

Please write clearly in block capitals.

Centre number

Candidate number

Surname

Forename(s)

Candidate signature

I declare this is my own work.

INTERNATIONAL GCSE

COMBINED SCIENCE

Paper 1 Biology Extension

E

Tuesday 4 June 2024

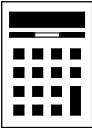
07:00 GMT

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a pencil and a ruler
- a scientific calculator.



Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.
- You are expected to use a scientific calculator where appropriate.

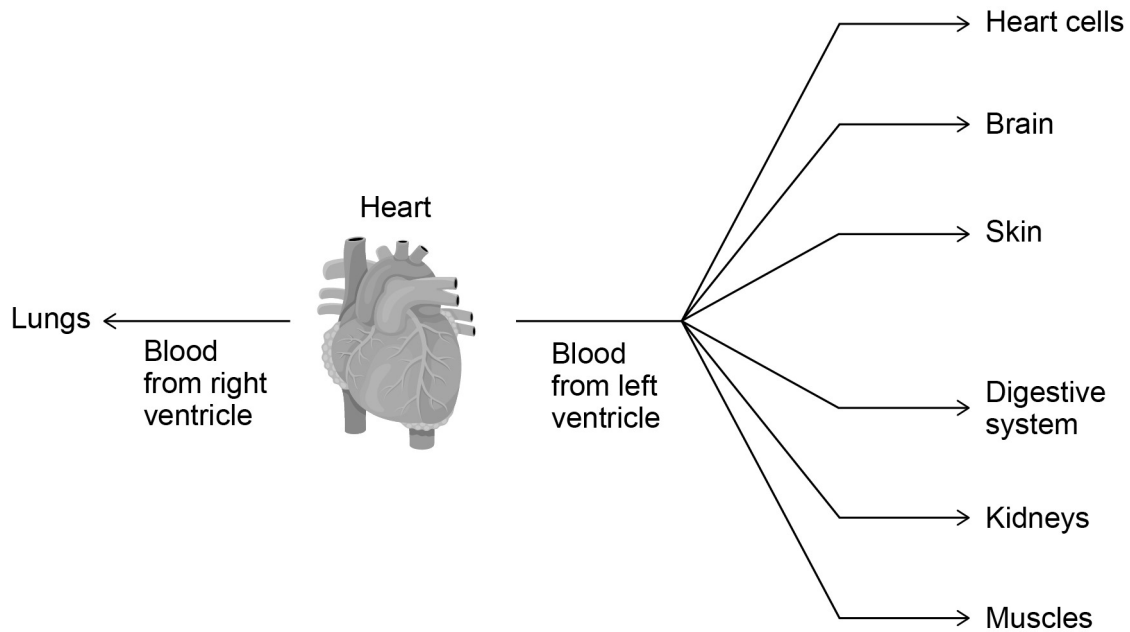
For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

Answer **all** questions in the spaces provided.

0 1

Figure 1 shows the flow of blood to different parts of the body.

Figure 1



0 1 . 1

The blood transports oxygen and carbon dioxide.

Complete **Table 1** to show the concentration of gases in blood from each ventricle.

You should write either **high** or **low** in each box.

[2 marks]

Table 1

	Concentration of oxygen	Concentration of carbon dioxide
Blood from right ventricle		
Blood from left ventricle		



0 1 . 2 Why does blood flow to the small intestine increase during digestion?

[1 mark]

Tick (✓) **one** box.

So that insoluble molecules are digested

☐

So that more water is absorbed from the faeces

☐

To add more enzymes onto the food

☐

To speed up absorption of soluble molecules

☐

0 1 . 3 Explain why blood flow to muscles increases as a person starts to exercise.

Do **not** refer to lactic acid.

[4 marks]

Question 1 continues on the next page

Turn over ►



Lactic acid is produced in the muscles during vigorous exercise.

0 1 . 4 Complete the word equation for the production of lactic acid in muscles.

[1 mark]

_____ → lactic acid

The blood transports lactic acid from the muscles to the liver to be broken down.

0 1 . 5 Why is it important to remove lactic acid from the muscles?

[1 mark]

An athlete investigated how blood lactic acid concentration varied after exercise.

The athlete:

- exercised vigorously for a period of time
- had a recovery period of 40 minutes after the exercise finished
- measured blood lactic acid concentration during the recovery period
- repeated the same vigorous exercise the next day.

On day **1**, the athlete did **no** exercise during the recovery period.

On day **2**, the athlete did gentle exercise during the recovery period.

0 1 . 6 Suggest **two** ways that the athlete could make sure that the exercise had the same effect on the body on both days.

[2 marks]

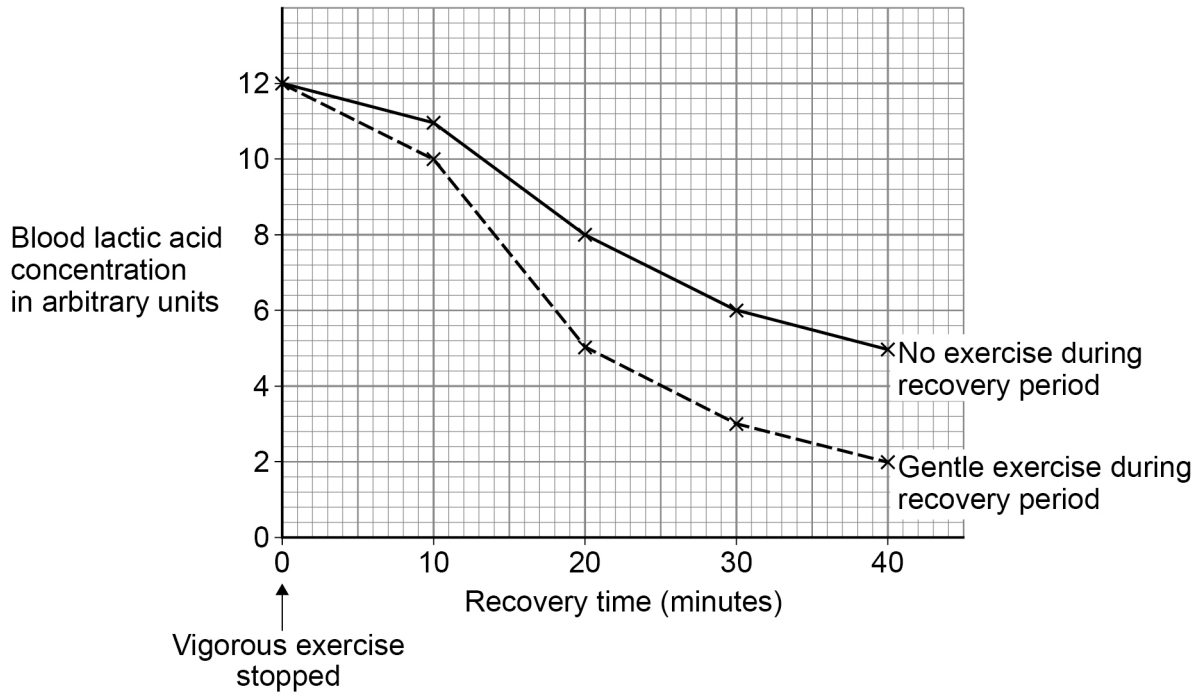
1 _____

2 _____



0 1 . 7 Figure 2 shows the results.

Figure 2



Blood lactic acid concentration at rest is 1 arbitrary unit.

Give **three** conclusions from the results in **Figure 2**.

[3 marks]

1 _____

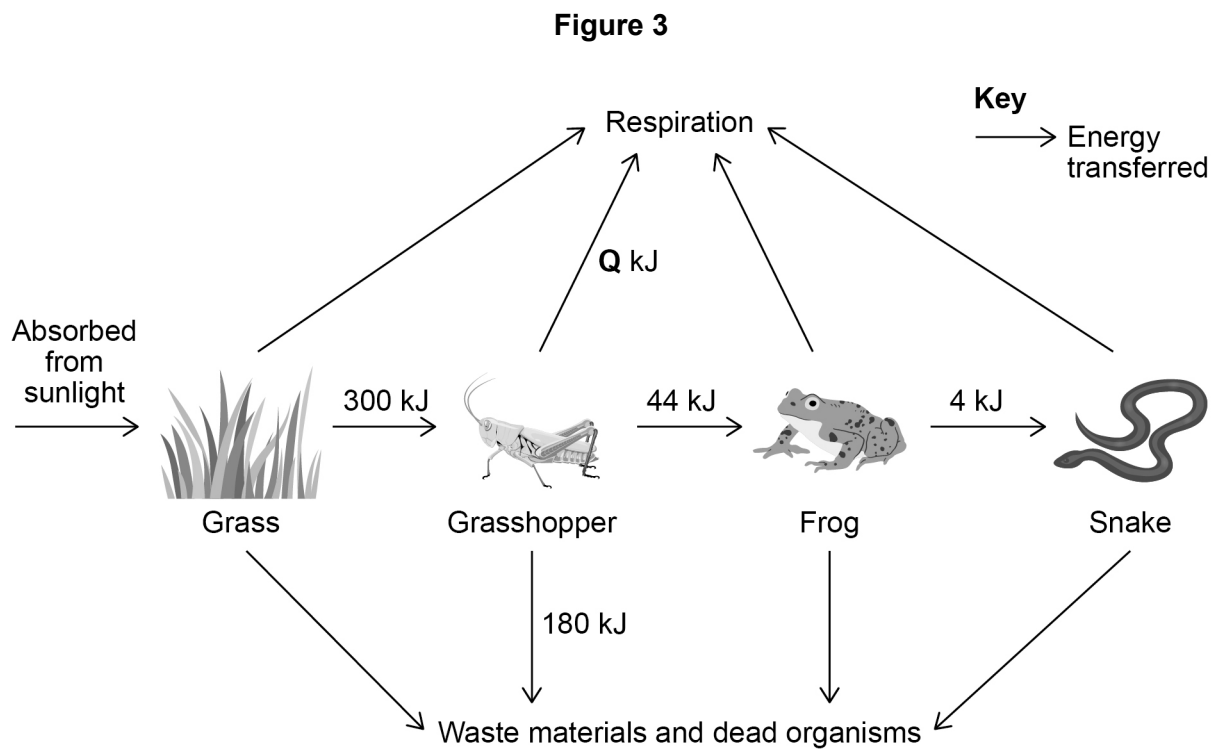
2 _____

3 _____



0 2

Figure 3 shows the flow of energy through a food chain.



0 2 . 1

300 kJ of energy is transferred from grass to grasshoppers.

Energy transferred by respiration of the grasshoppers is shown as **Q** in **Figure 3**.

Determine value **Q** in **Figure 3**.

[2 marks]

Q = _____ kJ



0 2 . 2 Which **two** molecules are produced in grass using energy from respiration?

[2 marks]

Tick (✓) **two** boxes.

Amino acids

☐

Carbon dioxide

☐

Nitrates

☐

Protein

☐

Water

☐

0 2 . 3 Describe how the carbon in waste materials and dead organisms is returned to the environment to be used by plants.

[4 marks]



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ANSWER IN THE SPACES PROVIDED**



0	3
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There are different species of ferret.

Figure 4 shows one species of ferret called the black-footed ferret.

Figure 4



The number of black-footed ferrets is too low for the species to survive in the wild.

Scientists removed some black-footed ferrets from the wild and kept them captive in a zoo.

0	3
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1

Suggest **one** reason why keeping black-footed ferrets in a zoo helps them survive.

[1 mark]

Question 3 continues on the next page

Turn over ►

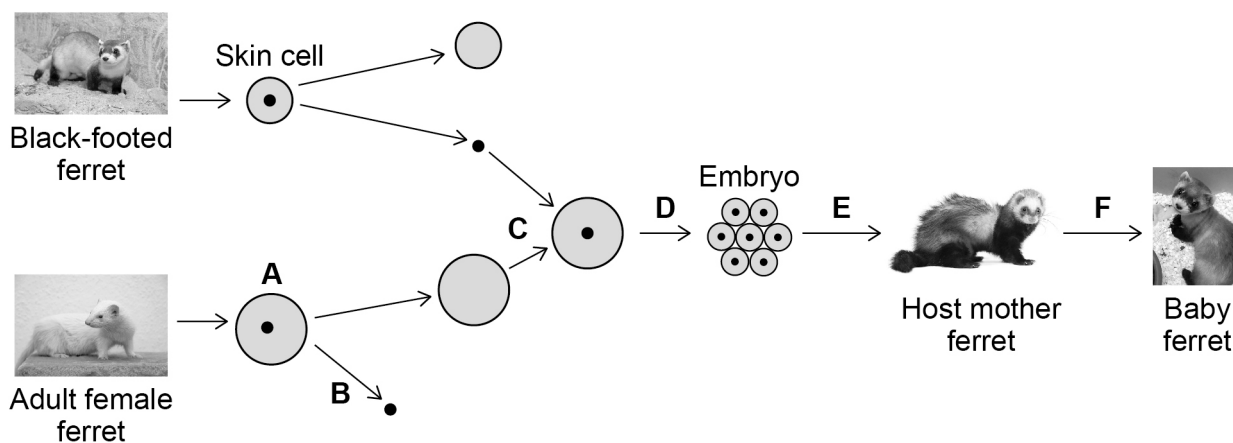


The black-footed ferrets in the zoo did not produce any offspring by sexual reproduction.

A skin cell taken from a black-footed ferret in the zoo was used to produce another black-footed ferret by adult cell cloning.

Figure 5 shows the process of adult cell cloning.

Figure 5



0 3 . 2 What type of cell is cell **A**?

[1 mark]

Tick (✓) **one** box.

Egg cell

☐

Muscle cell

☐

Nerve cell

☐

Skin cell

☐


0 3 . 3 **Table 2** describes some of the stages of adult cell cloning shown in **Figure 5**.

Complete **Table 2**.

[3 marks]

Table 2

Stage on Figure 5	Description
B	
C	
D	The cell divides and forms an embryo
E	
F	The host mother ferret gives birth to a baby ferret

0 3 . 4 What is used to stimulate the cell to start dividing at stage **D**?

[1 mark]

0 3 . 5 Which ferret in **Figure 5** is genetically identical to the baby ferret?

[1 mark]

0 3 . 6 Animal species may not survive when there are changes in their environment.

Suggest **two** human activities that can cause changes in the environment where a species lives.

[2 marks]

1 _____

2 _____

Turn over ►



0	4
---	---

Plants absorb light for photosynthesis.

0	4	.	1
---	---	---	---

Name **one other** type of organism that absorbs light for photosynthesis.

[1 mark]

0	4	.	2
---	---	---	---

Complete the sentences about photosynthesis.

[2 marks]

Light is absorbed by a green substance called _____.

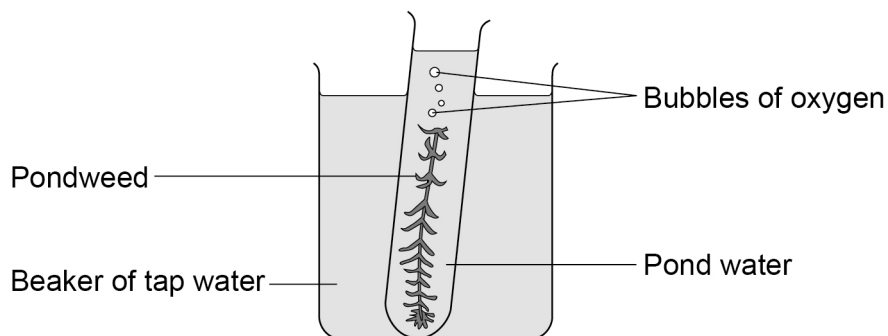
The parts of a plant cell that contain the green substance
are called _____.

Pondweed is a plant that grows in a pond.

A pond is a small lake.

Figure 6 shows pondweed in pond water.

Figure 6



The pondweed releases bubbles of oxygen into the water during photosynthesis.



[1 mark]

[6 marks]

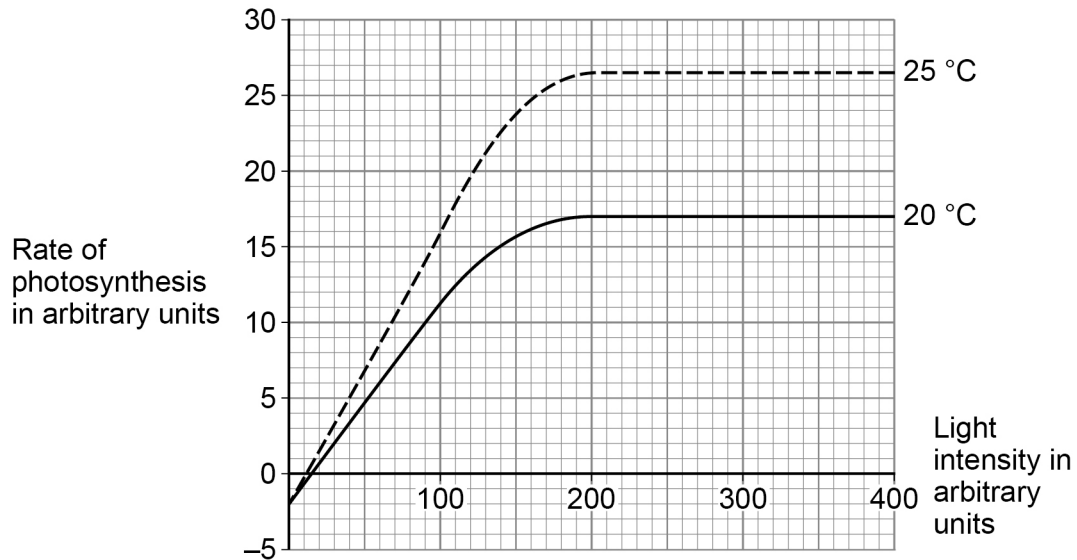
Turn over ►



A scientist investigated the effect of light intensity on the rate of photosynthesis in pondweed at different temperatures.

Figure 7 shows the results.

Figure 7



0 4 . 5

The rate of photosynthesis at a light intensity of 300 arbitrary units increased when the temperature increased from 20 °C to 25 °C.

Calculate the percentage increase in the rate of photosynthesis.

Give your answer to 2 significant figures.

[4 marks]

Percentage increase (2 significant figures) = _____ %



0

4

6

In the investigation, the scientist measured the concentration of oxygen in the water.

Explain why the rate of photosynthesis shown in **Figure 7** was a negative value when the light intensity was 0 arbitrary units.

[3 marks]

17

Turn over for the next question

Turn over ►



0 5

Bacterial and viral pathogens affect the body in different ways.

0 5 . 1

Describe how bacteria and viruses affect the body.

[2 marks]

Bacteria _____

Viruses _____

0 5 . 2

Complete the sentence.

[1 mark]

White blood cells ingest pathogens in a process called _____.

0 5 . 3

There are antigens on the surface of cells.

What type of molecule are antigens?

[1 mark]

0 5 . 4

Antibodies attach to the antigens on pathogens.

Explain why there are many different types of antibody.

[2 marks]



People can be protected against disease by methods including:

- antibiotics
- vaccines containing dead or inactive forms of the pathogen
- injections containing antibodies against the pathogen.

A person becomes infected by a virus that causes serious illness.

Evaluate the use of each of the three methods to treat the person infected with a virus.

[5 marks]

[illegible]

Question 5 continues on the next page

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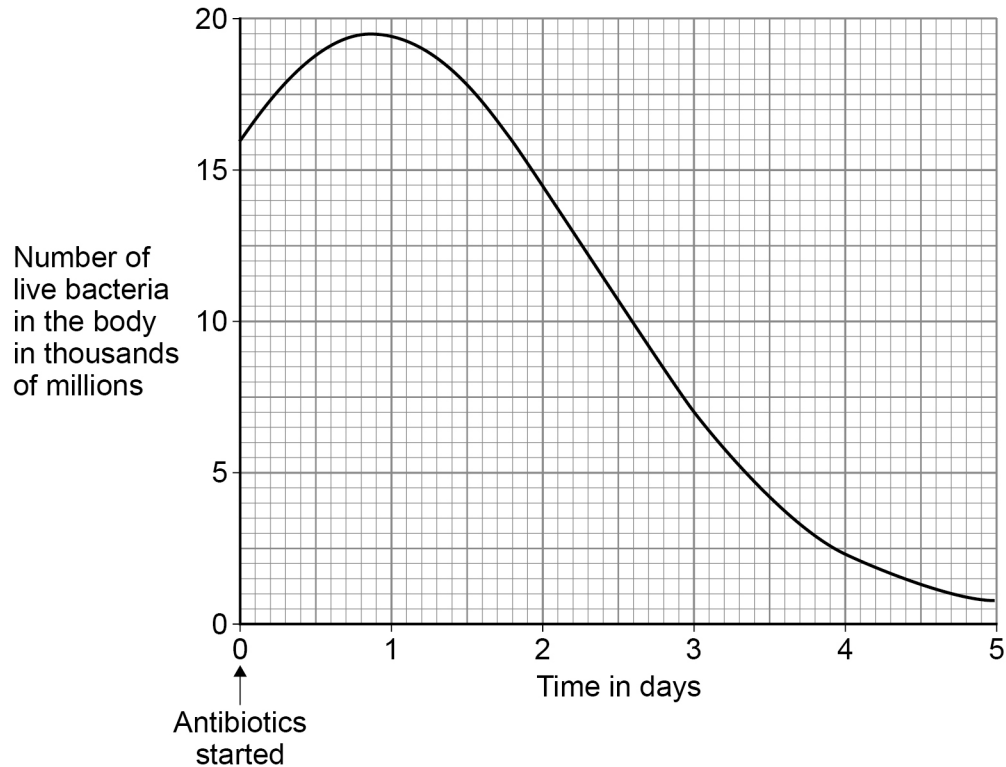


0 5 . 6

A person with a bacterial disease was treated with antibiotics.

Figure 8 shows how the number of live bacteria in the body changed after treatment with antibiotics was started.

Figure 8



Determine the maximum number of live bacteria in the body.

Use **Figure 8**.

Give your answer in standard form.

[2 marks]

Maximum number of bacteria (standard form) = _____



0 6

All living cells have a selectively permeable cell membrane.

0 6 . 1

What does 'selectively permeable' mean?

[1 mark]

A student carried out an osmosis experiment using dialysis tubes.

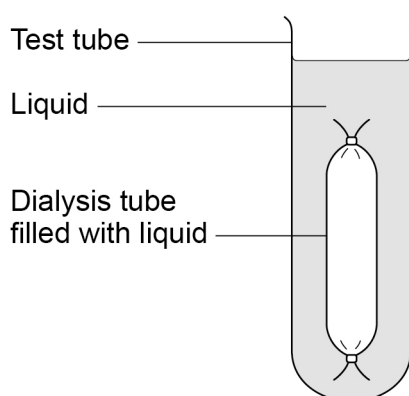
Dialysis tubes are made from a length of selectively permeable dialysis tubing.

A length of dialysis tubing is:

- cut to a suitable length
- tied at one end
- filled with a liquid
- tied at the other end.

Figure 9 shows a filled dialysis tube surrounded by another liquid in a test tube.

Figure 9



0 6 . 2

Name the molecule that moves into and out of cells by osmosis.

[1 mark]

Question 6 continues on the next page

Turn over ►



The student set up four dialysis tubes in four test tubes.

Table 3 shows the results.

Table 3

Test tube number	Liquid in test tube	Liquid in dialysis tube	Mass of dialysis tube in grams at				
			start	15 minutes	30 minutes	45 minutes	60 minutes
1	Distilled water	Distilled water	22.3	22.4	22.2	22.3	22.3
2	Distilled water	10% sugar solution	24.8	25.3	25.7	26.4	26.9
3	Distilled water	40% sugar solution	25.1	26.3	27.5	28.9	29.6
4	40% sugar solution	Distilled water	22.7	21.3	20.5	19.8	18.7

0 6 . 3 Suggest **one** control variable for the experiment.

[1 mark]

0 6 . 4 Describe how the data could be presented in a graph to compare the trends for each test tube.

[2 marks]



0 6 . 5 Why did the mass of the dialysis tube in test tube **1** remain relatively constant?

[1 mark]

Tick (✓) **one** box.

Test tube **1** was an anomalous result.

☐

The dialysis tube in test tube **1** had the smallest mass.

☐

The distilled water was contaminated.

☐

There was no concentration gradient.

☐

0 6 . 6 Which test tube contained liquid that was **hypertonic** to the liquid in the dialysis tube?

[1 mark]

0 6 . 7 In test tube **3**, the liquid in the dialysis tube will never reach the same concentration as the surrounding liquid.

Explain why.

[2 marks]

9

Turn over ►



0 7

Cells are organised into tissues and organs in multicellular organisms.

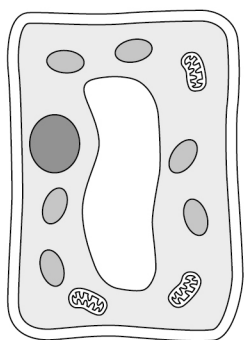
0 7 . 1

What is the function of xylem and phloem tissue?

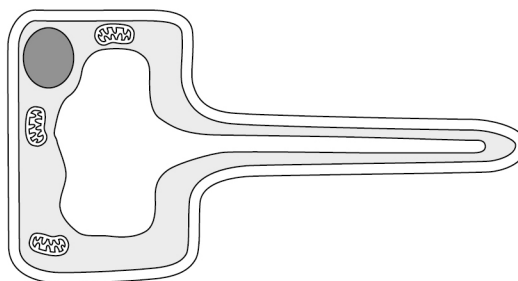
[1 mark]

Figure 10 shows cells, tissues and organs from different parts of a plant.

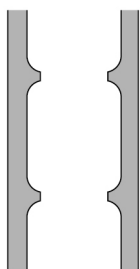
Figure 10



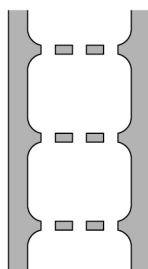
Palisade cell



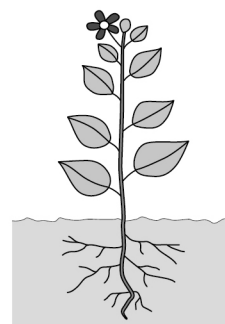
Root hair cell



Xylem tissue



Phloem tissue



Plant



[6 marks]

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7

Turn over ►



0 8

The reproductive system of a plant is the flower.

A flower can produce both male gametes (pollen) and female gametes (eggs).

0 8 . 1

What type of cell division produces gametes?

[1 mark]

The height of sweet pea plants is controlled by a gene that has two alleles.

The plants may be tall or short.

0 8 . 2

A homozygous tall plant was crossed with a homozygous short plant.

Explain why all the offspring were tall.

[2 marks]



Self-pollination occurs when pollen from a plant fertilises eggs on the same plant.

0 8 . 3

A heterozygous tall plant reproduced by self-pollination.

Determine the probability that one of the offspring will be a short plant.

You should:

- complete the genetic diagram
- use the symbols **T** and **t**
- identify the phenotype of each offspring genotype.

[4 marks]

		Female gametes	
Male gametes			

Probability of short plant = _____

0 8 . 4

Give **one** similarity and **one** difference between self-pollination and asexual reproduction.

[2 marks]

Similarity _____

Difference _____

Turn over ►



0 9

Glucose, glycogen and starch are carbohydrates.

0 9 . 1

Describe the role of the digestive system in starch digestion.

[3 marks]

0 9 . 2

Name the hormone produced after the products of starch digestion have been absorbed into the blood.

[1 mark]

0 9 . 3

Describe the role of glycogen in the control of blood glucose levels.

[2 marks]



There are two types of starch in food:

- resistant starch (**RS**) that **cannot** be digested
- digestible starch (**DS**) that is digested very quickly.

0 9 . 4

Suggest **one** reason why food that contains both **RS** and **DS** is a healthier choice than food that only contains **DS**.

[1 mark]

Question 9 continues on the next page

Turn over ►



A scientist collected data about the **RS** content of food from many different scientific studies.

Table 4 shows the **RS** content for four different types of bread.

Table 4

Type of bread	RS per 100 grams of food in grams		
	Mean	Minimum	Maximum
Rye bread	4.5	4.5	4.5
White bread	1.2	0.1	4.4
White bread rolls	0.3	0.2	0.6
Wholewheat bread	1.0	0.5	1.5

0 9 . 5 46% of the mass of rye bread is starch.

Calculate the **RS:DS** ratio for rye bread.

Use **Table 4**.

Give your answer to 2 significant figures.

[3 marks]

RS:DS (2 significant figures) = _____ :1



0 9 . 6

The scientist stated that all white bread has a lower **RS** content than wholewheat bread.

Evaluate the scientist's statement.

Use **Table 4**.

[4 marks]

14

END OF QUESTIONS



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