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Student name

BIOLOGY
Unit 3
Trial Examination

QUESTION AND ANSWER BOOK

Total writing time: 1 hour 30 minutes

Structure of book

Area	Number of questions	Number of questions to be answered	Number of marks	Suggested times (minutes)
A	25	25	25	30
B	5	5	50	60
		Total	**75**	**90**

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.
- No calculator is allowed in this examination.

Materials supplied

- Question and answer book of 17 pages with a detachable answer sheet for multiple-choice questions inside the front cover.

Instructions

- Detach the answer sheet for multiple-choice questions during reading time.
- Write your **name** in the space provided above on this page and on the answer sheet for multiple-choice questions.
- All written responses should be in English.

At the end of the examination

- Place the answer sheet for multiple-choice questions inside the front cover of this book.

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ABN 51 007 165 611

STAV Publishing
2003

BIOLOGY
Unit 3 Trial Examination
MULTIPLE CHOICE ANSWER SHEET

STUDENT NAME:	

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.

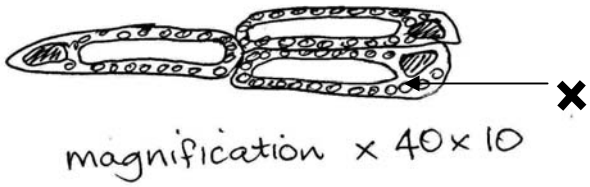
Each question has four possible correct answers. Only **one** answer for each question is correct. Select the answer that you believe is correct and indicate your choice on the Multiple Choice Answer Sheet by crossing the letter that corresponds with your choice of the correct answer.

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.

Questions 1, 2 and 3 refer to the following information

A VCE Biology student drew the cells below after examining a sample under a microscope in her school Biology laboratory.



Question 1

How many cells are visible in the student's drawing?

A. 3
B. 6
C. 9
D. more than 20

Question 2

The sample the student examined was probably from a/an:

A. animal
B. plant
C. fungus
D. bacteria

Question 3

The teacher wanted the student to label structure **X.** This would be correctly labeled as:

A. a chloroplast
B. a ribosome
C. a nucleus
D. a mitochondrion

Question 4

An amoeba is a single celled organism that lives in fresh water. It takes in large food particles by:

A. osmosis
B. diffusion
C. endocytosis
D. exocytosis

Questions 5 and 6 refer to the following information

Two students carried out an investigation to determine the action of the enzyme pepsin on protein digestion in the human stomach. They knew that gastric juice in the stomach contains water, pepsin, and hydrochloric acid. They decided to use small, equal-sized pieces of cooked egg white as the protein to be digested.

They set up four test tubes and placed equal, small amounts of egg white in each test tube. Then they filled each test tube with a different liquid to a height of 3 cm. To test tube 1 they added water, to test tube 2 they added dilute hydrochloric acid (HCl), to test tube 3 they added pepsin in water, and to test tube 4 they added pepsin and dilute hydrochloric acid. They place the four test tubes in an incubator set at 37ºC.

After one day, they observed the following results. They returned the test tubes to the incubator and observed them again the next day. The table below is the record of the results.

Test tube	1 day	2 days
1. egg + water	no change	no change
2. egg + HCl	no change	no change
3. egg + pepsin	liquid slightly cloudy, egg white solid	liquid cloudy, egg white still solid
4. egg + pepsin + HCl	liquid cloudy, pieces of egg smaller	liquid very cloudy, almost no egg remains

Question 5

The control or controls in this experiment is / are:

A. test tube 1
B. test tube 2
C. test tubes 1 and 2
D. test tubes 1, 2 and 3

The students decided to repeat the experiment, but this time they incubated the test tubes at 74^{o}C to see if doubling the temperature made the reaction go more quickly.

Question 6

The most likely result of the student's second experiment is:
A. All four test tubes show the same results as the first experiment, but in one day not two days.
B. There is no change in tubes 1 and 2, but the egg in tubes 3 and 4 is completely gone in two days.
C. There is no change in tubes 1 and 2, the egg white remains in tubes 3 and 4, but the liquid is slightly cloudy in these tubes after two days.
D. There is no change in any of the tubes after two days.

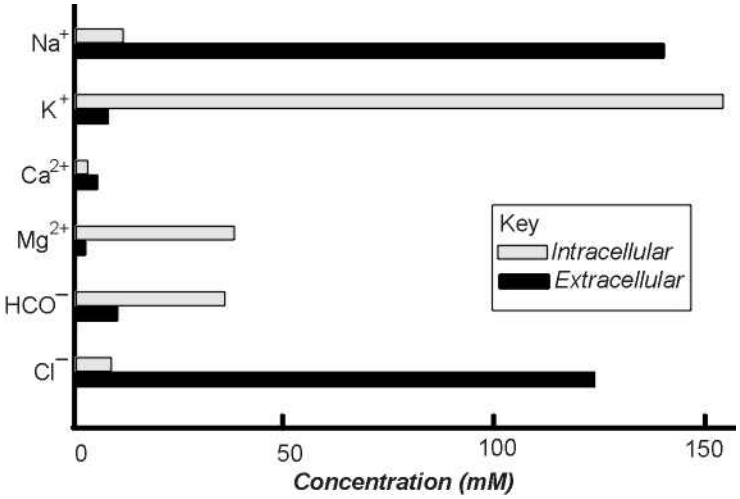
Question 7

The chemicals used to give a general anaesthetic (put the patient to sleep) act within seconds. This is because:

A. they are lipid soluble and cross cell membranes through the lipid bilayer.
B. they act on the brain and release fast acting hormones into the circulation.
C. they are transported into intestinal cells by active transport.
D. they are given by injection into a vein so they arrive at the hypothalamus quickly.

Questions 8, 9 and 10 refer to the following information

The figure below shows the concentrations, in mM, of various ions in intracellular and extracellular fluid in the human body.



Question 8

The concentrations of ions in intracellular fluid, from highest to lowest, is:

A. Na^+, Cl^-, HCO_3^-, K^+, Ca^{2+}, Mg^{2+}
B. Mg^{2+}, Ca^{2+}, K^+, HCO_3^-, Cl^-, Na^+
C. K^+, Mg^{2+}, HCO_3^-, Na^+, Cl^-, Ca^{2+}
D. Ca^{2+}, Cl^-, Na^+, HCO_3^-, Mg^{2+}, K^+

Question 9

From the information given, it is true to say that the ion that is most concentrated inside human cells is:

A. Na^+
B. K^+
C. Mg^{2+}
D. Cl^-

Question 10

The process that maintains the difference in concentration of sodium ions (Na^+) between the intracellular and extracellular fluid is:

A. osmosis
B. facilitated diffusion
C. passive transport
D. active transport

Question 11

When yeast ferments the sugar in a bread mixture, the substance that is produced that causes the bread dough to rise is:

A. carbon dioxide
B. ethanol
C. water
D. oxygen

Question 12

In the late afternoon of a sunny summer day a student noticed that all the sunflowers in a paddock were facing away from the road. The student correctly decided that the most likely explanation for this observation was that:

A. the flowers were facing south as a response to gibberellins.
B. the flowers were facing north in response to the drought.
C. the flowers were facing east in response to auxins.
D. the flowers were facing west in response to positive tropism.

Question 13

Hormones and enzymes are both organic substances formed in living things. Which of the following statements about these substances is correct?

A. Both hormones and enzymes are used at, or near their site of, production.
B. Vitamins are often needed for the efficient functioning of hormones but not for enzyme function.
C. Enzymes are always made up of protein whereas hormones may consist of amino acids or steroids.
D. Both hormones and enzymes catalyse chemical reactions.

Question 14

Viruses share some characteristics with living things these characteristics include:

A. They are made up of cells.
B. They contain genetic material.
C. They reproduce by mitosis.
D. They carry out aerobic respiration.

Question 15

A similarity between the nervous system and the endocrine system is that they both:

A. secrete chemicals across synapses.
B. are composed of neurons.
C. transmit messages from effectors to receptors.
D. maintain homeostasis.

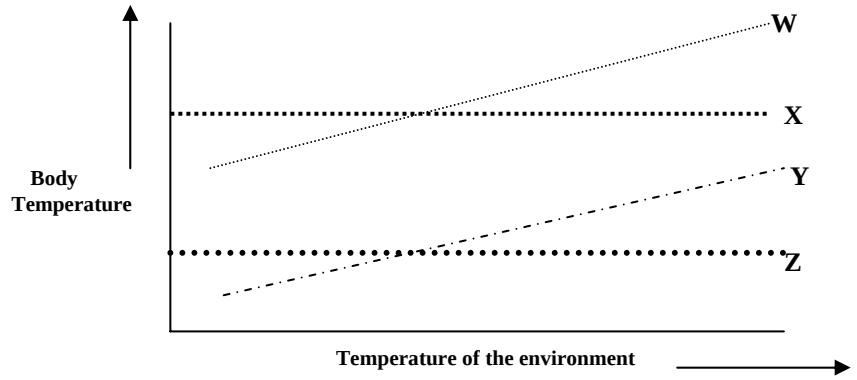
Question 16

During a long distance run on a hot day, an athlete produces large quantities of sweat. As a result the kidneys change the rate of urine production. This change is important because:

A. decreased urine production increases the amino acids in the blood.
B. increased urine production removes urea which is toxic.
C. decreased urine production allows the body to conserve water.
D. increased urine production allows more water to remain in the bloodstream.

Question 17

The graph below shows the body temperature of four animals (W, X, Y and Z) and the environmental temperature.



From the graph it can be deduced that:

A. Animals W and X are desert animals.
B. Animals Y and Z are desert animals.
C. Animals X and Z are endotherms.
D. Animals W and Y are reptiles.

Question 18

Temperature control is important in mammals. Which of the following statements applies to temperature control in humans:

A. A change in body temperature is detected by receptors in the skin.
B. A change in body temperature is the stimulus that causes temperature mechanisms to be activated.
C. The transmission of information from the receptors to effectors involves hormones.
D. Temperature control is an example of positive feedback.

Question 19

The time between exposure to a pathogen and the appearance of symptoms is called:

A. the incubation period.
B. the exposure period.
C. contagious interval.
D. the virulent period.

Question 20

Vaccines can be used to protect animals from infectious diseases. In order to determine if a particular vaccine is effective against a disease found in sheep an investigator would:

A. vaccinate 100 sheep and expose all 100 to the disease.
B. vaccinate 100 sheep and expose only 50 of them to the disease.
C. vaccinate 50 sheep, do not vaccinate 50 other sheep, and expose all 100 to the disease
D. vaccinate 50 sheep, do not vaccinate 50 other sheep, and expose only the vaccinated sheep to the disease.

Question 21

Newborn infants nursing from their mothers receive milk containing antibodies against diseases to which the mother is immune. The infants, however, remain immune to those diseases for only a short time. This situation is an example of:

A. active immunity.
B. passive immunity.
C. an oral vaccine.
D. non specific immunity.

Question 22

When people who are allergic to pollen come into contact with pollen, their eyes begin to water and itch due to:

A. antigens released from red blood cells.
B. antibodies released from B lymphocytes.
C. mast cells degranulating to release histamines.
D. phagocytes engulfing the pollen grains and releasing toxins.

Question 23

Diabetes insipidus is an inherited disease due to endocrine malfunction. The kidneys fail to reabsorb normal amounts of water. Sufferers of this disease produce such large amounts of urine each day that their kidneys deteriorate. Treatment of this disease involves replacing which of the following missing hormones?

A. glucagon
B. insulin
C. renin
D. antidiuretic hormone (ADH)

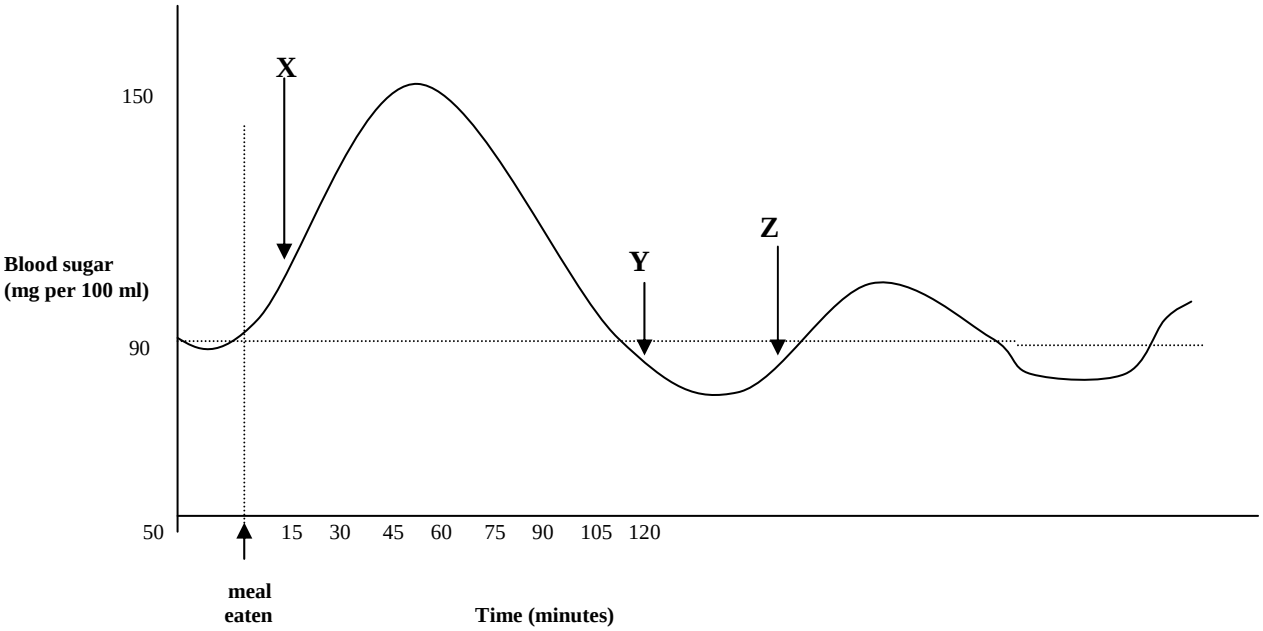
Question 24

The filtrate formed by the nephrons in the kidney is not the same as urine. This filtrate is first refined and concentrated before it leaves the body as urine. The processes involved are:

A. filtration and secretion
B. filtration and reabsorption
C. secretion and excretion
D. reabsorption and secretion

Question 25

The graph below shows the effects of insulin and glucagon hormones on blood sugar.



From the graph it can be deduced:

A. insulin release begins at point X
B. insulin release begins at point Y
C. glucagon release begins at point X
D. glucagon release begins at point Z

END OF SECTION A

SECTION B - Short Answer Questions

Specific instructions for Section B

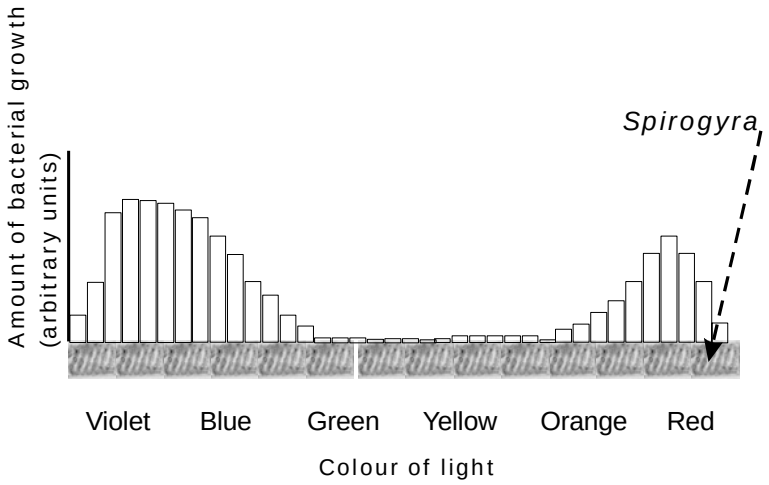
This section consists of 5 questions. There are 50 marks in total for this section.
Write your responses in the spaces provided. You should attempt **all** questions. Please write your responses in **blue** or **black ink**.

Question 1

In 1803, Thomas Engelmann of Germany used a combination of *Spirogyra*, a filamentous alga, and aerobic bacteria to study the effect of various colours of the visible light spectrum on the rate of photosynthesis.

He passed white light through a prism in order to separate the light into the different colours of the spectrum; then he exposed different segments of the *Spirogyra* to the various colours. He observed in which areas of the spectrum the greatest number of bacteria appeared.

His results are shown in the Figure below.



a Did Engelmann's observations support his hypothesis? Explain.

_____

_____

_____

(2 marks)

b Describe one control Engelmann might have used.

_____

_____

(1 mark)

c Based on the Figure, what would Engelmann's conclusion be?

_____

_____

(1 mark)

d What substance was the Spirogyra making that allowed the bacteria to grow as they did?

_____

(1mark)

e Write a balanced equation to illustrate the production of the substance you named in part (**d**) above.

_____

(2 marks)

Total 7 marks

Question 2

Phytophthera cinnamomi is a microscopic fungus that belongs to group known as the water moulds. It needs moist conditions to survive. The fungus invades the root system of susceptible plants, forming a mass of threads - the mycelium - that interferes with the plant's ability to take in and circulate water and nutrients by causing lesions (areas that appear rotten.) This fungus is blamed for "forest dieback" in native forests of Victoria as well as Western Australia and Tasmania, causing millions of dollars worth of damage annually to forest industries, as well as placing many plant populations under serious threat.

a Is Phytophthera a prokaryotic or eukaryotic organism?

_____

(1 mark)

b Explain your answer to (**a**) above.

_____

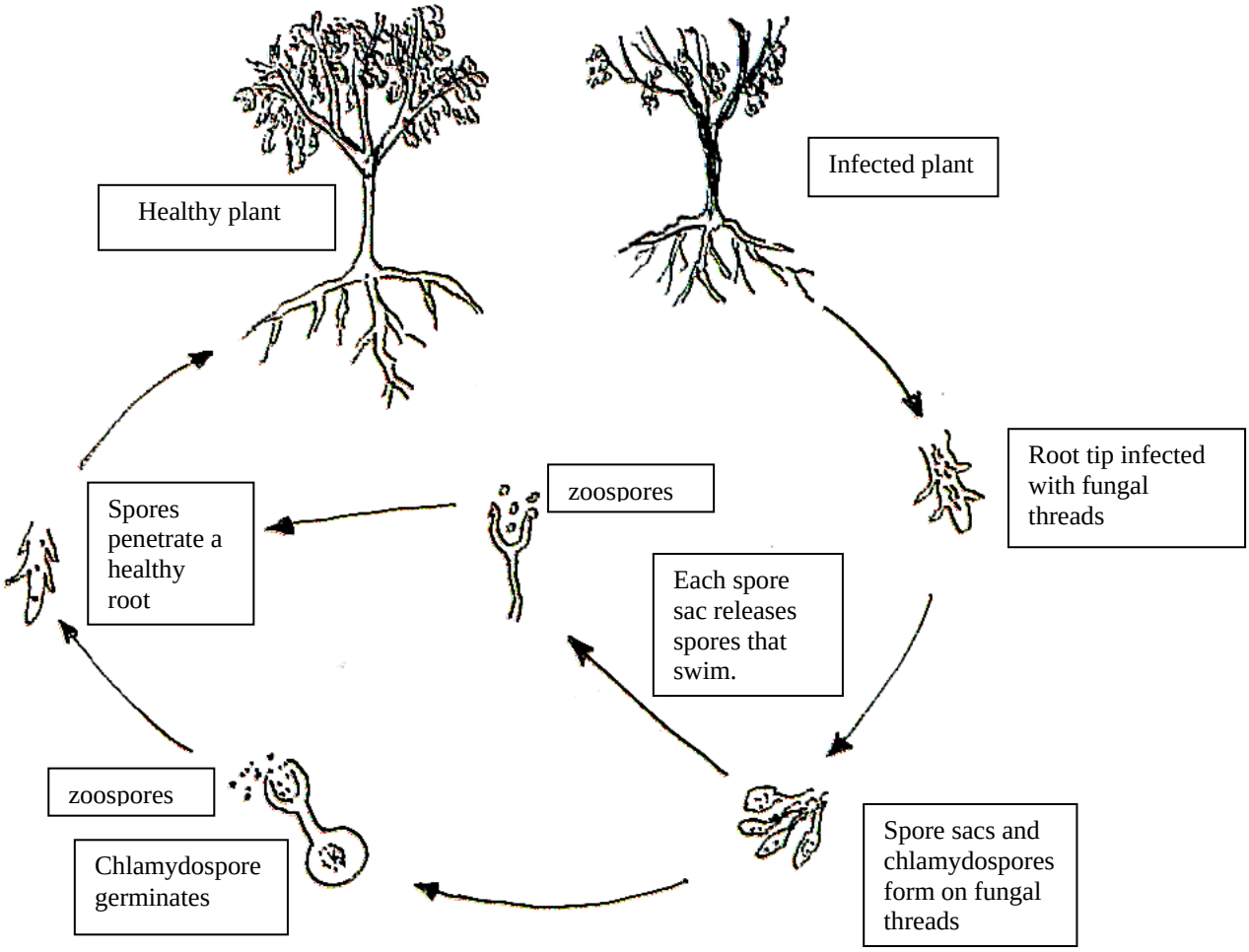
(1 mark)

c Name the part of the vascular tissue of infected plants most likely to be infected by the fungus?

_____

(1 mark)

Phytophthera is able to reproduce through the production of 2 types of microscopic spores; Zoospores that are released in large numbers and have flagella enabling them to swim in the soil water and chlamydospores that are larger, with thick protective walls that can withstand dry conditions. The chamydospores may survive being transported long distances in dry soil. The fungus can also spread by the mycelium from the root of an infected plant making contact with the roots of an uninfected plant. Below is a diagram showing the phytophthera life cycle.



d List **3** features that enable phytophthera to be a successful parasite.

Feature 1. _____

Feature 2. _____

Feature 3. _____

(3 marks)

e Choose **one** feature from (**d**) above and explain how this is an advantage to the fungus.

_____

_____

(2 marks)

Some plants are only moderately susceptible to the fungus and may not die for a year or so after infection whereas other plants such as Banksia die in a few weeks.

f Suggest a possible mechanism that a less susceptible plant may use to lessen the effect of the fungus.

_____

_____

(1 mark)

The fungus is rapidly spreading throughout Victoria.

g Suggest a way in which the fungus can spread over large distances.

_____

_____

(1 mark)

h Suggest a practical way in which the spread of this fungus could be reduced.

_____

_____

(1 mark)

Total 11 marks

Question 3

Australia has many venomous snakes. One species, commonly called the Death Adder (*Acanthophis antarticus)*, has one of the most dangerous bites in the world.

The active component of the venom is an alpha neurotoxin that binds to the receptor sites for acetyl choline. Paralysis of muscles results and death can occur when the muscles of the diaphragm become paralysed and breathing is prevented.

a What type of substance is acetylcholine?

_____

(1 mark)

b What is the function of the substance in **(a)**?

_____

(1 mark)

c Explain how the alpha neurotoxin prevents the acetylcholine from working?

_____

_____

(2 marks)

Fortunately, there is an anti-venom injection available to people who have been bitten by a Death Adder. If the anti-venom is injected quickly enough it prevents the paralysis.

The anti-venom is prepared by injecting tiny amounts of snake venom into horses over a long period of time. The amounts of venom injected are so small that the horses are unaffected, however, there is a response by the horses' immune system.

d What substances would the horse produce in order to counteract the snake venom in its body?

_____

(1 mark)

e What cells in the horse would be responsible for the formation of the substance above?

_____

(1 mark)

f Explain why small amounts of venom are injected into the horse over a long period of time?

_____

_____

(2 marks)

g Outline the steps involved in the formation of compounds named in (**d**) above.

_____

_____

_____

_____

_____

(3 marks)

After 10 – 12 months blood is extracted from the horse and the plasma can be injected into snake-bite victims.

h What term is given to the use of horse plasma as a treatment for snake-bite?

_____

(1 mark)

i How is this effective in treating the snake-bite victim?

_____

_____

(1 mark)

Total 13 marks

Question 4

Both the platypus (*Ornithorhychus anatinus*), and the Australian water rat (*Hydromys chrysogaster)* spend time searching for food in very cold water. The platypus is a monotreme whereas the water rat is a placental or eutherian mammal. The following table compares the two animals.

Feature	Water rat	Platypus
Mass (male)	**400 – 1275g**	**1000 - 2400g**
Average body temperature	**38°C**	**32°C**

a Name **two** ways that heat is lost from both these animals during a dive?

i _____

ii _____

(2 marks)

The platypus is very good at surviving in cold water even though it is small in size.

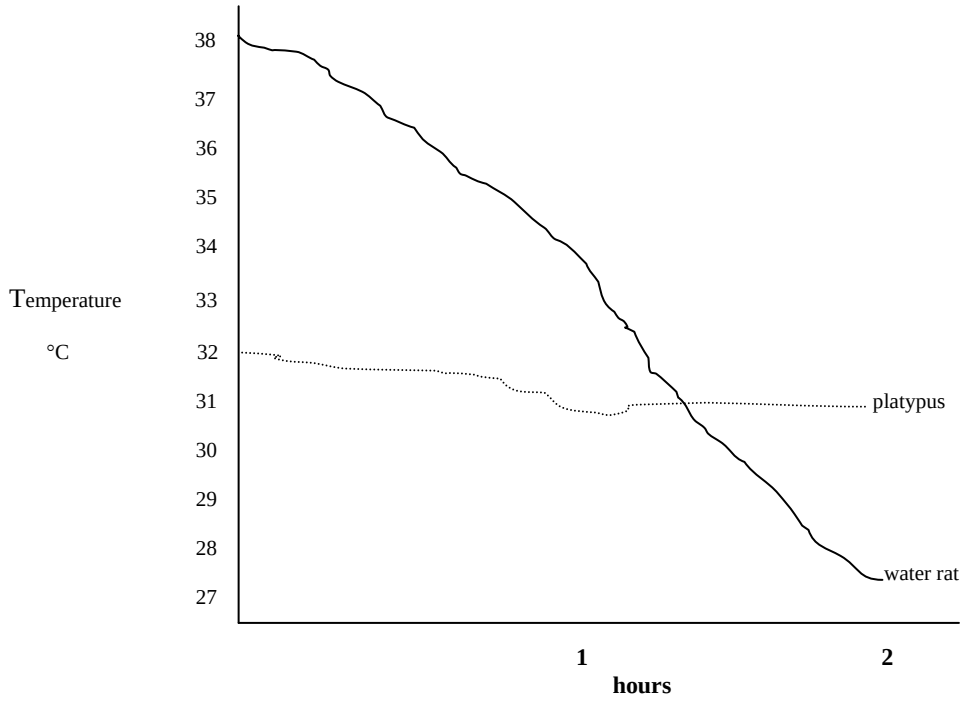
b How does the size of an animal relate to its heat loss?

_____

_____

(2 marks)

The graph below shows the temperature change in both animals over a period of two hours in water at a temperature of 5°C.



c Using the information in the graph, explain which animal is most effective in conserving body heat.

_____

_____

(2 marks)

The basal metabolic rate of the platypus is approximately 70% of eutherian (placental) mammals like the water rat.

d What is the name of the cellular process that generates heat in all types of animals?

_____

(1 mark)

Both the water rat and the platypus undergo a reduced heart rate during a dive, a state know as brachycardia.

e How does this state of brachycardia aid temperature control in these animals?

_____

_____

_____

(2 marks)

The water rat, unlike the platypus, lacks highly insulated fur and efficient heat conserving vascular networks.
The platypus has a complicated blood network involving a countercurrent mechanism to the tail, bill and hind legs.

f Explain what is meant by a countercurrent mechanism and how it reduces heat loss?

_____

_____

_____

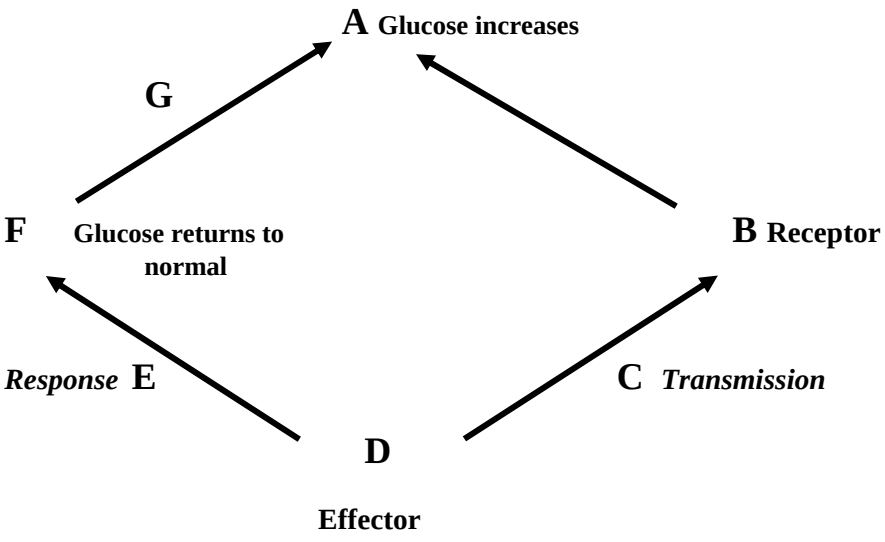
_____

(3 marks)

Total 12 marks

Question 5

Regulation of blood glucose levels is an important homeostatic mechanism in mammals.
The diagram below represents a scheme for the body's response to an **increase** in glucose.



a Name the receptor at **B**.

_____

(1 mark)

b **i** What **type** of substance is responsible for transmission at **C**?

_____

(1 mark)

ii Name the substance used for transmission at **C.**

_____

(1mark)

c Name the effector at **D.**

_____

(1 mark)

d What term is given to the mechanism that is represented by **G**?

_____

(1 mark)

e Explain how the mechanism named in part **d** functions in the specific situation shown in the diagram on the previous page, representing the body's response to an increase in glucose.

_____

_____

_____

(2 marks)

Total 7 marks

END OF EXAMINATION