AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE
BIOLOGY

F

Foundation Tier Paper 1F

Time allowed: 1 hour 45 minutes

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.
- 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.
- In all calculations, show clearly how you work out your answer.

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

Information
- The maximum mark for this paper is 100.
- 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.

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

Do not write outside the box

0 1 HIV (Human Immunodeficiency Virus) is a pathogen.

0 1 . 1 How is HIV spread from one person to another person?

[1 mark]

Tick (✓) **one** box.

Coughing ☐

Sexual intercourse ☐

Touching door handles ☐

Table 1 shows information about new cases of HIV diagnosed in the UK.

Table 1

Year	Number of new HIV cases
2010	2642
2014	2767
2018	1530

0 1 . 2 Describe what happened to the number of new cases of HIV from 2010 to 2018.

[2 marks]

Do not write outside the box

0 1 . 3 What could cause a **decrease** in the number of new HIV cases in the future?

[1 mark]

Tick (✓) **one** box.

A higher population of people in the UK ☐

A lower number of trained HIV nurses ☐

Better education on how to prevent the spread of HIV ☐

0 1 . 4 Scientists have been working to produce a vaccine for HIV for many years.

How could a vaccine work to prevent a person being infected with HIV?

Write the stages **A**, **B**, **C**, **D** and **E** in the correct order.

[3 marks]

The first stage has been completed for you.

A Antibodies attach to the inactive virus.

B Antibodies destroy the inactive virus.

C An inactive form of the virus is injected into the body.

D If the active virus enters the body, antibodies are produced quickly.

E White blood cells produce antibodies to the inactive virus.

C ⟶ _____ ⟶ _____ ⟶ _____ ⟶ _____

Question 1 continues on the next page

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0 1 . 5 When scientists produce a vaccine for a disease the vaccine is tested on live animals.

What is the next stage in testing the vaccine?

[1 mark]

Tick (✓) **one** box.

Testing on cells in a laboratory ☐

Testing on healthy volunteers ☐

Testing on the whole human population ☐

0 1 . 6 A vaccine for HIV is important because it is difficult to develop safe drugs to destroy viruses.

Why is it difficult to develop safe drugs to destroy viruses?

[1 mark]

Tick (✓) **one** box.

Drugs that destroy viruses also damage body tissues. ☐

There are too many viruses for the drugs to destroy. ☐

Viruses are too big for the drugs to destroy. ☐

Do not write outside the box

0 1 . 7 Some drugs originated from plants.

Draw **one** line from each drug to the plant the drug originated from.

[2 marks]

Drug	Plant the drug originated from
Aspirin	Foxglove
	Rose
Digitalis	Tobacco
	Willow

11

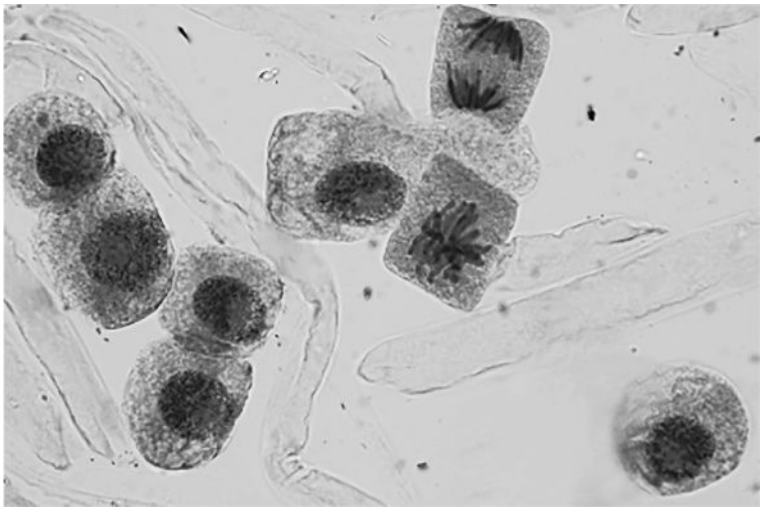
Turn over for the next question

Do not write outside the box

0 2 **Figure 1** shows animal cells.

Some of the cells are dividing by mitosis for growth and repair.

Figure 1



0 2 . 1 What fraction of the cells in **Figure 1** is dividing by mitosis?

[1 mark]

Tick (✓) **one** box.

$\frac{1}{8}$ ☐ $\frac{1}{4}$ ☐ $\frac{1}{2}$ ☐ $\frac{3}{4}$ ☐

Do not write outside the box

0 2 . 2 The cells which are **not** dividing in **Figure 1** each contain 10 chromosomes.

One of these cells divides by mitosis to produce two new cells.

How many chromosomes will each new cell contain after mitosis?

[1 mark]

Tick (✓) **one** box.

5 ☐ 10 ☐ 15 ☐ 20 ☐

0 2 . 3 Cells divide in a series of stages called the cell cycle.

Complete the sentences.

Choose answers from the box.

[3 marks]

contracts	**divides**	**grows**
reacts	**relaxes**	**replicates**

Before mitosis occurs, the cell _____.

The genetic material in the cell doubles when the DNA _____.

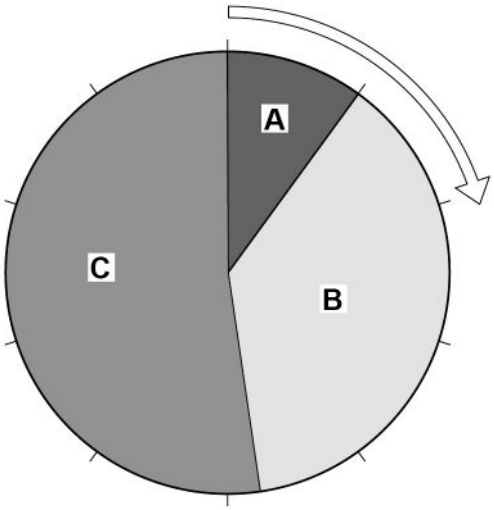
After the chromosomes have been pulled to each end of the cell, the cytoplasm _____.

Question 2 continues on the next page

Do not write outside the box

Figure 2 shows the time taken to complete different stages of the cell cycle.

Figure 2



0 2 . 4 Which stage of the cell cycle takes the most time?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐

0 2 . 5 What percentage of time in the cell cycle is stage **A**?

[1 mark]

Tick (✓) **one** box.

5% ☐ 10% ☐ 15% ☐ 25% ☐

Do not write outside the box

Stem cells divide by mitosis.

Scientists can use stem cells from an embryo to create heart cells in a laboratory.

0 2 . 6 Which organ system contains heart cells?

[1 mark]

Tick (✓) **one** box.

- Circulatory system ☐
- Digestive system ☐
- Nervous system ☐
- Respiratory system ☐

0 2 . 7 Name **one** medical condition that could be treated using heart cells created from an embryo.

[1 mark]

_____

0 2 . 8 Give **one** reason why a patient may **not** want to be treated with heart cells created from an embryo.

[1 mark]

_____

_____

10

Turn over for next question

Do not write outside the box

0 3 A scientist investigated the rate of photosynthesis of one type of tomato plant.

The tomato plants were grown in a greenhouse.

Table 2 shows the results.

Table 2

Percentage (%) concentration of carbon dioxide in the air	Rate of photosynthesis in arbitrary units
0.00	0
0.02	5
0.04	16
0.06	19
0.08	20
0.10	20
0.12	20

0 3 . 1 Give **two** control variables the scientist should have used in the investigation.

[2 marks]

1 _____

2 _____

0 3 . 2 Which range of carbon dioxide concentrations caused the rate of photosynthesis to change the most?

[1 mark]

Tick (✓) **one** box.

From 0.00% to 0.02% ☐

From 0.02% to 0.04% ☐

From 0.04% to 0.06% ☐

From 0.06% to 0.08% ☐

Do not write outside the box

0 3 . 3 How could the scientist have improved the validity of the results?

[1 mark]

Tick (✓) **one** box.

Repeat each reading three times and calculate a mean. ☐

Use concentrations of carbon dioxide above 0.12%. ☐

Use different tomato plants for each concentration. ☐

0 3 . 4 Explain the change in the rate of photosynthesis when the concentration of carbon dioxide increased between 0.00% to 0.08%.

[2 marks]

0 3 . 5 A farmer decided **not** to use a concentration of carbon dioxide higher than 0.08% to grow tomato plants.

Suggest **two** reasons for the farmer's decision.

Use information from **Table 2** and your own knowledge.

[2 marks]

1

2

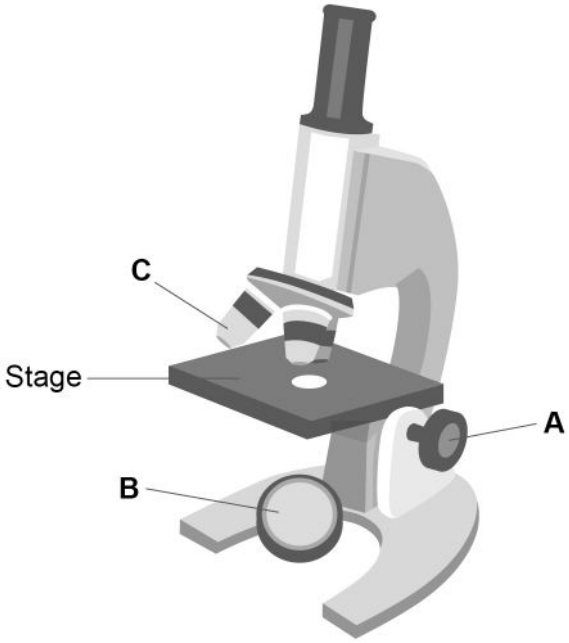
8

Turn over for the next question

Do not write outside the box

0 4 **Figure 3** shows a microscope.

Figure 3



0 4 . 1 Draw **one** line from each part of the microscope to the function of the part.

[3 marks]

Part of the microscope	Function
	To adjust the focus of the microscope
A	To direct light into the viewer's eye
B	To hold a slide in place
	To magnify the image of a specimen
C	To support the microscope

Do not write outside the box

A student prepared some onion cells.

The student viewed the onion cells using a microscope.

This is the method used.

1. Cut an onion into pieces using a sharp knife.
2. Peel off a thin layer of cells from one piece.
3. Place the layer of cells onto a microscope slide.
4. Add three drops of iodine solution to the layer of cells.
5. Cover with a cover slip.
6. Place the slide on the stage of the microscope.

0 4 . 2 Why was iodine solution added to the layer of onion cells?

[1 mark]

Tick (✓) **one** box.

To dry the cells ☐

To separate the cells ☐

To stain the cells ☐

0 4 . 3 Why was a **thin** layer of onion cells used?

[1 mark]

Tick (✓) **one** box.

To allow light to pass through the cells ☐

To allow oxygen to pass through the cells ☐

To allow water to pass through the cells ☐

Question 4 continues on the next page

Do not write outside the box

0 4 . 4 The student was worried about using a sharp knife to cut the onion.

The student wrote a risk assessment for using a knife.

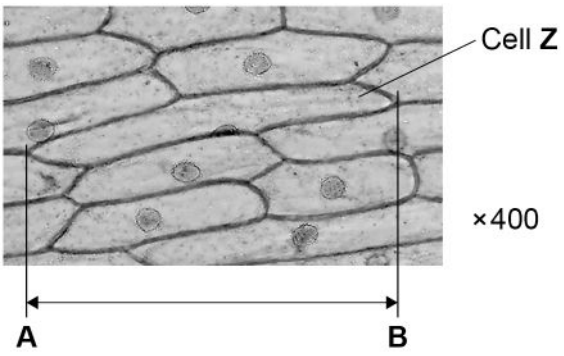
Draw **one** line from each part of the risk assessment to the description of the part.

[2 marks]

Part of risk assessment	**Description**
Hazard	Call a first aider
	Cut the onion on a chopping board
Plan to minimise risk	The onion is cut into pieces
	The knife is sharp

Figure 4 shows what the student saw using the microscope at a magnification of ×400.

Figure 4



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0 4 . 5 Line **A**–**B** in **Figure 4** shows the length of cell **Z**.

Calculate the real length of cell **Z**.

Complete the following steps.

[4 marks]

Measure the length of line **A**–**B** in millimetres (mm).

Length of line **A**–**B** = _____ mm

Give your measurement of the length of line **A**–**B** in micrometres (µm).

1 mm = 1 000 µm

Length of line **A**–**B** = _____ µm

Calculate the real length of cell **Z**.

Use the equation:

$$\text{real length of cell } \mathbf{Z} \text{ (in µm)} = \frac{\text{length of line } \mathbf{A}\text{–}\mathbf{B} \text{ (in µm)}}{\text{magnification}}$$

Real length of cell **Z** = _____ µm

Question 4 continues on the next page

Do not write outside the box

0 4 . 6 How would onion cells look different if they were seen using an electron microscope?

[2 marks]

Tick (✓) **two** boxes.

The cells would be coloured. ☐

The cells would have no nuclei. ☐

The cells would look larger. ☐

The cells would look more blurred. ☐

The cells would show more internal structures. ☐

0 4 . 7 **Figure 4** is repeated below.

Figure 4

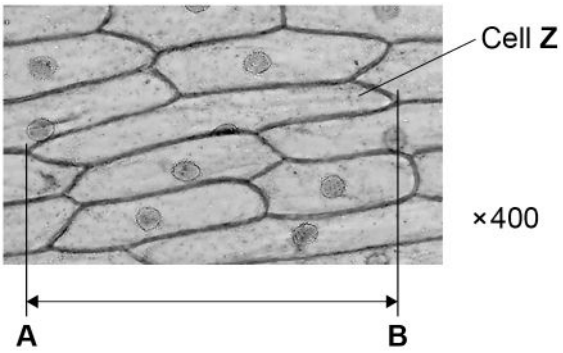

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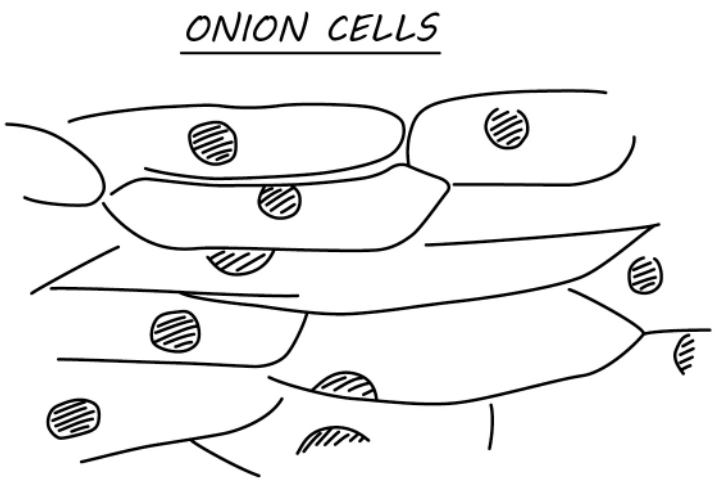
Figure 5 shows the student's drawing of **Figure 4**.

Figure 5



What **two** improvements could the student make to the drawing in **Figure 5**?

[2 marks]

Tick (✓) **two** boxes.

Add colour to the cells. ☐

Complete the cell walls. ☐

Draw each cell on a separate piece of paper. ☐

Include the magnification. ☐

Use a ruler to draw the cells. ☐

15

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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0 5 . 1 Plants take up water from the soil through their roots.

Some of the water is used for photosynthesis.

Complete the word equation for photosynthesis.

Choose answers from the box.

[2 marks]

fat	**glucose**	**nitrogen**	**oxygen**	**protein**

carbon dioxide + water → _____ + _____

0 5 . 2 Water and dissolved substances are transported through a plant.

Complete the sentences.

Choose answers from the box.

[3 marks]

epidermis	**guard cells**	**palisade cells**
phloem	**stomata**	**xylem**

Water moves from the roots to the leaves in the _____.

Water is lost from leaves through pores called _____.

Dissolved sugars are transported in the _____.

Question 5 continues on the next page

Turn over ►

Do not write outside the box

Table 3 shows the rate of transpiration in four different plant species.

Table 3

Plant species	Rate of transpiration in arbitrary units
A	310
B	254
C	87
D	192

0 5 . 3 Calculate how many times greater the rate of transpiration of species **A** is than the rate of transpiration of species **B**.

Give your answer to 2 significant figures.

[3 marks]

Number of times greater (2 significant figures) = _____

Do not write outside the box

0 5 . 4 Which factor could cause species **A** to have a higher rate of transpiration than species **B**?

[1 mark]

Tick (✓) **one** box.

Each flower of species **A** has more petals. ☐

Each leaf of species **A** has more stomata. ☐

Each plant of species **A** has shorter roots. ☐

0 5 . 5 Which environmental change would cause an increase in the rate of transpiration?

[1 mark]

Tick (✓) **one** box.

Decreased light intensity ☐

Decreased wind speed ☐

Increased humidity ☐

Increased temperature ☐

0 5 . 6 Which plant species in **Table 3** is most likely to live in a dry desert?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

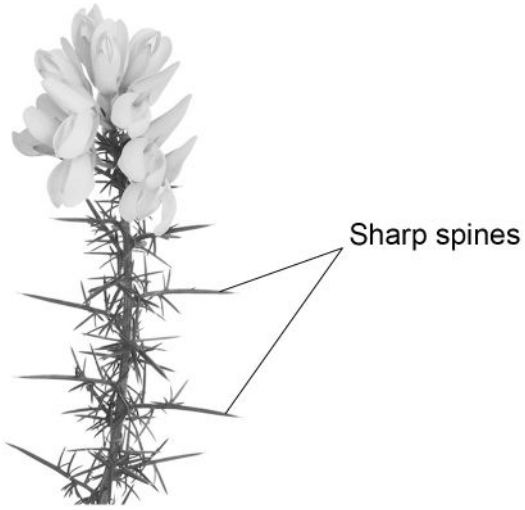
Question 5 continues on the next page

Do not write outside the box

0 5 . 7 Some plants have adaptations that help them survive.

Figure 6 shows part of a gorse plant.

Figure 6



How will the sharp spines help the gorse plant survive?

[1 mark]

Do not write outside the box

0 5 . 8 Animals also have adaptations to help them survive.

Figure 7 shows two insects.

Figure 7

Hornet **Hornet Moth**

Hornets are insects that sting other animals and cause pain.

Hornet moths do **not** sting other animals.

Explain why animals avoid eating the **hornet moth**.

[2 marks]

14

Turn over for the next question

Do not write outside the box

0 6 **Table 4** shows information about four jellyfish.

The jellyfish are listed in order of increasing size.

Table 4

Jellyfish	Size of jellyfish	Surface area in mm^2	Volume in mm^3	Surface area to volume ratio
A	Smallest ↓	3 600	1 200	**X**:1
B		50 000	25 000	2:1
C		1 800 000	6 000 000	0.3:1
D	Largest	7 500 000	125 000 000	0.06:1

0 6 . 1 Calculate value **X** in **Table 4**.

[2 marks]

X = _____

0 6 . 2 Describe the relationship between the size of a jellyfish and its surface area to volume ratio.

Use **Table 4**.

[1 mark]

Do not write outside the box

The jellyfish in **Table 4** take oxygen into their cells by diffusion.

0 6 . 3 Name **one** other substance that enters cells by diffusion.

Do **not** refer to oxygen in your answer.

[1 mark]

0 6 . 4 Suggest **two** factors that affect the rate of diffusion of oxygen into a jellyfish.

[2 marks]

1 _____

2 _____

0 6 . 5 Some organisms take in oxygen using a respiratory system.

In humans, gas exchange takes place in the lungs.

Name the organs where gas exchange takes place in **fish**.

[1 mark]

Question 6 continues on the next page

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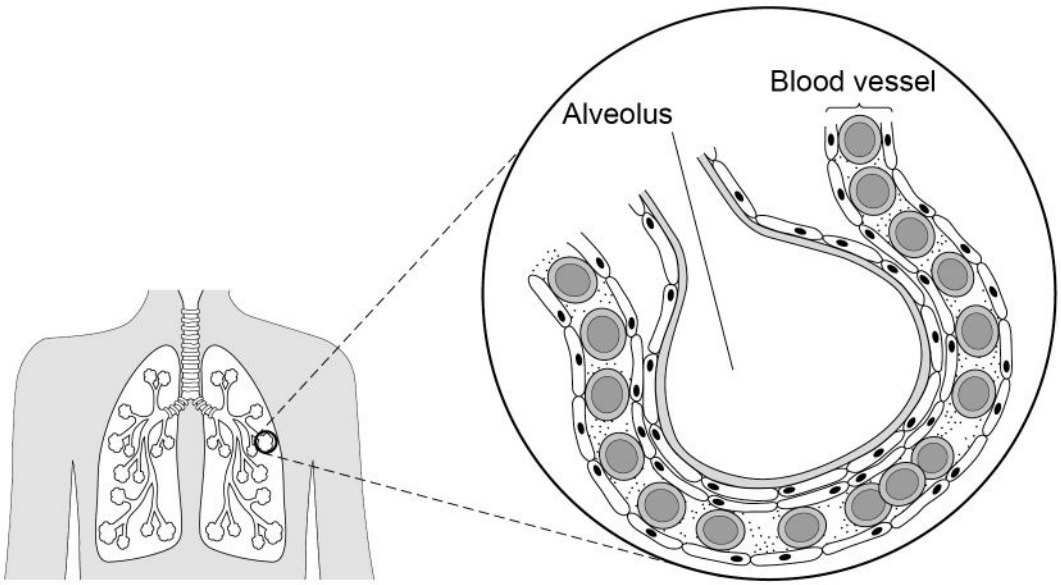
0 6 . 6 **Figure 8** shows parts of the human breathing system.

Figure 8



Explain how the human breathing system is adapted to maximise the rate of gas exchange.

[6 marks]

13

Do not write outside the box

0 7 This question is about cells and transport.

0 7 . 1 Complete **Table 5**.

[3 marks]

Table 5

Name of cell part	Function of cell part
	Contains genetic information
Mitochondria	
	Controls the movement of substances into and out of the cell

Cells in potatoes are plant cells.

Cells in potatoes do **not** contain chloroplasts.

0 7 . 2 What is the function of chloroplasts?

[1 mark]

0 7 . 3 Name **one** type of cell in a potato plant that does **not** contain chloroplasts.

[1 mark]

Question 7 continues on the next page

Do not write outside the box

A student investigated the effect of salt concentration on pieces of potato.

This is the method used.

1. Cut three pieces of potato of the same size.

2. Record the mass of each potato piece.

3. Add 150 cm^3 of 0.4 mol/dm^3 salt solution to a beaker.

4. Place each potato piece into the beaker.

5. After 30 minutes, remove each potato piece and dry the surface with a paper towel.

6. Record the mass of each potato piece.

7. Repeat steps 1 to 6 using different concentrations of salt solution.

0 7 . 4 What is the independent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

Concentration of salt solution ☐

Mass of potato piece ☐

Time potato is left in salt solution ☐

Volume of salt solution ☐

0 7 . 5 Why did the student dry the surface of each potato piece with a paper towel in step **5**?

[1 mark]

Do not write outside the box

The student calculated the percentage change in mass of each potato piece.

0 7 . 6 For one potato piece:

- the starting mass was 2.5 g
- the end mass was 2.7 g.

Calculate the percentage increase in mass of the potato piece.

[2 marks]

Use the equation:

$$\text{percentage increase in mass} = \frac{\text{increase in mass}}{\text{starting mass}} \times 100$$

Percentage increase in mass = _____ %

Question 7 continues on the next page

Do not write outside the box

The student used the results from each potato piece to calculate the mean percentage change in mass at each concentration.

Table 6 shows the results.

Table 6

Concentration of salt solution in mol/dm^3	**Mean percentage (%) change in mass**
0.0	9.8
0.1	9.5
0.2	7.0
0.3	0.4
0.4	−1.4

0 7 . 7 Complete **Figure 9**.

You should:

- label the x-axis
- use a suitable scale for the x-axis
- plot the data from **Table 6**
- draw a line of best fit.

[4 marks]

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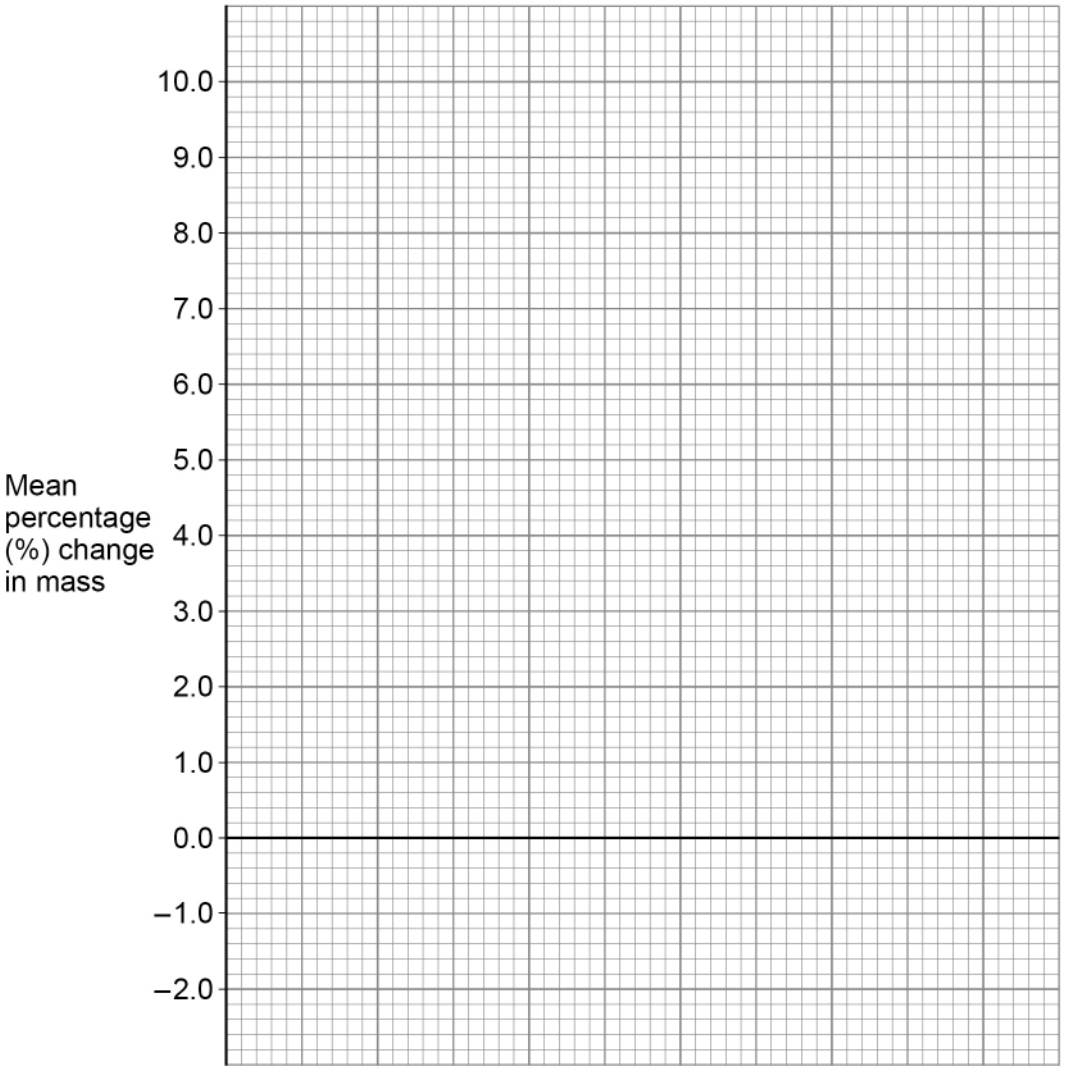
Figure 9



0 7 . 8 What concentration of salt solution was equal to the concentration of the solution inside the potato pieces?

Use **Figure 9**.

[1 mark]

Concentration = _____ mol/dm^3

Question 7 continues on the next page

Turn over ►

Do not write outside the box

0 7 . 9 Explain why the potato pieces in the 0.4 mol/dm^3 salt solution decreased in mass.

[3 marks]

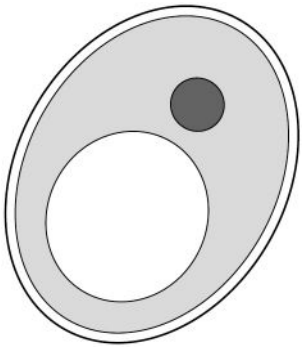
17

Do not write outside the box

0 8 Plant cells and fungal cells are similar in structure.

Figure 10 shows a fungal cell.

Figure 10



0 8 . 1 Name **one** structure in **Figure 10** which is present in both plant cells and fungal cells but **not** in animal cells.

[1 mark]

0 8 . 2 Which disease is caused by a fungus?

[1 mark]

Tick (✓) **one** box.

Gonorrhoea ☐

Malaria ☐

Measles ☐

Rose black spot ☐

Question 8 continues on the next page

Do not write outside the box

0 8 . 3 A fungal cell divides once every 90 minutes.

How many times would this fungal cell divide in 24 hours?

[2 marks]

Number of times cell divides in 24 hours = _____

Do not write outside the box

Some types of fungal cell are grown to produce high-protein food.

The high-protein food can be used to make meat-free burgers.

0 8 . 4 Where is protein digested in the human digestive system?

[1 mark]

Tick (✓) **one** box.

- Large intestine ☐
- Liver ☐
- Salivary glands ☐
- Stomach ☐

0 8 . 5 Which chemical could be used to test if the burgers contain protein?

[1 mark]

Tick (✓) **one** box.

- Benedict's reagent ☐
- Biuret reagent ☐
- Ethanol ☐
- Iodine solution ☐

Question 8 continues on the next page

Do not write outside the box

0 8 . 6 **Table 7** shows some information about burgers made from meat and meat-free burgers.

Table 7

	Mass per 100 g of burger	
	Burgers made from meat	**Meat-free burgers**
Protein in g	14.0	9.0
Fibre in g	0.9	5.5
Fat in g	16.0	5.2
Carbohydrate in g	15.5	15.1
Cholesterol in mg	120.0	0.0

Evaluate the use of burgers made from meat compared with meat-free burgers in providing humans with a healthy, balanced diet.

Use information from **Table 7** and your own knowledge.

[6 marks]

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12

END OF QUESTIONS

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Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

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