

INTERNATIONAL GCSE COMBINED SCIENCE DOUBLE AWARD

9204/BC BIOLOGY – PAPER 1 – CORE TIER

Specimen material

1 hour 45 minutes

Materials

For this paper you must have:

- a ruler with millimetre measurements
- a calculator.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the bottom of this page.
- Answer **all** questions.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.

Please write clearly, in block capitals, to allow character computer recognition.

Centre number

Candidate number

Surname

Forename(s)

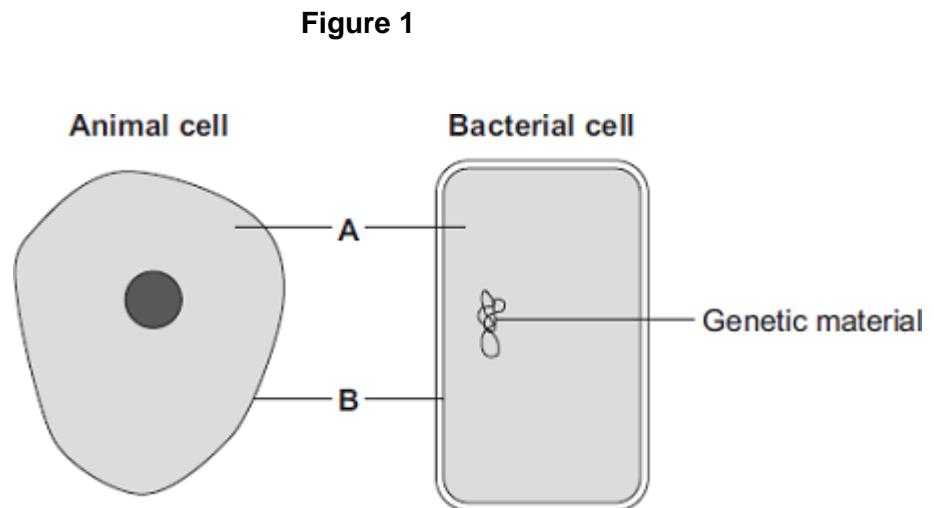
Candidate signature _____

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

1

Figure 1 shows an animal cell and a bacterial cell.

Structures **A** and **B** are in both the animal cell and the bacterial cell.



0 1 . **1**

What is structure **A**?

Tick **one** box

[1 mark]

Cell membrane

Cell wall

Cytoplasm

0 1 . **2** What is structure **B**?

Tick **one** box.

[1 mark]

Cell membrane

Cell wall

Cytoplasm

0 1 . **3** Draw **one** line from each structure to its function.

[3 marks]

Structure

Function

Cell membrane

Controls what substances enter the cell

Mitochondrion

Photosynthesis

Ribosome

Protein synthesis

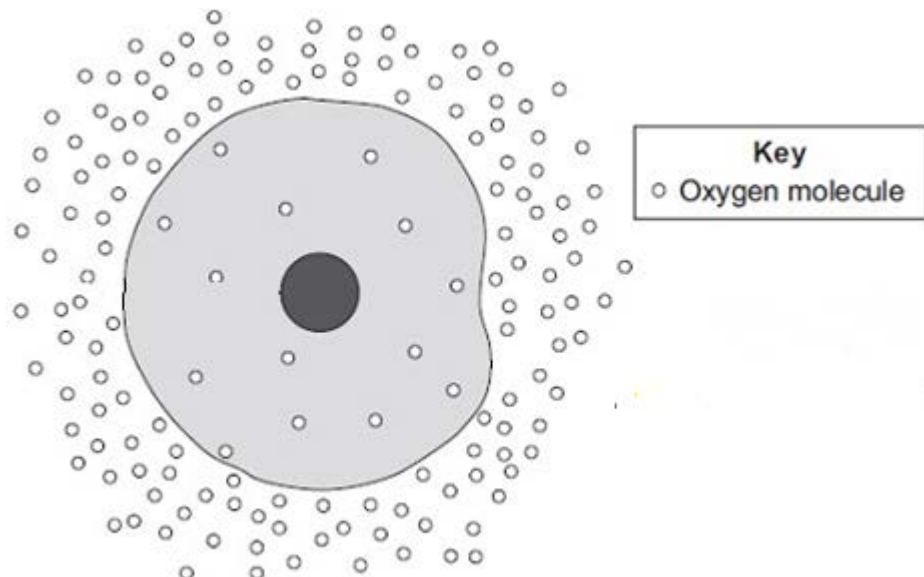
Respiration

0 1 . 4 Name the structure in the animal cell that contains genetic material.

[1 mark]

Figure 2 shows an animal cell.

Figure 2



0 1 . 5 Give the reason why cells need oxygen.

[1 mark]

0 1 . **6**

In **Figure 2**, oxygen molecules will move into the animal cell.

Name the process for the movement of oxygen molecules.

Tick **one** box.

[1 mark]

Diffusion

Osmosis

Respiration

Secretion

0 1 . **7**

Explain the movement of oxygen molecules in **Figure 2**.

[2 marks]

Turn over for the next question

Turn over ▶

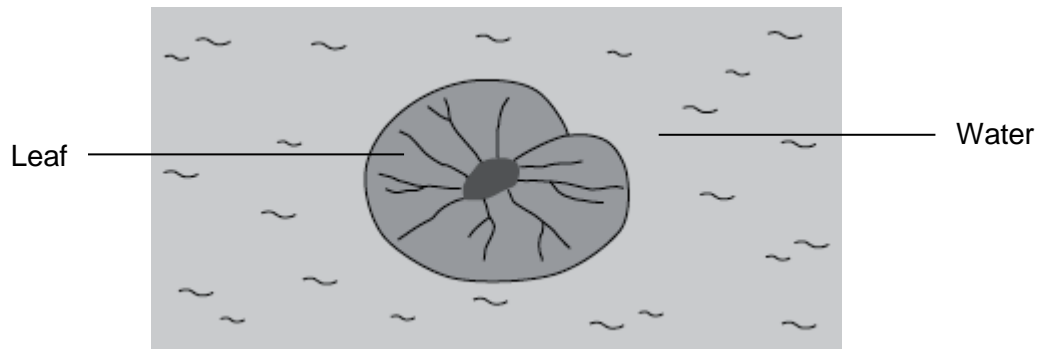
2

Plants are adapted for survival in many different ways.

0 2 . 1 **Figure 3** shows a plant that lives in water.

The leaves of the plant float on the surface of the water.

Figure 3

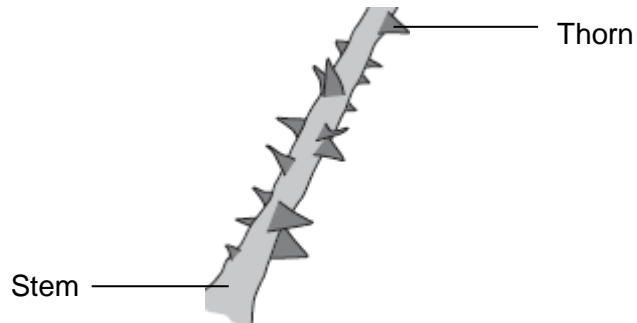


Suggest how the leaf of this plant is adapted for floating on water.

[1 mark]

0 2 . 2 Figure 4 shows a plant that has sharp thorns on its stem.

Figure 4

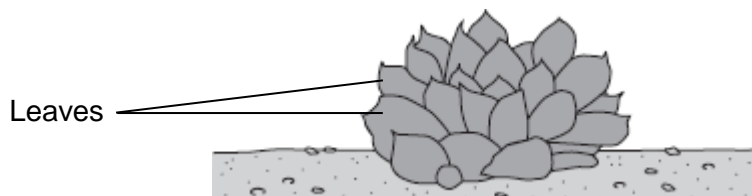


Suggest how thorns help this plant survive.

[1 mark]

0 2 . 3 Figure 5 shows a plant that lives in very dry places.

Figure 5



Suggest how the swollen leaves help this plant to survive in very dry places.

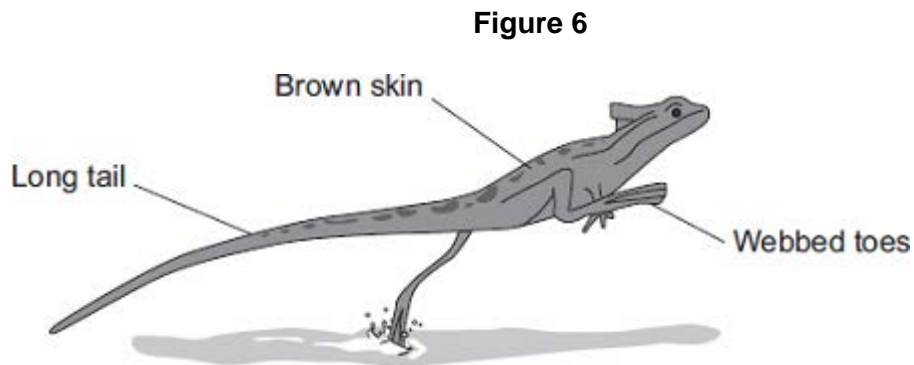
[1 mark]

0 2 . 4 Plants compete with each other for resources.

Give **one** resource that plants compete for.

[1 mark]

0 2 . 5 **Figure 6** shows a lizard. Some of the adaptations of the lizard are labelled.



These lizards are often found resting on branches of trees that grow next to water.

They can run across the surface of the water.

Draw **one** line from each adaptation of the lizard to the advantage of the adaptation.

[3 marks]

Adaptation

Advantage

Webbed toes	For camouflage on branches of trees
Long tail	Helps the lizard to balance when running
Brown skin	Warning colours to deter predators
	Increases surface area in contact with the water

0 2 . **6** Animals compete with each other.

Which resource do animals compete for?

Tick **one** box.

[1 mark]

Carbon dioxide

Food

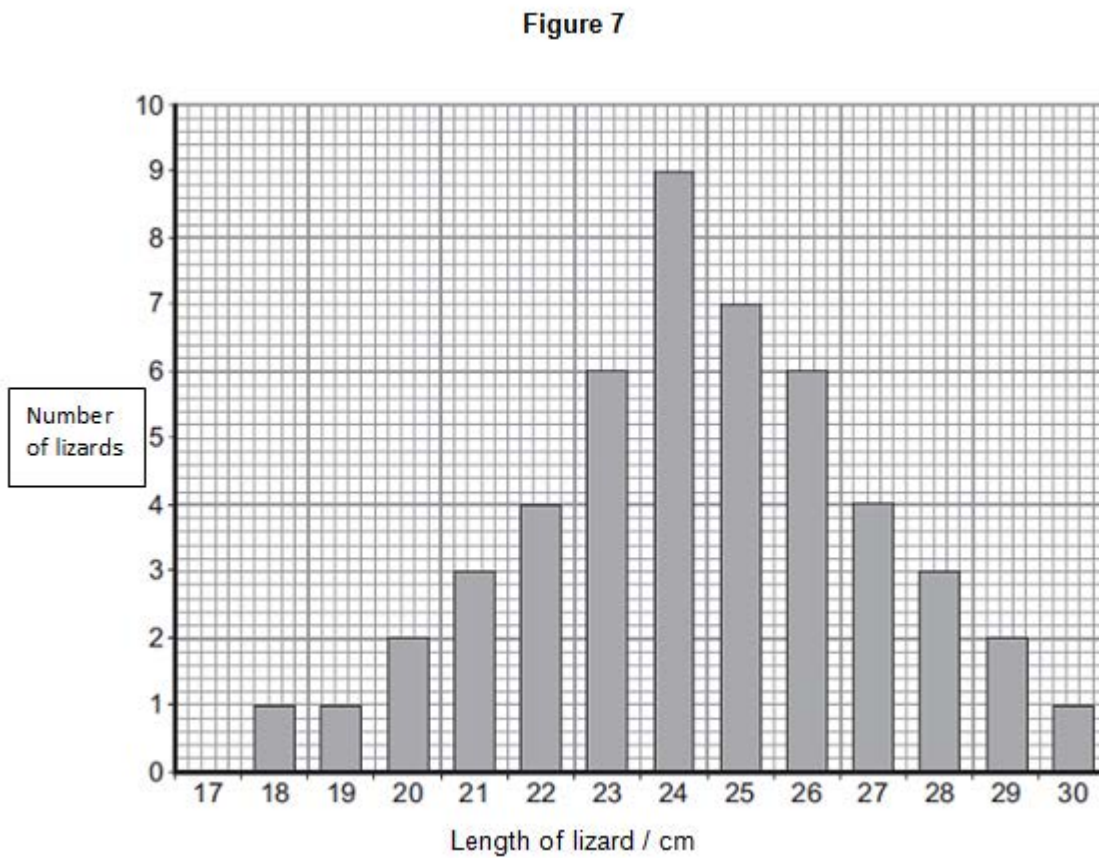
Light

Oxygen

Question 2 continues on the next page

Scientists measured the length of 49 lizards of the same age and gender.

Figure 7 shows the scientists' results.



0 2 . 7

Give the range for the length of this species of lizard.

[1 mark]

From _____ to _____

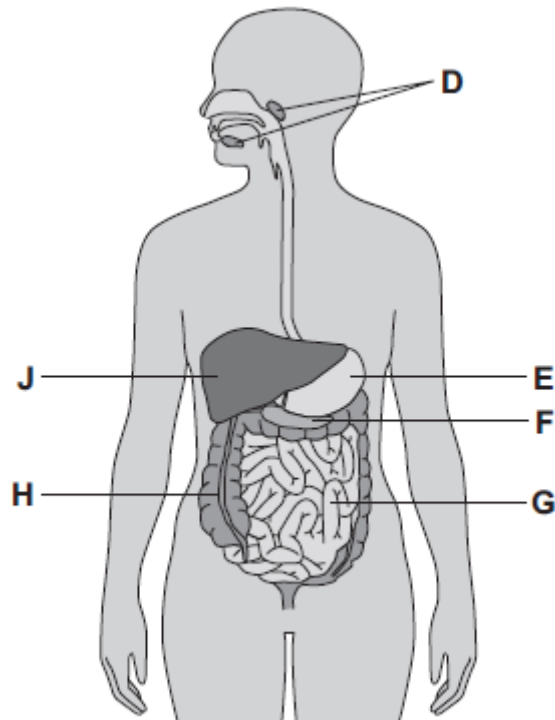
0 2 . 8

Suggest one reason why the scientists **cannot** be sure that this is the full range of lengths for this species of lizard.

[1 mark]

3 **Figure 8** shows part of the human digestive system.

Figure 8



0 3 . **1** Which letter, **E**, **G**, **H** or **J**, is the liver?

Tick (✓) **one** box.

[1 mark]

- | | |
|----------|--------------------------|
| E | <input type="checkbox"/> |
| G | <input type="checkbox"/> |
| H | <input type="checkbox"/> |
| J | <input type="checkbox"/> |

0 3 . **2** The enzyme amylase digests starch.

Which three parts of the digestive system make amylase?

Choose three letters from **Figure 8**.

[3 marks]

<input type="text"/>	<input type="text"/>	<input type="text"/>
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A student investigated the effect of temperature on the rate of starch digestion by amylase.

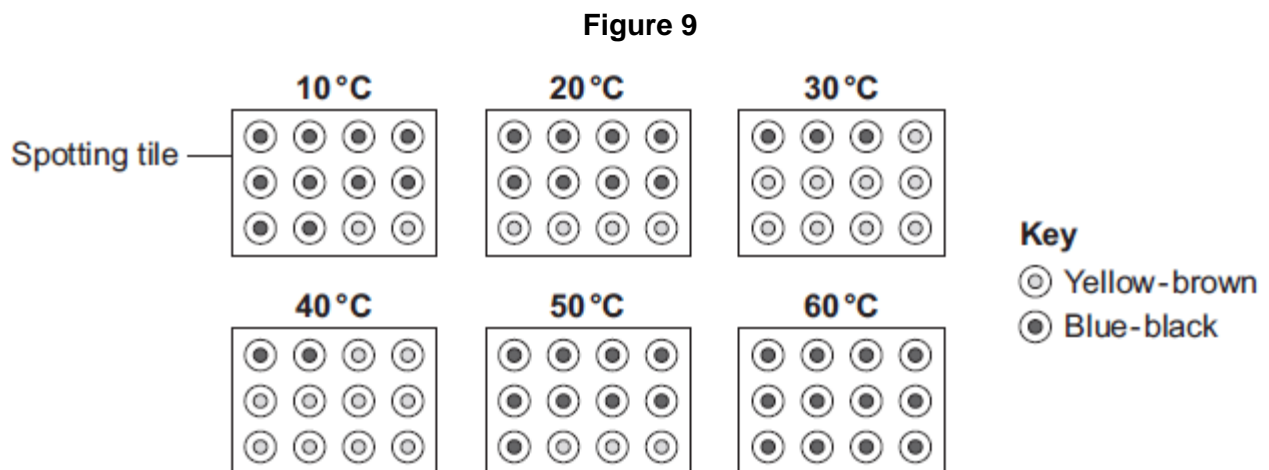
The student:

- put 5 cm³ of starch solution in a test tube in a water bath at 10 °C
- put 1 cm³ of amylase solution in another test tube in the same water bath
- added the amylase to the starch after 5 minutes and kept the mixture in the water bath
- removed a drop of the mixture of amylase and starch and added the drop to iodine on a spotting tile
- continued to test the mixture every minute by adding a drop to the next spot of iodine on the spotting tile.

The student repeated the experiment at 20 °C, 30 °C, 40 °C, 50 °C and 60 °C.

Iodine changes colour from yellow-brown to blue-black when it mixes with starch.

Figure 9 shows the student's results.



0 3 . 3

Why did the student leave the starch and amylase in the water bath for 5 minutes before mixing them?

[1 mark]

At 10 °C, the starch had been digested after 10 minutes.

At 20 °C, the starch had been digested after 8 minutes.

0 3 . **4** Complete **Table 1** by using information from **Figure 9** on page 12.

Write suitable headings for the columns and write in the results from 30 °C to 50 °C. **[4 marks]**

Table 1

10	10
20	8
30	
40	
50	
60	Starch was not digested

0 3 . **5** At which temperature is starch broken down the fastest?

[1 mark]

0 3 . **6** Explain the result at 60 °C.

[2 marks]

0 3 . **7** Starch is broken down into sugars in the digestive system.

Describe what happens to the sugars after digestion.

[2 marks]

4 Blood is part of the circulatory system.

0 4 . 1 Give **one** function of white blood cells.

[1 mark]

0 4 . 2 Give **one** function of red blood cells.

[1 mark]

0 4 . 3 Which of the following is a feature of platelets?

Tick **one** box.

[1 mark]

They have a nucleus.

They contain haemoglobin.

They are small fragments of cells.

0 4 . 4 Urea is transported by the blood plasma from where it is made to where the urea is excreted.

Complete the following sentence.

[2 marks]

Blood plasma carries urea from where it is made in the _____

to the _____ where the urea is removed from the blood.

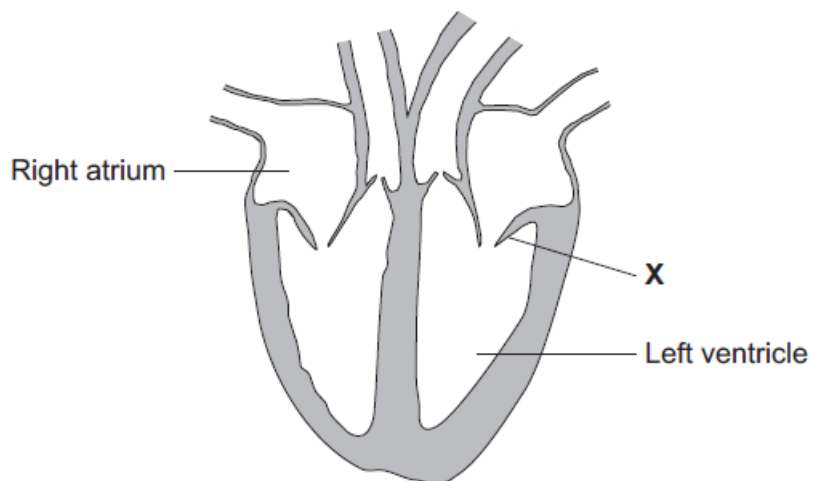
0 4 . 5 Blood is carried around the body in blood vessels.

Give **two** differences between arteries and veins.

[2 marks]

Figure 10 shows a section through the human heart.

Figure 10



0 4 . 6 Suggest why the wall of a ventricle is thicker than the wall of an atrium.

[1 mark]

0 4 . **7** Structure X is a valve. If valve X stops working, it may need to be replaced.

A scientist is designing a new heart valve.

The scientist knows that the valve must be the correct size to fit in the heart.

Suggest **two** other factors the scientist needs to consider so that the newly designed valve works effectively in the heart.

[2 marks]

Turn over for the next question

5 This question is about genes and inheritance.

0 5 . 1 Fruit flies are insects that are used to investigate genetics. They can produce hundreds of offspring very quickly.

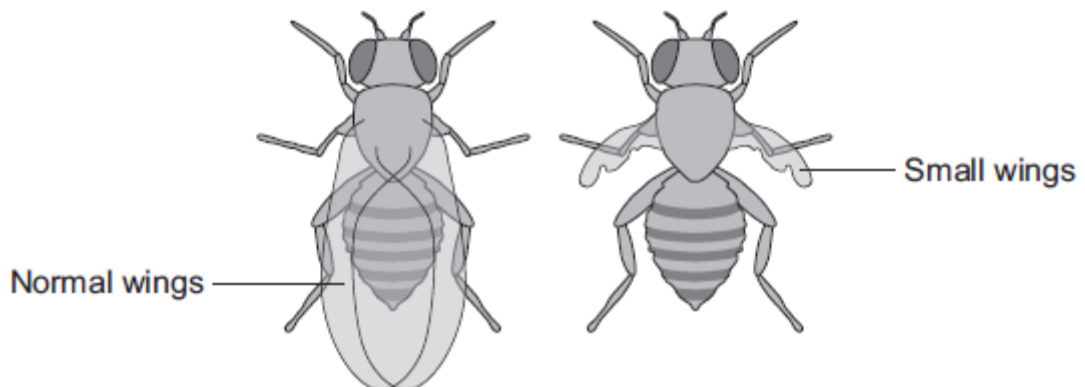
Suggest **three** reasons why it is easier to use fruit flies rather than mammals to investigate genetics.

[3 marks]

Figure 11 shows a fruit fly with normal wings and a fruit fly with small wings.

The type of wing is controlled by one gene.

Figure 11



The gene for the type of wing in fruit flies has two alleles, one for normal wings and one for small wings.

The allele for normal wings (N) is dominant.

The allele for small wings (n) is recessive.

0 5 . **2** Two fruit flies with normal wings both have two different alleles, **Nn**.

Complete the genetic diagram in **Figure 12** showing the offspring from these two fruit flies.

[2 marks]

Figure 12

	N	n
N	NN	Nn
n		

0 5 . **3** Draw a ring around any offspring in the genetic diagram in **Figure 12** that would have small wings.

[1 mark]

0 5 . **4** What is the probability that the offspring will have small wings?

Tick **one** box.

[1 mark]

25%

50%

75%

Question 5 continues on the next page

Some scientists investigated how wing type was inherited in fruit flies.

The scientists used fruit flies with the alleles Nn.

These fruit flies had the same alleles as the parent fruit flies in part **05.2**.

Five pairs of these fruit flies were allowed to mate.

The number of each type of offspring is shown in **Table 2**.

Table 2

	Pair number				
	1	2	3	4	5
Number of offspring with normal wings	116	92	0	132	122
Number of offspring with small wings	34	29	0	38	37

0 5 . **5** Suggest why five pairs of fruit flies were allowed to mate, instead of just one pair. **[1 mark]**

0 5 . **6** The results from one pair of fruit flies seem to be anomalous.

Which pair number has the anomalous results?

[1 mark]

0 5 . **7** Suggest **one** reason for the anomalous results.

[1 mark]

0 5 . **8** 77% of the offspring had normal wings.

What percentage of the offspring had small wings?

[1 mark]

0 5 . **9** Why is this percentage different from your answer to part **05.4**?

Tick **one** box.

[1 mark]

Alleles are inherited randomly.

Not enough characteristics were investigated.

Too many fruit flies died.

Turn over for the next question

6

This question is about photosynthesis.

0 6 . 1

Identify where the energy needed for photosynthesis comes from.

[1 mark]

0 6 . 2

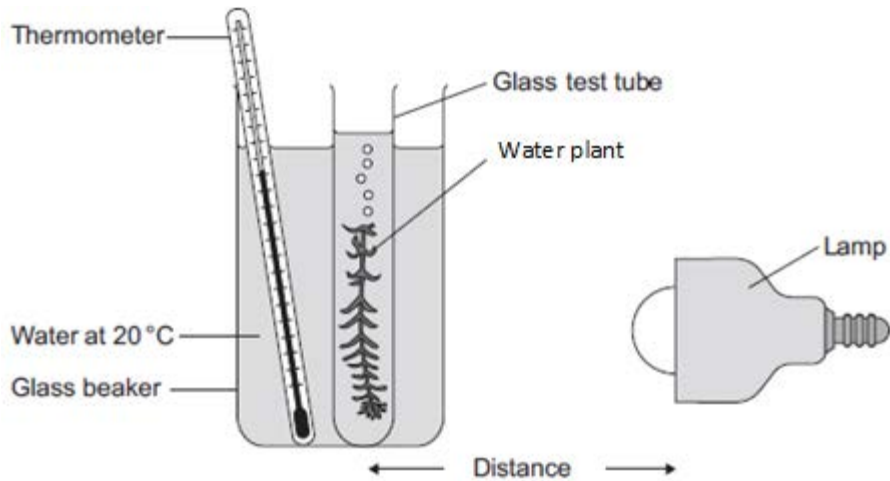
Name the green pigment found in leaves.

[1 mark]

A student investigated the effect of light intensity on the rate of photosynthesis in a water plant.

Figure 13 shows the apparatus the student used.

Figure 13



0 6 . 3

The student put a thermometer in the glass beaker to measure the temperature of the water.

Give **two** reasons why this was important.

[2 marks]

The student counted the bubbles released by the water plant in one minute at each distance.

The student repeated the experiment four times and calculated a mean.

Table 3 shows the student's results.

Table 3

Distance in cm	Number of bubbles released in one minute				
	1	2	3	4	Mean
10	52	52	54	54	53
20	49	51	48	52	50
30	32	30	27	31	30
40	30	10	9	11	

0 6 . 4

Calculate the mean number of bubbles released when the distance was 40cm, taking account of the anomalous result.

[2 marks]

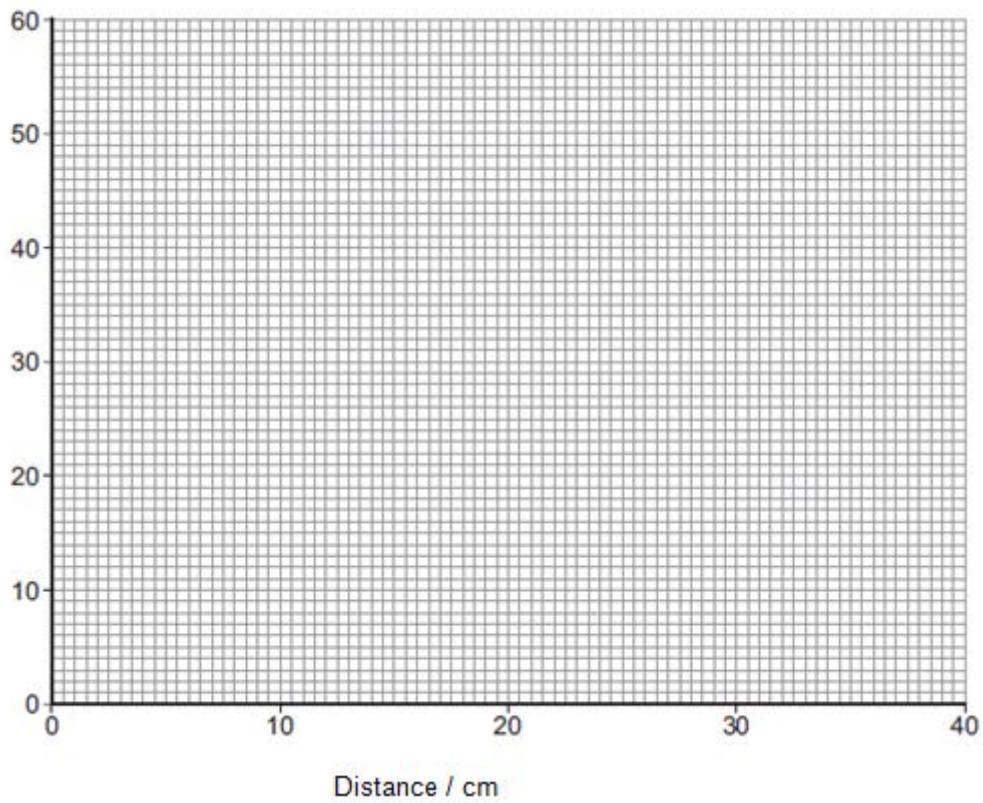
Mean number of bubbles at 40 cm = _____

0 6 . 5 Complete the graph in **Figure 14**.

- Label the y-axis
- Plot the **mean** results
- Draw a line of best fit.

[3 marks]

Figure 14



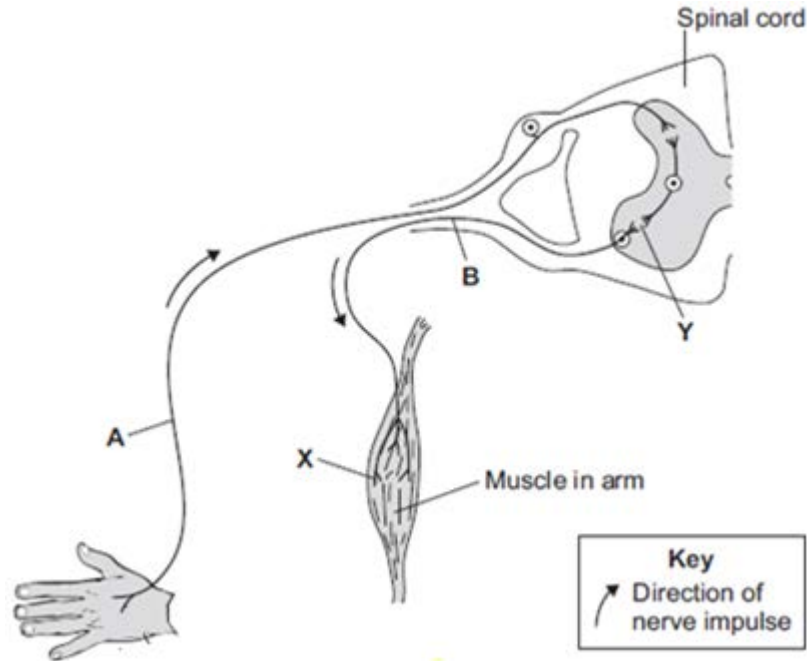
0 6 . 6 Give **one** conclusion from the results.

[1 mark]

7

Figure 15 shows the reflex pathway of an impulse from a receptor in the hand to the muscle in the arm that contracts to pull the hand away from a stimulus.

Figure 15



0 7 . 1

Which letter from **Figure 15** labels the sensory neurone?

[1 mark]

0 7 . 2

Pulling the hand away from a stimulus is a reflex action.

Use information from **Figure 15** to explain how you can tell that this action is not a conscious action.

[1 mark]

07 . 3

The average speed an impulse travels through this pathway is 60 ms^{-1} .
The length of the pathway, from the receptor in the hand to the muscle in the arm,
is 1.2 m.

$$\text{speed} = \frac{\text{distance}}{\text{reaction time}}$$

Calculate the reaction time using this equation.

[2 marks]

Reaction time = _____ s

07 . 4

Reflex actions have shorter reaction times than voluntary actions.
Suggest **two** reasons why.

[2 marks]

1 _____

2 _____

Some students investigated the effect of caffeine on a person's reaction time.

The students used the following steps.

- One student held a ruler just above a second student's hand, as shown in **Figure 16**.
- The student let go of the ruler. The second student caught it as soon as possible, as shown in **Figure 17**.
- The students repeated this experiment seven more times.
- The student catching the ruler then drank a cup of strong coffee. Coffee contains caffeine.
- 15 minutes after drinking the coffee, the students repeated the experiment.

Figure 16

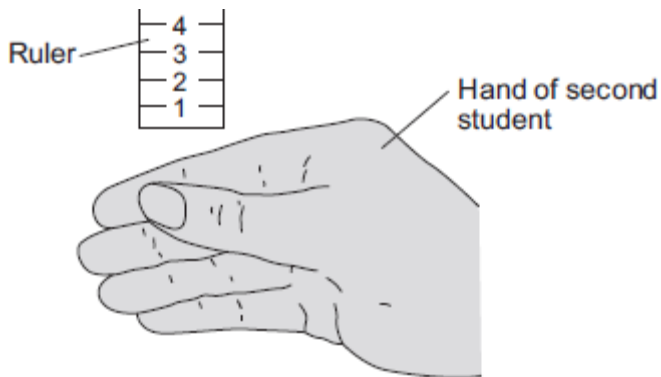


Figure 17

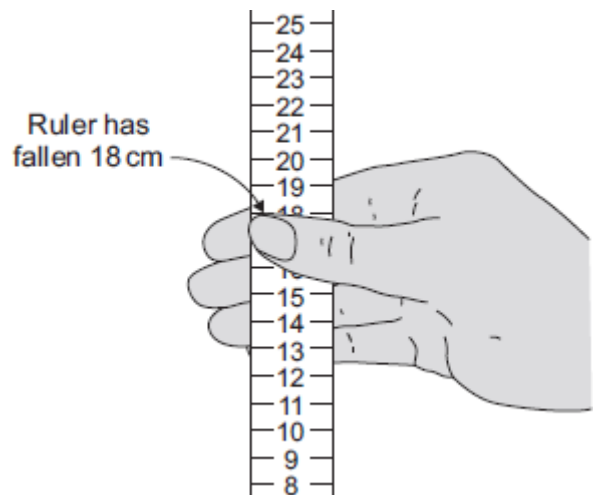


Table 4 shows the students' results.

Table 4

Distance ruler fell before it was caught in cm	
Before drinking coffee	After drinking coffee
18	8
21	13
25	11
15	17
19	10
16	14
12	13
21	13
Range is 12 to 25	Range is 8 to 17
Mean = 18.4	Mean = 12.4

07 . 5

A scientist concluded that caffeine decreases reaction times.

Evaluate this conclusion using data from **Table 4**.

[2 marks]

07 . 6

Suggest **two** ways that the students could improve their investigation.

[2 marks]

8

This question is about decay and the carbon cycle.

0 8 . **1**

Decay happens faster in aerobic conditions.

Identify **two** other conditions which leads to faster decay of living things after they die.**[2 marks]**

Condition 1 _____

Condition 2 _____

0 8 . **2**

Why does decay happens faster in aerobic conditions?

[1 mark]

9

The map shows Christmas Island.

Christmas Island is in the Indian Ocean, 400 km from any other land.



Many years ago, Christmas Island rats lived on the island.

The island was the only place in the world where this rat species lived.

0 9 . 1

Suggest **one** reason why this species of rat was able to evolve on Christmas Island. **[1 mark]**

0 9 . 2

The Christmas Island rats became extinct a number of years after a ship had visited the island.

Some Black rats of a different species had jumped off the ship onto the island.

The Black rats started to breed very quickly.

Suggest **two** reasons why the introduction of Black rats resulted in the extinction of Christmas Island rats.

[2 marks]

10

This question is about plants.

1 0

. 1

Explain how plant roots are adapted for absorbing water from soil.

[4 marks]

1 0 . 2

The surface of plant leaves are covered by epidermal tissue.

What is a tissue?

[1 mark]

1 0 . 3

The epidermal tissues on the lower surface of a leaf has pores called stomata.

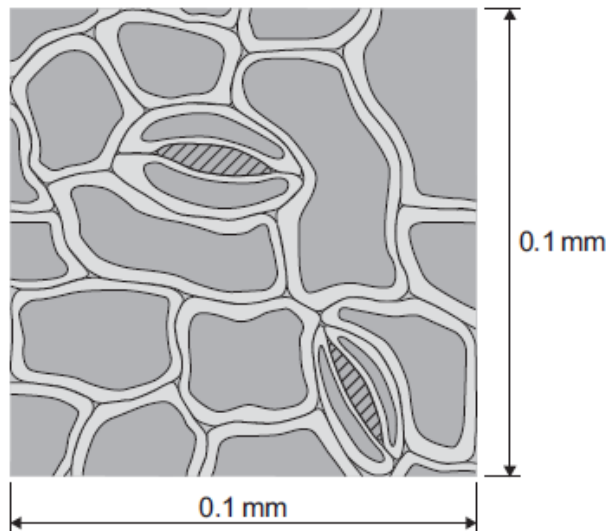
Suggest why the rate of photosynthesis increases when these pores are open.

[1 mark]

1 0 . 4

Figure 19 shows part of the surface of a leaf.

Figure 19



The length and width of this piece of leaf surface are both 0.1 mm.

Calculate the number of stomata per mm^2 of this leaf surface.

[2 marks]

_____ per mm^2

END OF QUESTIONS

There are no questions printed on this page

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