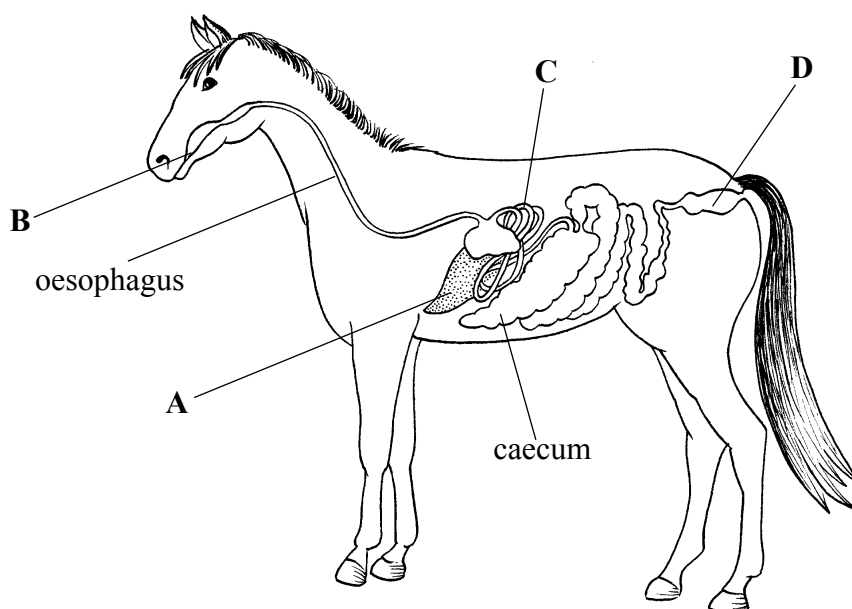


Answer ALL the questions. Write your answers in the spaces provided.

1. The horse is a mammal and the digestive system is similar to that of humans.

The diagram shows the digestive system of a horse with parts labelled **A**, **B**, **C** and **D**.



(a) The statements below are about the digestive system. Choose the correct letter to match each statement. Put a cross (☒) in the correct box.

This is where plant food is chewed **A** **B** **C** **D**

This is where faeces are stored **A** **B** **C** **D**

This is where most villi are found **A** **B** **C** **D**

(3)

(b) Explain how food is moved along the oesophagus.

.....

.....

.....

.....

(2)



(c) The caecum contains bacteria. These bacteria help the horse by digesting the carbohydrate in plant cell walls and by making vitamin C.

(i) Name the carbohydrate found in plant cell walls.

.....
(1)

(ii) Why does a horse need vitamin C?

.....
.....
(1)

(d) The table gives the energy needed by the horse at increasing levels of exercise from a slow walk to a gallop.

Level of exercise	Energy needed in kJ per kg per hour
slow walk	7.1
fast walk	10.5
slow trot	27.1
medium trot	39.7
fast trot	57.3
gallop	96.1

(i) Describe the relationship between the level of exercise and energy needed.

.....
.....
(1)

(ii) A horse weighing 500 kg walks fast for one hour. How much energy does it use?

.....
..... kJ
(1)

(Total 9 marks)

Q1

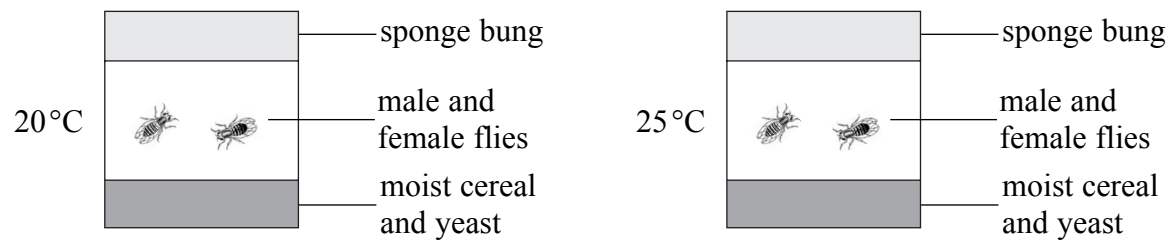


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2. The tubes below were used to breed insect flies. One tube was kept at 20°C and the other tube was kept at 25°C. Each tube contained one male and one female fly.



(a) (i) The sponge bung stops the flies escaping. It also allows gases to enter and leave the tube. Name **one** gas used by the flies and **one** gas produced by the flies.

gas used

gas produced

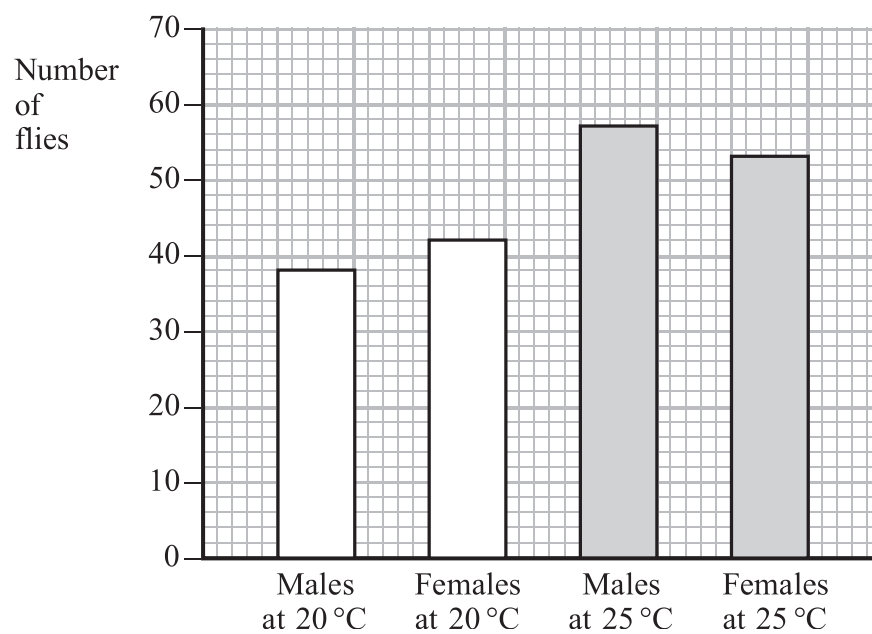
(1)

(ii) The flies feed on the yeast cells and the yeast cells feed on the cereal. Use this information to draw a food chain in the space below.

(2)



(b) The graph shows the number of male and female offspring produced in each tube after two weeks.



(i) How many male offspring were produced after two weeks at 20°C?

..... **(1)**

(ii) More male offspring were produced after 2 weeks at 25°C than at 20°C. Calculate the percentage increase at the higher temperature. Show your working.

..... % increase **(2)**

(c) Suggest why more offspring were produced after two weeks at 25°C.

.....

 **(2)**



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(d) (i) Equal numbers of male and female offspring were expected at 20°C.

Use your knowledge of how sex chromosomes are inherited to show why. You may use a genetic diagram in your answer.

.....
.....
.....
.....

(5)

(ii) Suggest **one** reason why equal numbers of male and female offspring were not obtained at 20°C.

.....
.....

(1)

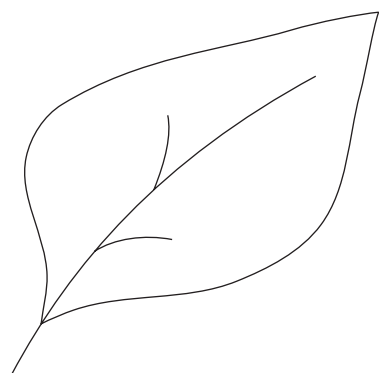
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Q2

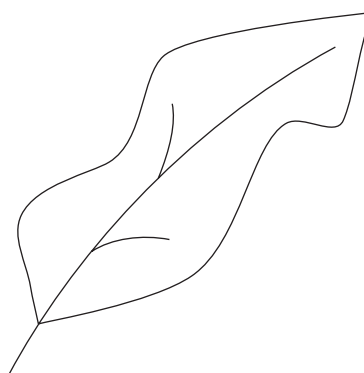
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3. The diagram shows a leaf from a crop plant before and after it was attacked by an insect pest.



Before



After

(a) Suggest how the insect pests would affect crop yield.

.....
.....
.....
.....
.....
.....

(3)

(b) Explain why farmers often spray pesticide onto their crops.

.....
.....
.....
.....

(2)



(c) The table shows the changes in the numbers of an insect pest in a glasshouse during a period of 50 days. The crop was sprayed with pesticide twice during this time.

Time in days	Number of insects in thousands
0	44
5	54
6	6
14	8
20	12
28	20
29	16
35	28
42	42
50	54

(i) The crop was first sprayed with pesticide on day 5. Use the data in the table to suggest the day on which the crop was sprayed with pesticide for the second time.

.....
(1)

(ii) What was the decrease in numbers of the insect after spraying with pesticide on day 5?

.....
(1)

(d) Give **two** disadvantages of using pesticides.

1

.....

.....

2

.....

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(2)

(Total 9 marks)

Q3



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4. *Campylobacter jejuni* is a bacterium that causes food poisoning. Most people recover from this illness, but in some people serious problems occur.

The effects could lead to kidney failure and damage to red blood cells.

(a) (i) Name **one** substance that would not be removed from the body if the kidneys failed.

.....
(1)

(ii) Why would damage to red blood cells lead to problems?

.....
.....
(1)

(b) Another effect can be damage to nerve cells. This is caused when nerve cells are damaged by the antibodies that the body produces to attack the *Campylobacter* bacteria.

(i) Name the cells in the body that produce antibodies.

.....
(1)

(ii) Damage to nerve cells that control breathing can lead to paralysis. The paralysis occurs because the muscles involved in breathing do not receive impulses to make them contract.

Explain why paralysis of breathing muscles is dangerous.

.....
.....
.....
.....
.....
.....
(3)

(Total 6 marks)

Q4



5. Read the passage and answer the following questions.

When a sample of water is tested, its water quality is measured by finding out how much of its oxygen is used up when it is kept sealed in the dark for five days. The oxygen is used by microorganisms breaking down organic matter in the water. The amount of oxygen used up is called the biological oxygen demand or BOD, and is calculated in mg per litre. The higher the BOD the more polluted the water is. The table shows some typical BOD values.

Sample	BOD in mg per litre
Clean water	3
Polluted water	10
Water containing treated sewage	20
Water containing raw sewage	300

(a) What is the BOD ratio between water containing raw sewage compared with water containing treated sewage?

.....
(1)

(b) Explain why polluted water has a high BOD.

.....
.....
.....
.....
.....
.....
(3)

(c) What would happen to the BOD of clean water if eutrophication occurred?

.....
(1)

(Total 5 marks)

Q5



6. Describe and explain the consequences of smoking on human lungs.

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(Total 5 marks)

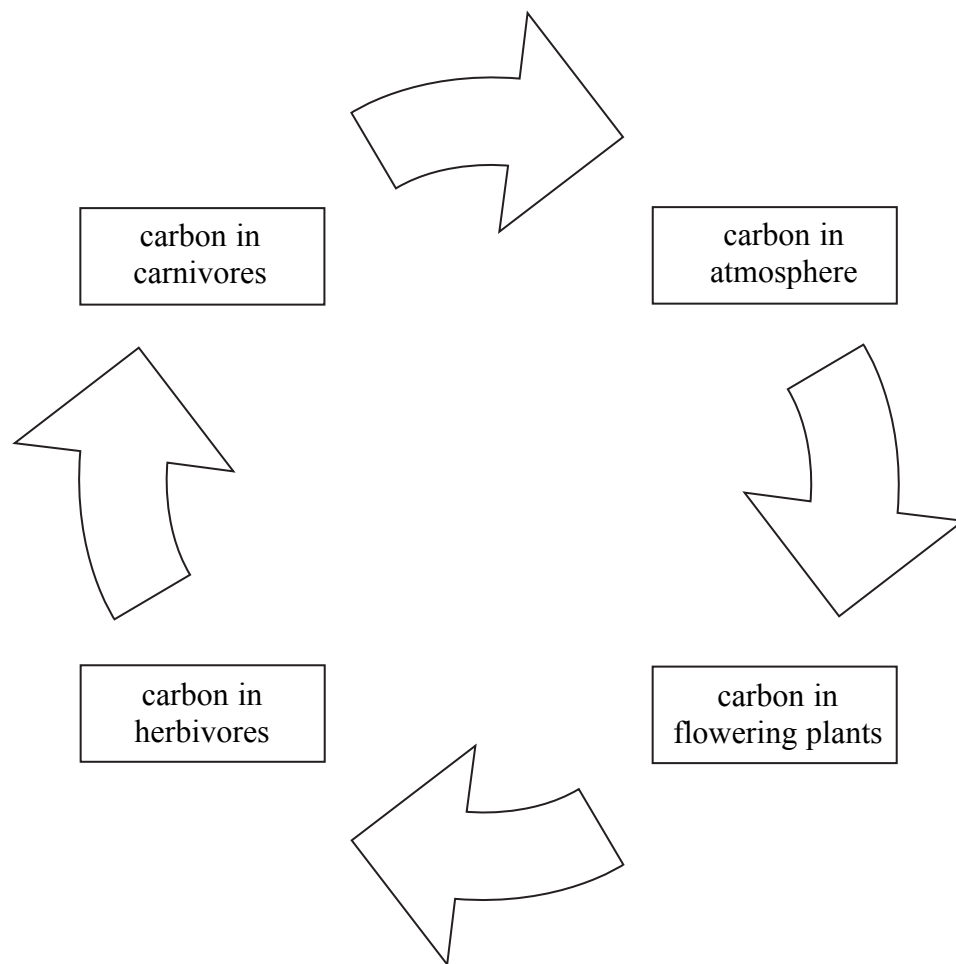
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Q6



N 2 6 2 7 6 A 0 1 3 2 0

7. The diagram shows part of the carbon cycle. This shows how carbon compounds enter and leave living organisms.



(a) The arrows on the diagram represent various processes.

Write a word next to each arrow to show which process it represents. Choose your words from the list. Each word may be used once, more than once or not at all.

- respiration
- photosynthesis
- feeding

(4)

(b) On the diagram, draw and label **one** arrow to represent the process of decomposition.

(1)

Q7

(Total 5 marks)

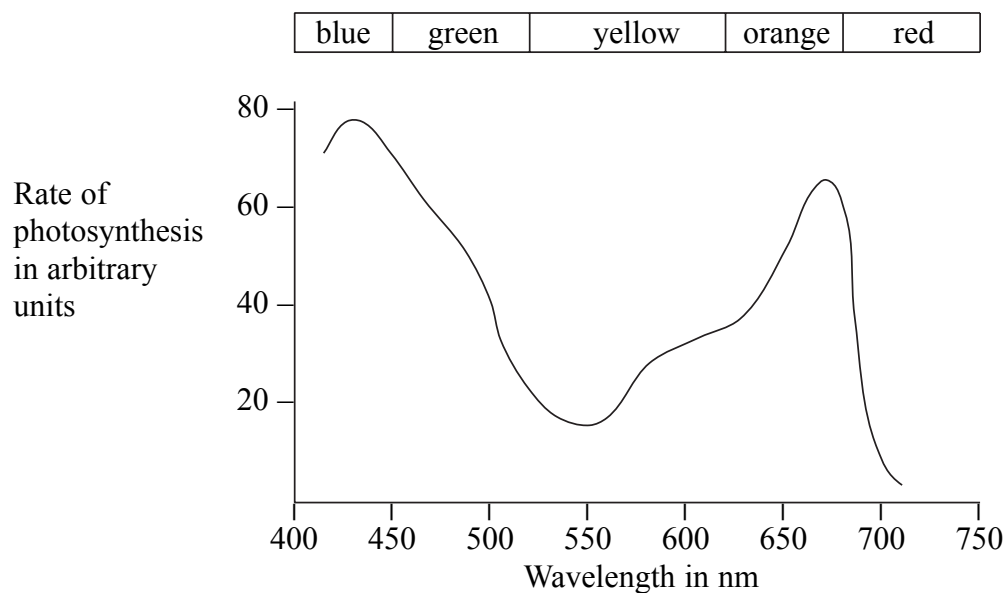


8. Chlorophyll is a green pigment found in plants. It absorbs light, which is used in photosynthesis.

(a) In which cells of the leaf would you expect to find most chlorophyll?

.....
(1)

(b) The graph shows the rate of photosynthesis of a plant when exposed to different colours of light. Different colours of light have different wavelengths.



At which **two** wavelengths of light is the rate of photosynthesis highest?

.....
(2)

(c) Describe and explain the effect on the rate of photosynthesis you would expect if green light is shone on the leaf instead of blue light.

.....
.....
.....
.....
(2)

(d) Name **two** factors, other than wavelength, that can affect the rate of photosynthesis.

1

2

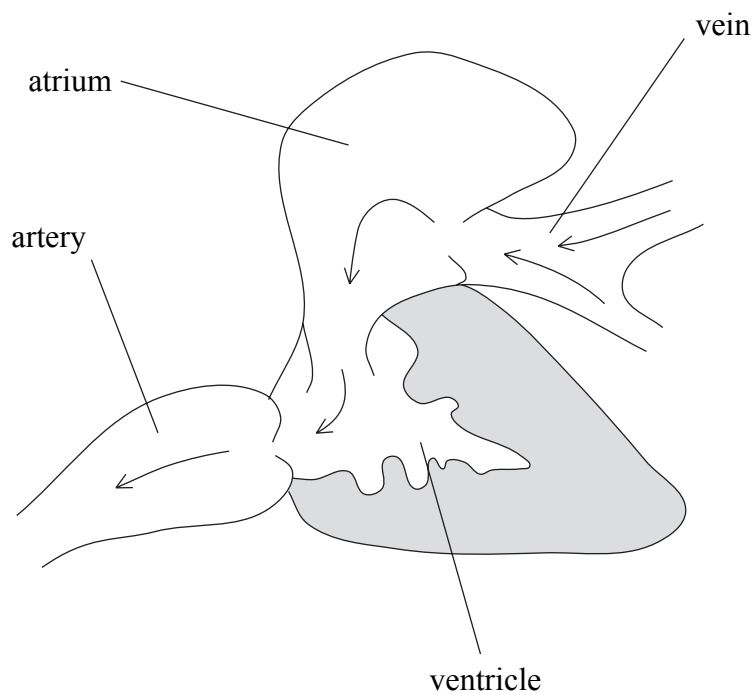
(2)

(Total 7 marks)

Q8



9. The diagram shows a section through the heart of a freshwater fish. The arrows show the direction of blood flow.



(a) (i) Give **two** ways in which the structure of the fish heart is similar to the heart of a human.

- 1
- 2 **(2)**

(ii) Give **two** ways in which the structure of the fish heart differs from the heart of a human.

- 1
- 2 **(2)**

(b) The circulation system of a human is known as a double circulation system. Suggest why the circulation system of a fish is known as a single circulation system.

-
-
-
- **(2)**



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(c) The heart pumps blood which transports substances around the body. Complete the table below to show the origin and destination of each of the substances listed.

Substance	Origin (where taken into the blood)	Destination (where removed from the blood)
oxygen		respiring cells
glucose		
urea	liver	
ADH		

(6)

(Total 12 marks)

Q9

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17

Turn over



N 2 6 2 7 6 A 0 1 7 2 0

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10. (a) Genetic modification (genetic engineering) uses enzymes to cut and join sections of DNA.

(i) Name the enzyme used to cut DNA at a specific site.

.....
(1)

(ii) Name the enzyme used to join two sections of DNA.

.....
(1)

(b) (i) Name **one** human hormone that is produced by genetically modified bacteria.

.....
(1)

(ii) Give **one** advantage of using genetically modified bacteria to produce this hormone.

.....
.....
(1)

(Total 4 marks)

Q10



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11. The passage below describes stages involved in the process of micropropagation in plants.

Use suitable words to complete the sentences in the passage.

Very small pieces are cut from the tips of stems or side shoots of a plant.

When these pieces have been removed they are called

..... They are cut to a size

of about 0.5 to 1 mm. They are then placed

in medium

containing and

....., which help the pieces to

grow into small plants. When the small plants have grown roots they are

transferred to a glasshouse. They are grown in pots containing

....., and

conditions such as and

..... can be controlled. The small

plants produced are called

which means they are genetically

Q11

(Total 9 marks)



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12. Describe what is meant by a mutation and explain the effects a mutation could have in a population of organisms.

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Q12

(Total 5 marks)

TOTAL FOR PAPER: 90 MARKS

END

