplus*) transmits the disease tick fever by inoculating a tiny protozoan *Babesia bovis* into the cattle when it sucks the blood. The disease called babesiosis causes severe anaemia, fever and a high death rate as the protozoa enter red blood cells and destroy them. Below is a diagram of the protozoa inside cattle red blood cells.



Babesia inside red blood cells

c Is *Babesia bovis* a prokaryote or a eukaryote?

(1 mark)

d What term best describes the tick in this relationship?

(1 mark)

e What term is given to a disease-causing organism?

(1 mark)

f Which organism should be given the term in (e)?

(1 mark)

g Discuss **two** advantages for the organism *Babesia* to have two different hosts – the tick and the cow.

Advantage 1:

Advantage 2:

(2 marks)

It is important to protect cattle against this disease and a vaccine has been developed and given to calves. This vaccine is a live attenuated vaccine of *Babesia bovis*. After injection the cattle are protected from infection by *Babesia bovis* for at least 4 years.

h Explain why this live attenuated strain does not cause the disease when injected into a calf.

(2 marks)

i Explain why these cattle are protected from the disease for at least four years.

(2 marks)

Total 13 marks

END OF EXAMINATION