

GCSE TOPIC TEST

BIOLOGY

H

Higher Tier

4.1 Cell Biology

Materials

For this paper you must have:

- a ruler
- a scientific calculator

Instructions

- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.

Information

- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
TOTAL	

A student investigated the effect of different concentrations of sugar solution on pieces of potato.

This is the method used.

1. Cut five pieces of potato.
2. Record the starting mass of each piece of potato.
3. Place each piece of potato in a different concentration of sugar solution.
4. After 24 hours remove the pieces of potato from the solutions.
5. Record the final mass of each piece of potato.
6. Calculate the change in mass for each piece of potato.

Table 1 below shows the results.

Table 1

Concentration of sugar solution in mol/dm ³	Mass of potato at start in grams	Mass of potato after 24 hours in grams	Change in mass in grams
0.0	7.94	10.14	2.20
0.1	7.95	9.10	1.15
0.2	7.96	8.21	0.25
0.3	7.93	7.53	-0.40
0.4	7.93	7.18	-0.75
0.5	7.95	7.00	-0.95

What is the independent variable?

Tick **one** box.

- ☐ Change in mass of the pieces of potato
- ☐ Concentration of the sugar solution
- ☐ Length of time the pieces of potato are in the solution
- ☐ Starting mass of the pieces of potato

[1 mark]

01.2

Explain why the potato in 0.0 mol/dm^3 sugar solution increased in mass.

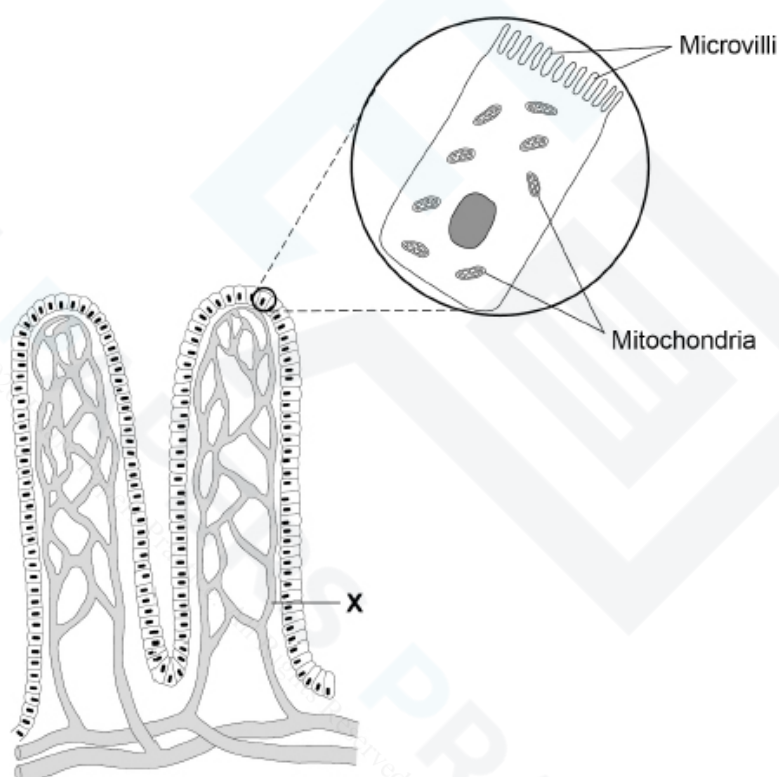
[2 marks]

02.1

Figure 1 shows two villi.

Figure 1 also shows one cell on the surface of a villus as seen using an electron microscope.

Figure 1



Give **one** advantage of using an electron microscope compared with using a light microscope.

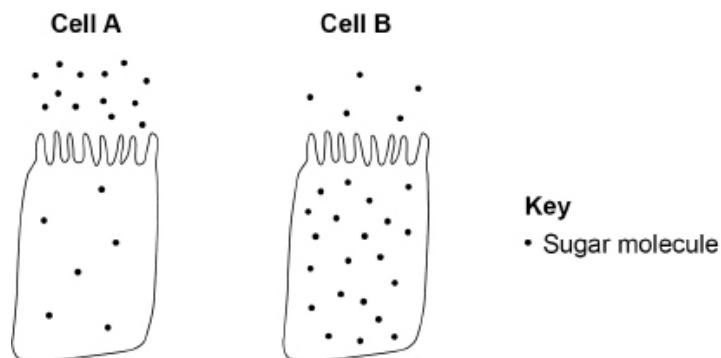
[1 mark]

02.2

Figure 2 shows two cells from the surface of a villus.

There are sugar molecules inside and next to each cell.

Figure 2



(a) Name the process by which sugar moves into cell **A**.

(1)

(b) Name the process by which sugar moves into cell **B**.

(1)

[2 marks]

03.1

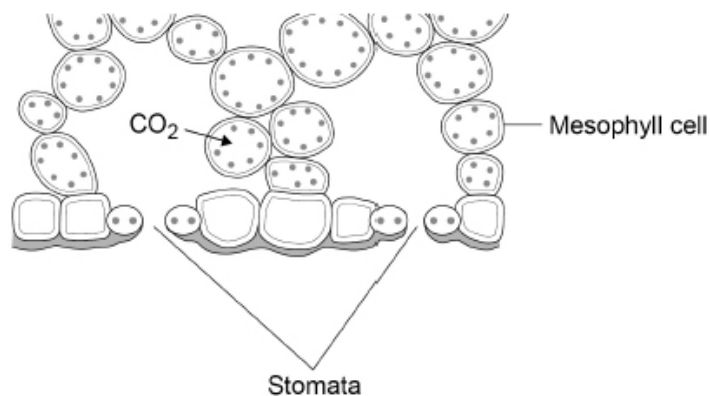
What is meant by the term diffusion?

[2 marks]

03.2

Figure 3 below shows part of a leaf.

Figure 3



Molecules of carbon dioxide diffuse from the air into the mesophyll cells.

Which **two** changes will increase the rate at which carbon dioxide diffuses into the mesophyll cells?

Tick **two** boxes.

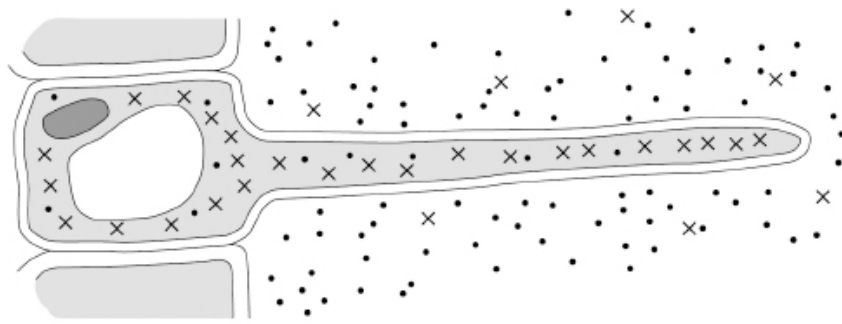
- ☐ Decreased number of chloroplasts in the cells
- ☐ Decreased surface area of cells in contact with the air
- ☐ Increased carbon dioxide concentration in the air
- ☐ Increased number of stomata that are open
- ☐ Increased oxygen concentration in the air

[2 marks]

03.3

Figure 4 below shows a root hair cell.

Figure 4



Key

•• Water molecules

X X Nitrate ions

Nitrate ions need a different method of transport into the root hair cell.

Explain how the nitrate ions in the diagram are transported into the root hair cell.

Use information from **Figure 4** in your answer.

Name of process _____

Explanation

[3 marks]

04.1

Name **one** type of cell that does **not** contain a nucleus.

[1 mark]

04.2

Figure 5 below shows an animal cell viewed using a microscope.

Figure 5



The cell contains a nucleus.

What is the function of the nucleus?

[1 mark]

04.3

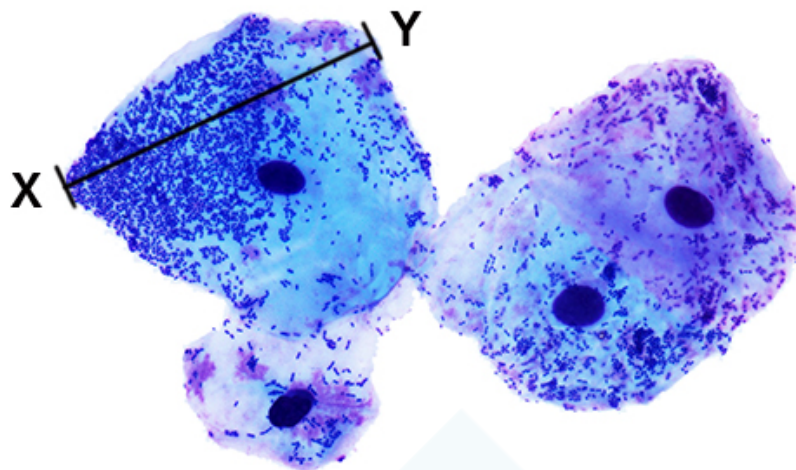
Name **one** structure found in a plant cell but **not** found in an animal cell.

[1 mark]

04.4

Figure 6 below shows some cells.

Figure 6



The real length from point X to point Y is 0.06 mm

The length of the image from point X to point Y is 24 mm

Calculate the magnification.

Use the equation:

$$\text{magnification} = \frac{\text{size of image}}{\text{real size of object}}$$

Magnification = ×

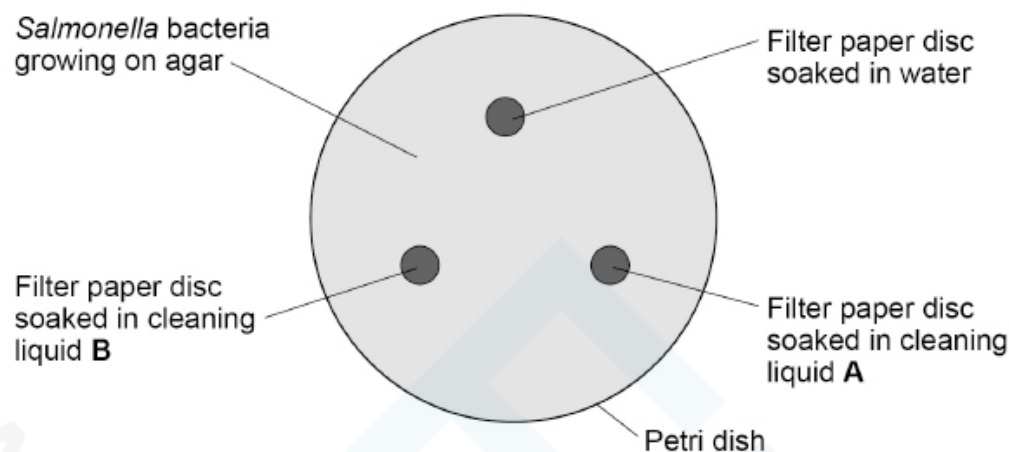
[2 marks]

A restaurant owner employed a scientist to test the effectiveness of two kitchen cleaning liquids.

The scientist investigated the effect of cleaning liquid **A** and cleaning liquid **B** on *Salmonella* bacteria grown in a laboratory.

Figure 7 shows the way the investigation was set up.

Figure 7



The Petri dish was placed in an incubator at 25 °C for 48 hours.

After 48 hours, the scientist calculated the area around each paper disc where no bacteria were growing.

The results are shown in **Table 2**.

Table 2

Filter paper disc	Area around disc with no bacteria growing in cm ²
Water	0
Cleaning liquid A	11
Cleaning liquid B	13

- (a) What measurement would the scientist need to take to calculate the area where no bacteria were growing?

(1)



- (b) Give **one** change to the investigation that would allow the scientist to check if the results are repeatable.

(1)

- (c) The scientist showed the results to the restaurant owner.

Both cleaning liquids cost the same per dm^3 .

Suggest **one** other factor the restaurant owner should consider when choosing which cleaning liquid to use.

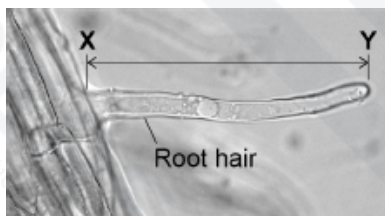
(1)

[3 marks]

06

Figure 8 below shows a root hair viewed using a microscope.

Figure 8



The root hair was viewed at a magnification of $\times 50$.

The image length of the root hair **X–Y** is 43 mm.

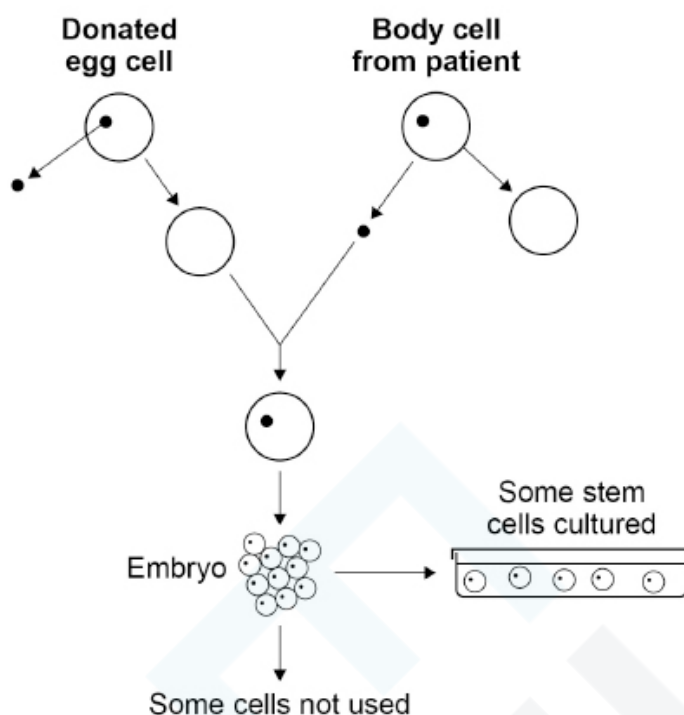
Calculate the real length of the root hair in micrometres (μm).

Real length = μm

[4 marks]

Figure 9 shows how embryonic stem cells are produced in therapeutic cloning for use in patients.

Figure 9



Give **two** advantages and **two** disadvantages of therapeutic cloning in medical treatments.

Use **Figure 9** to help you.

Advantage 1

Advantage 2

Disdvantage 1

Disdvantage 2

[4 marks]

08.1

Ragwort is a weed that grows on farmland.

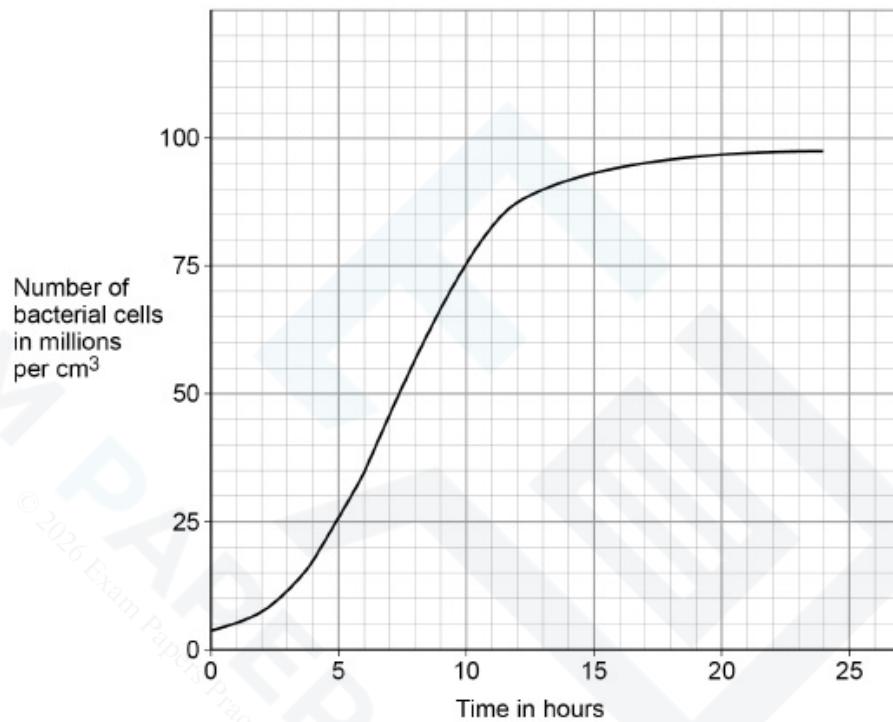
Ragwort is poisonous to horses.

The herbicide glyphosate will kill ragwort and other weeds.

Scientists use bacteria for the genetic engineering of crop plants to make the crops resistant to glyphosate.

Figure 10 shows the growth of a culture of the bacteria in a solution of nutrients at 25 °C.

Figure 10



Why did the rate of reproduction increase between 2 hours and 7 hours?

[1 mark]



08.2

After 12 hours, the rate of reproduction decreased.

Suggest **three** ways the scientists could maintain a high rate of reproduction in the bacterial culture.

1.

2.

3.

[3 marks]

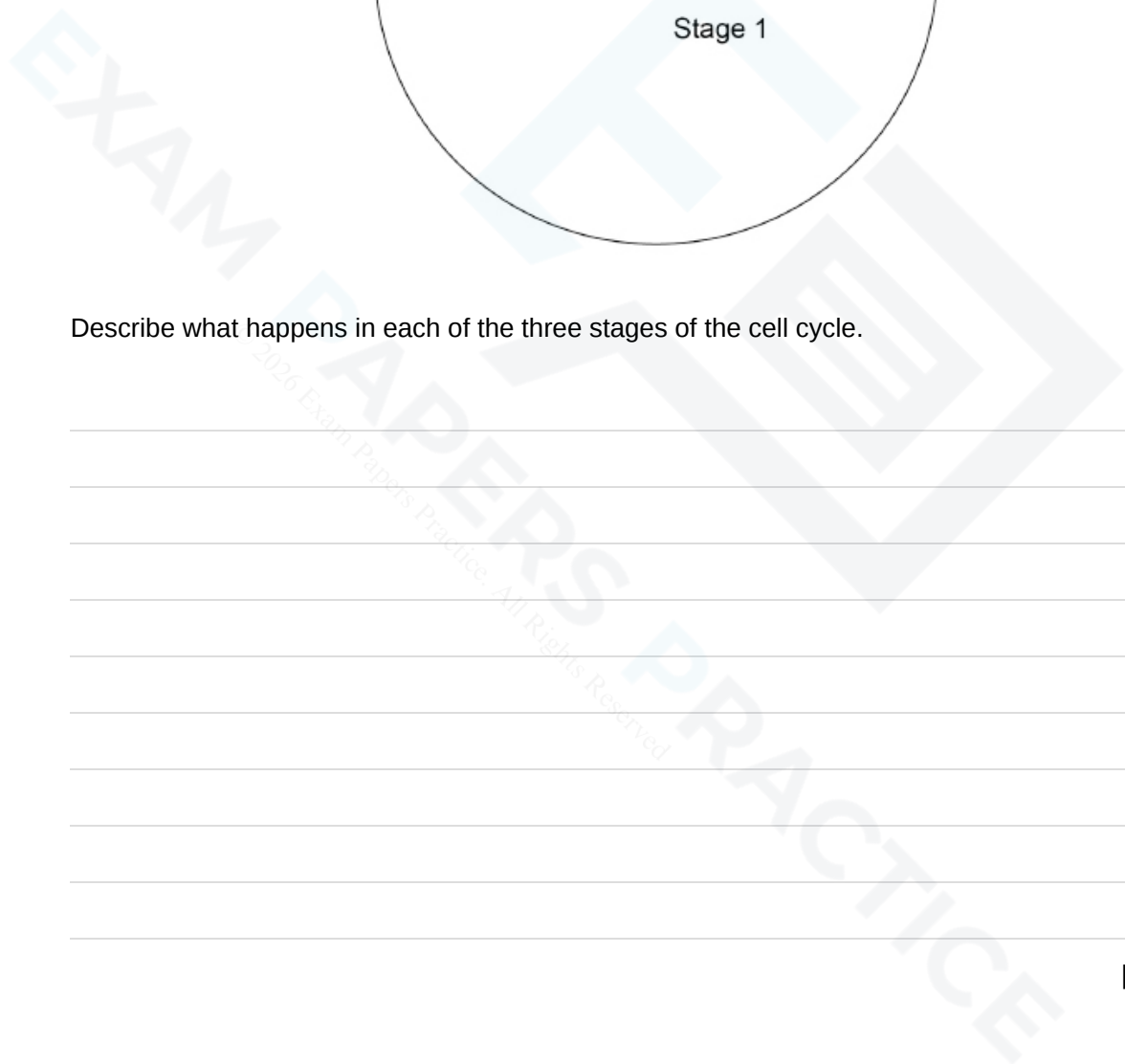
09.1

Give **one** place in a plant where stem cells are found.

[1 mark]

Embryonic stem cells divide by mitosis.

Figure 11



[5 marks]

**10.1**

A student carried out an investigation using chicken eggs.

This is the method used.

1. Place 5 eggs in acid for 24 hours to dissolve the egg shell.
2. Measure and record the mass of each egg.
3. Place each egg into a separate beaker containing 200 cm^3 of distilled water.
4. After 20 minutes, remove the eggs from the beakers and dry them gently with a paper towel.
5. Measure and record the mass of each egg.

Table 3 shows the results.

Table 3

Egg	Mass of egg without shell in grams	Mass of egg after 20 minutes in grams
1	73.5	77.0
2	70.3	73.9
3	72.4	75.7
4	71.6	73.1
5	70.5	73.8

Explain why the masses of the eggs increased.

[3 marks]



10.2

Chicken egg shells contain calcium. Calcium ions are moved from the shell into the cytoplasm of the egg.

Table 4 shows information about the concentration of calcium ions.

Table 4

Location	Concentration of calcium ions in arbitrary units
Egg shell	0.6
Egg cytoplasm	2.1

Explain how calcium ions are moved from the shell into the cytoplasm of the egg.

[3 marks]