

Questions are for both separate science and combined science students unless indicated in the question

**Q1.**

A student prepared some animal cells to view using a microscope.

**Figure 1** shows the student preparing the cells.

**Figure 1**



(a) Name **two** pieces of laboratory equipment the student could have used to **prepare** cells to view using a microscope.

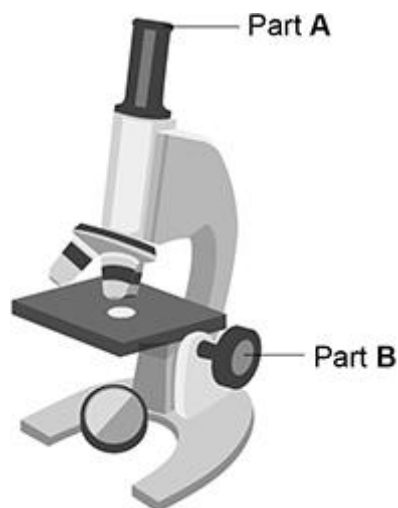
1 \_\_\_\_\_

2 \_\_\_\_\_

(2)

**Figure 2** shows the student's light microscope.

**Figure 2**



(b) Name part **A**.

\_\_\_\_\_

(1)

(c) What is the function of part **B**?

\_\_\_\_\_

\_\_\_\_\_

(1)

(d) The student tried to look at the cells using the microscope.

Suggest **one** reason why the student could **not** see any cells when looking through part **A**.

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(1)

(e) Red blood cells are specialised animal cells.

Compare the structure of a red blood cell with the structure of a plant cell.

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(6)

(f) When placed into a beaker of water:

- a red blood cell bursts
- a plant cell does **not** burst.

Explain why the red blood cell bursts but the plant cell does **not** burst.

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(2)

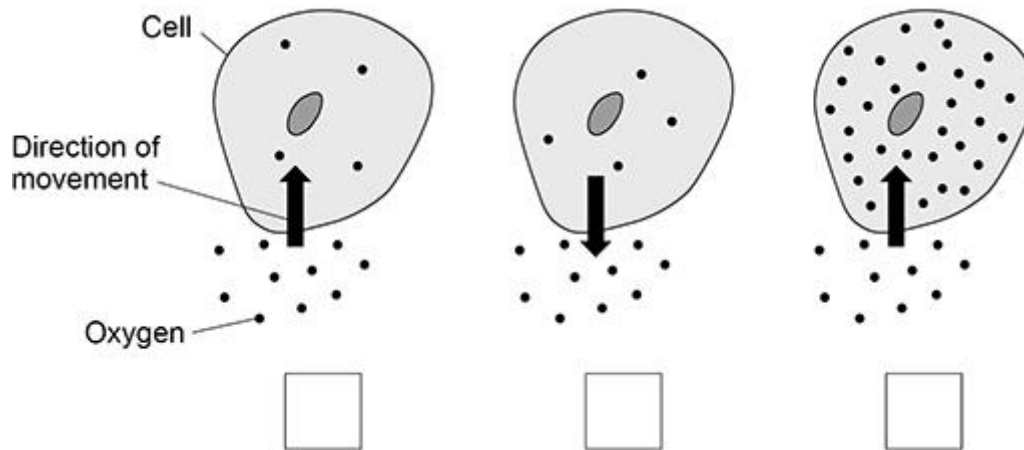
(Total 13 marks)

**Q2.**

This question is about cells.

(a) Which diagram shows oxygen moving by diffusion?

Tick (✓) **one** box.



(1)

(b) Complete the sentences.

Choose answers from the box.

<b>carbon dioxide</b>	<b>chlorophyll</b>	<b>energy</b>
<b>light</b>	<b>mineral ions</b>	<b>water</b>

Plant cells absorb substances from the soil.

Plant cells use osmosis to absorb \_\_\_\_\_.

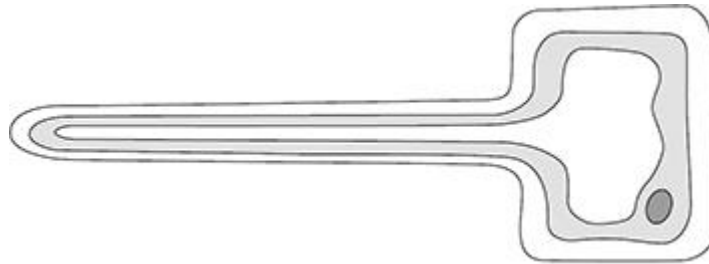
Plant cells use active transport to absorb \_\_\_\_\_.

Active transport moves substances against the concentration gradient and needs \_\_\_\_\_.

(3)

**Figure 1** shows a specialised cell that absorbs substances from the soil.

**Figure 1**



(c) Name the type of specialised cell in **Figure 1**.

\_\_\_\_\_

(1)

(d) Describe how the cell in **Figure 1** is adapted to increase the absorption of substances from the soil.

\_\_\_\_\_  
\_\_\_\_\_

(1)

A sperm cell is another specialised cell.

**Figure 2** shows a sperm cell.

**Figure 2**



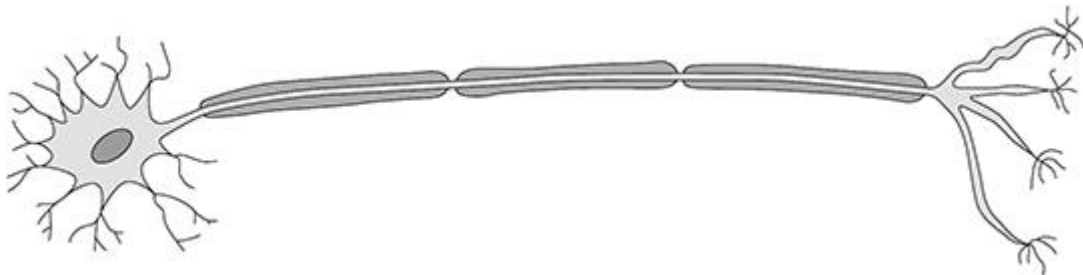
- (e) Draw **one** line from each feature to how the feature helps the sperm cell carry out its function.

Feature of sperm cell	How the feature helps
Contains a nucleus	To break the outer layer of the egg
	To help the cell to swim to the egg
	To provide the chromosomes for fertilisation
Has a long tail	To release energy

(2)

**Figure 3** shows another specialised cell.

**Figure 3**



- (f) Name the type of cell in **Figure 3**.

Describe **one** feature of the cell that helps it to carry out its function.

Name of the cell \_\_\_\_\_

Feature of the cell \_\_\_\_\_

\_\_\_\_\_

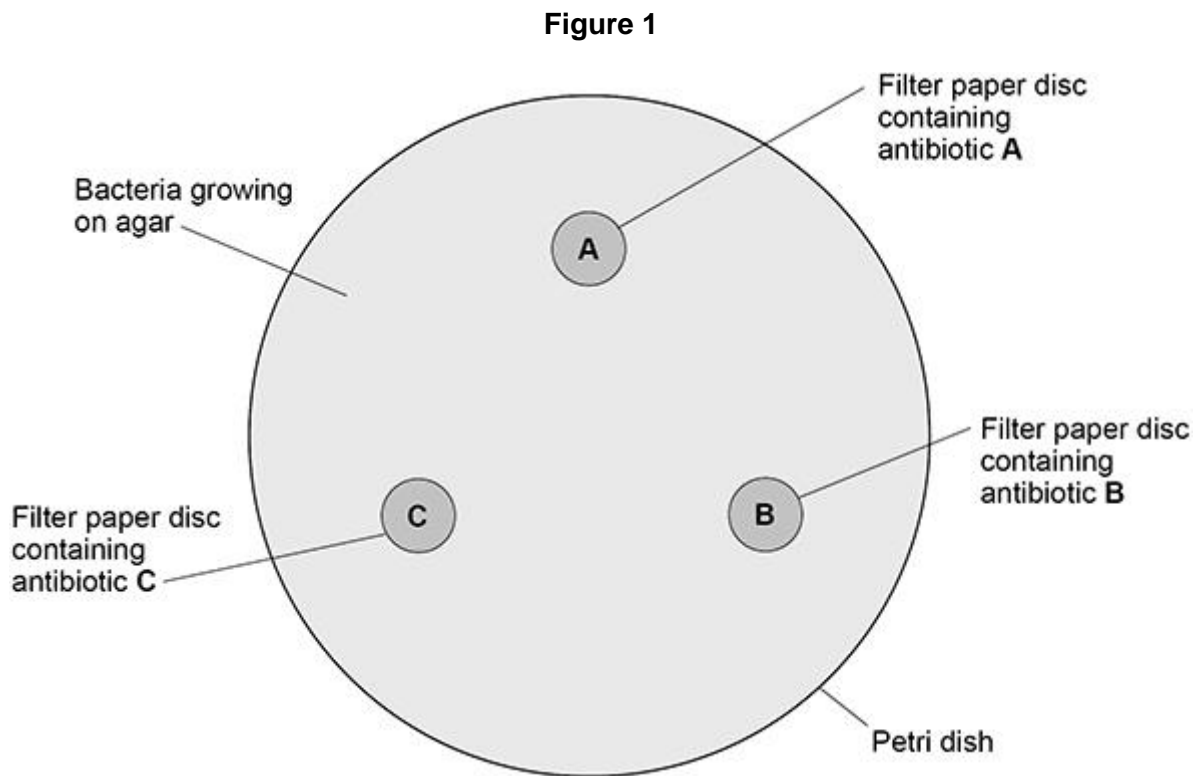
(2)

(Total 10 marks)

**Q3. (separate only)**

A student investigated the effectiveness of three different antibiotics.

**Figure 1** shows how the student set up an agar plate.



The student used aseptic techniques to make sure that only one type of bacterium was growing on the agar.

(a) Describe **two** aseptic techniques the student should have used. **(separate only)**

1 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

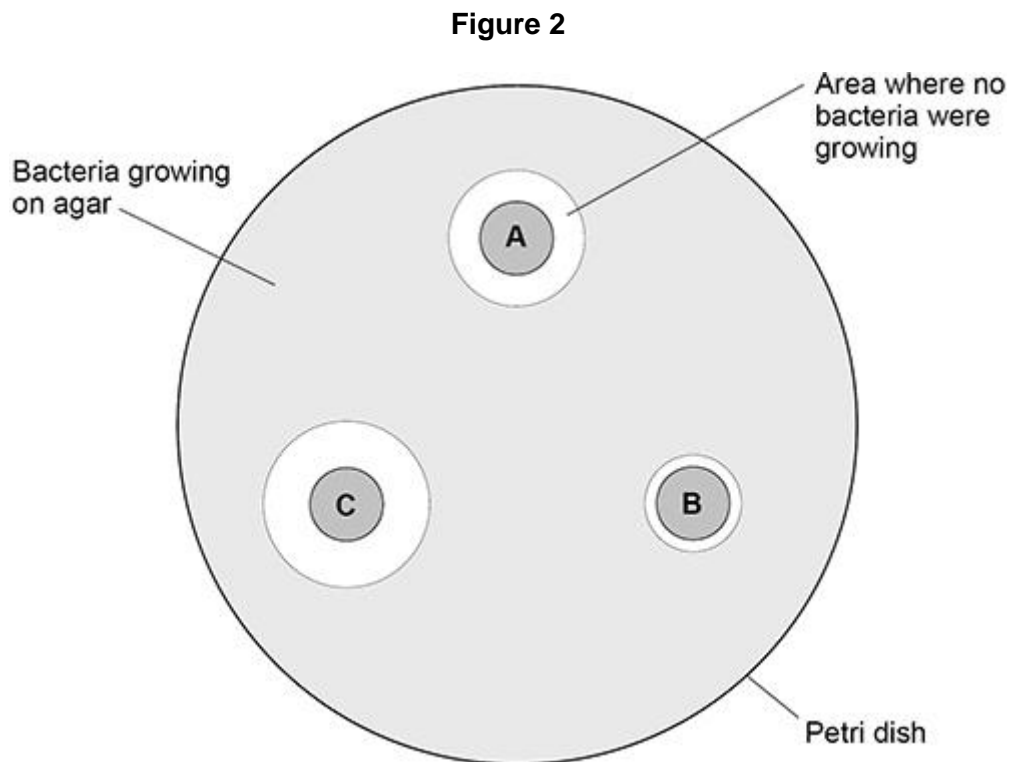
\_\_\_\_\_

\_\_\_\_\_

(2)

The student placed the agar plate in an incubator at 25 °C for 48 hours.

**Figure 2** shows the agar plate after 48 hours.



(b) Which antibiotic is the **least** effective? **(separate only)**

Give a reason for your answer.

Least effective antibiotic \_\_\_\_\_

Reason \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(1)

(c) Calculate the area where no bacteria were growing for antibiotic **C**.

Use  $\pi = 3.14$

Give the unit. **(separate only)**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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Area = \_\_\_\_\_ Unit \_\_\_\_\_

(5)

- (d) Suggest **one** way the student could improve the investigation. **(separate only)**

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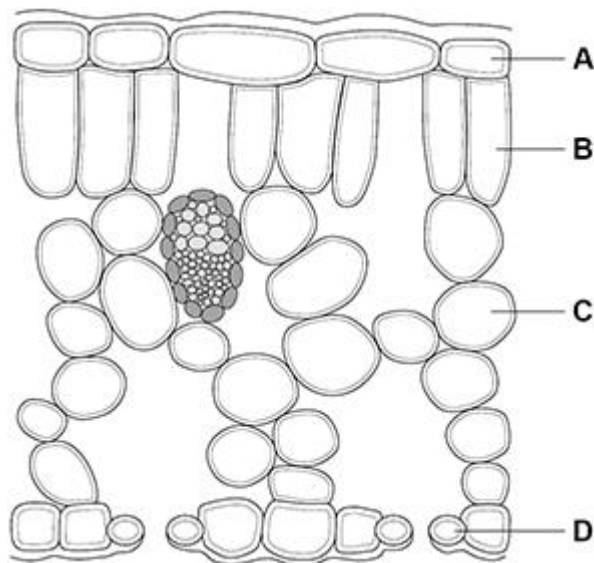
(1)

(Total 9 marks)

**Q4.**

**Figure 1** shows a cross section of a leaf.

**Figure 1**



- (a) Which cell is most transparent?

Tick (✓) **one** box.

A       B       C       D

(1)



(b) Which cell structure in a leaf mesophyll cell is **not** found in a root hair cell?

\_\_\_\_\_

(1)

Plants lose water through their leaves.

(c) Name the cells in a leaf that control the rate of water loss.

\_\_\_\_\_

(1)

(d) Water is taken in by the roots, transported up the plant and lost from the leaves.

Which scientific term describes this movement of water?

\_\_\_\_\_

(1)

(e) Which change would decrease the rate of water loss from a plant's leaves?

Tick (✓) **one** box.

Increased humidity

Increased light intensity

Increased density of stomata

Increased temperature

(1)

(f) Compare the structure and function of xylem tissue and phloem tissue.

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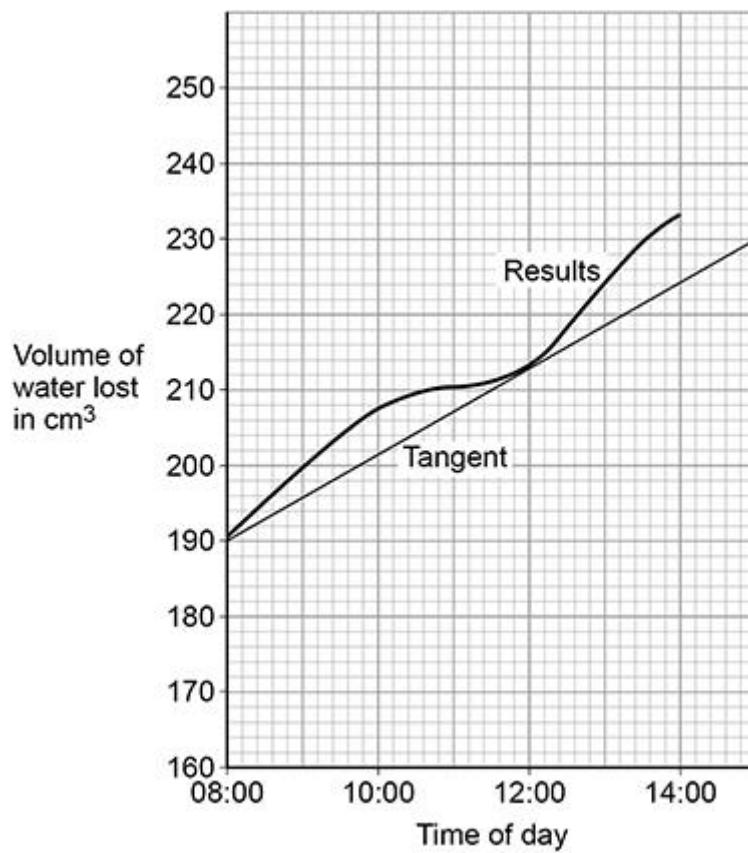


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(6)

Figure 2 shows the total volume of water lost from a plant over 6 hours.

Figure 2



(g) Determine the rate of water loss at 12:00

Use the tangent on the graph above.

Give your answer:

- in cm<sup>3</sup> per minute
- in standard form.

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Rate of water loss = \_\_\_\_\_ cm<sup>3</sup> per minute

(4)

(h) The rate of water loss at midnight was much lower than at 12:00

Explain why.

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(2)

(Total 17 marks)

**Q5.**

This question is about cells.

(a) **Figure 1** shows a cell.

**Figure 1**



What type of cell is shown in **Figure 1**?

Tick (✓) **one** box.

Animal

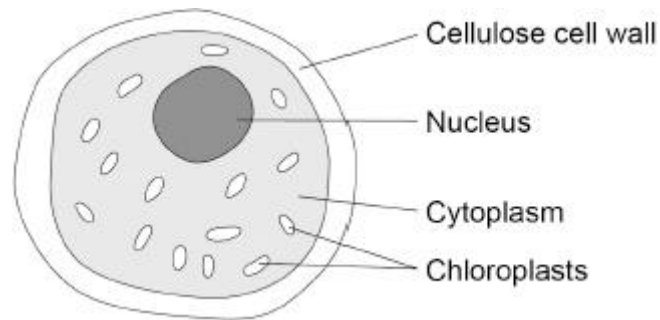
Bacterium

Plant

(1)

Figure 2 shows an algal cell.

Figure 2



(b) What is the function of the cell wall?

Tick (✓) **one** box.

To contain the genetic material

To stop the chloroplasts leaking out

To strengthen the cell

(1)

(c) The algal cell is green.

Which part of the algal cell makes it green in colour?

Tick (✓) **one** box.

Cellulose

Chloroplast

Cytoplasm

Nucleus

(1)

(d) Cells contain sub-cellular structures.

Draw **one** line from each structure to its function.

Structure	Function
Cell membrane	Controls transport of substances into the cell
Mitochondria	Where energy is released
Ribosomes	Where glucose is made
	Where photosynthesis takes place
	Where proteins are made

(3)

A student prepared a microscope slide of cheek cells.

The student looked at one cell using a microscope.

**Figure 3** shows the image the student saw.

**Figure 3**



(e) What should the student do to get a clear image?

Tick (✓) **one** box.

Adjust the focus knob

Make the light dimmer

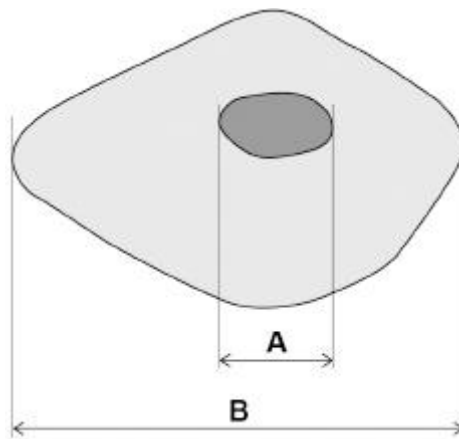
Put water on the slide

(1)

The student then obtained a clear image.

**Figure 4** shows the clear image.

**Figure 4**



(f) Measure the length of the nucleus (**A**) and the length of the cell (**B**) in millimetres (mm).

**A** = \_\_\_\_\_ mm

**B** = \_\_\_\_\_ mm

(2)

(g) How many times longer is the cell (**B**) than the nucleus (**A**)?

\_\_\_\_\_

Number of times longer = \_\_\_\_\_

(1)

(h) The student looked at another cell.

The image width of the cell was 40 mm

The real width of the cell was 0.1 mm

Calculate the magnification of the cell.

Use the equation:

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

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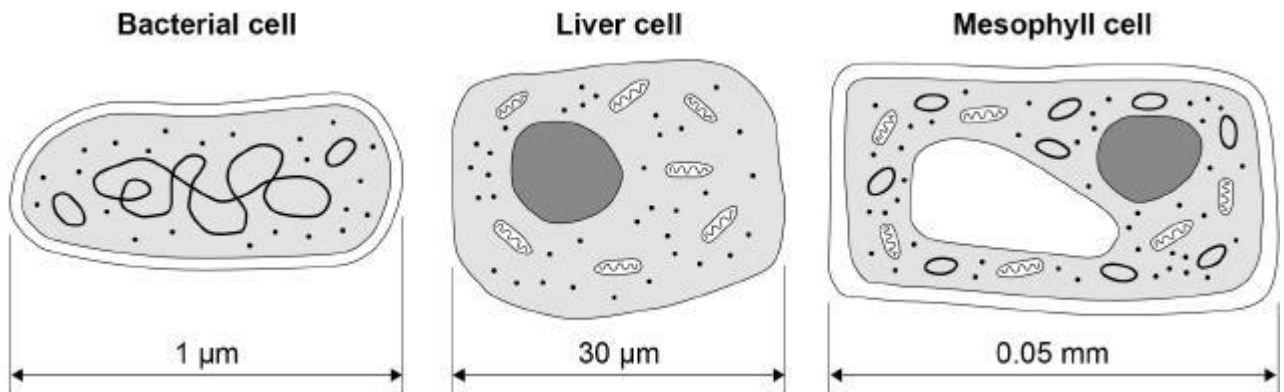
Magnification = x \_\_\_\_\_

(2)

(Total 12 marks)

**Q6.**

The diagram below shows three types of cell.



(a) Give **two** similarities between the prokaryotic cell and the eukaryotic cells in the diagram above.

1 \_\_\_\_\_

2 \_\_\_\_\_

(2)

- (b) Give **three** differences between the prokaryotic cell and the eukaryotic cells in the diagram above.

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

3 \_\_\_\_\_

\_\_\_\_\_

**(3)**

- (c) Calculate the ratio of the size of the bacterial cell to the size of the mesophyll cell.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Ratio = 1 : \_\_\_\_\_

**(2)**

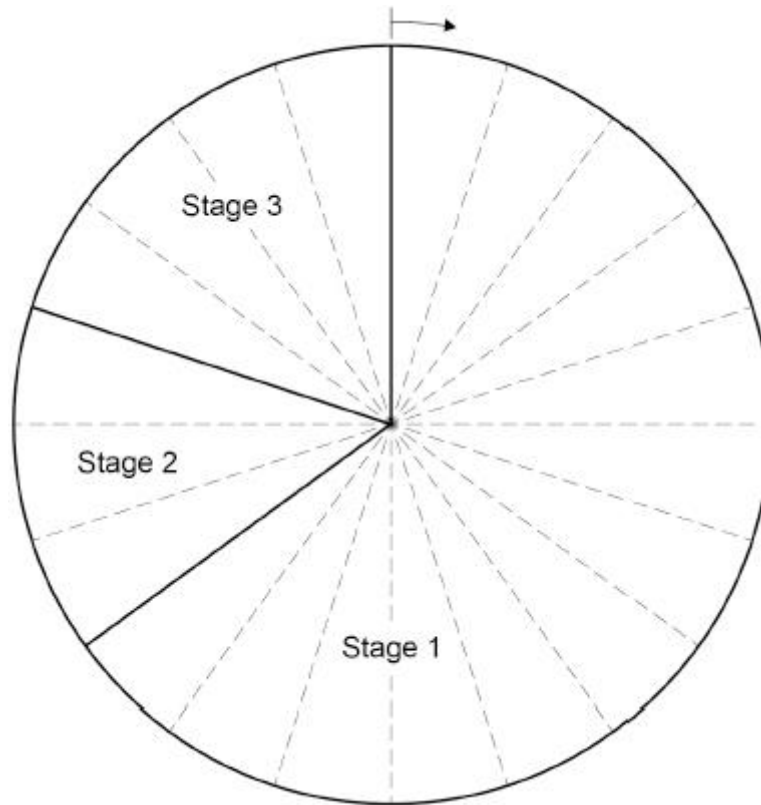
- (d) Name the type of cell division that produces genetically identical body cells for growth and repair.

\_\_\_\_\_

**(1)**



The chart below shows a cell cycle.



- (e) What percentage of the time for one cell cycle is represented by stage 2 and stage 3 together?

Tick (✓) **one** box.

7%     35%     40%     65%

(1)

- (f) Describe what happens during each stage of the cell cycle.

Stage 1

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Stage 2

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Stage 3

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(4)

(Total 13 marks)

**Q7.**

**Figure 1** shows an animal cell viewed using a microscope.

**Figure 1**



(a) The cell contains a nucleus.

What is the function of the nucleus?

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(1)

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

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(1)

- (c) Draw a simple diagram of the cell in **Figure 1**.  
Label **two** parts of the cell.

(2)

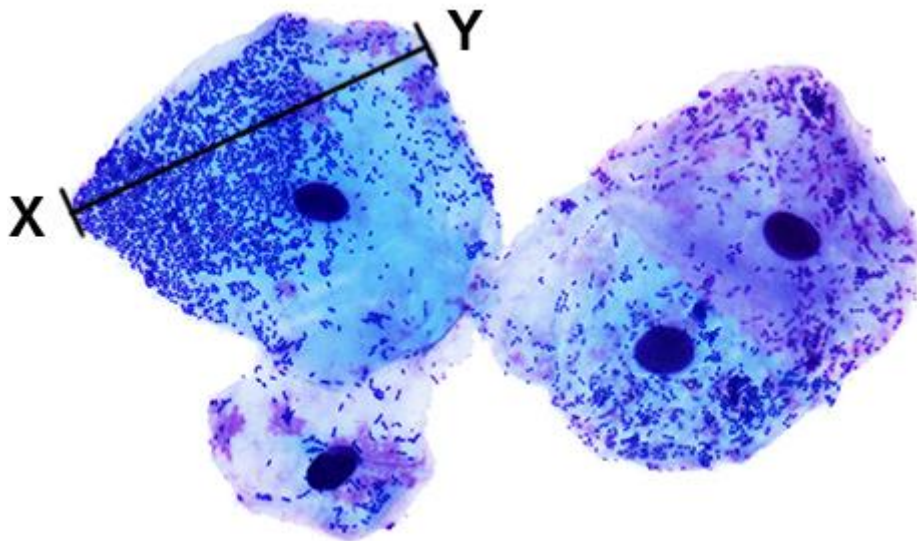
- (d) Name **one** structure found in a plant cell but **not** found in an animal cell.

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(1)

**Figure 2** shows some different cells.

**Figure 2**



- (e) The real length from point **X** to point **Y** is 0.06 mm  
Calculate the magnification.  
Use the equation:

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

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Magnification =  $\times$  \_\_\_\_\_

(3)

(f) The cells shown in **Figure 2** were viewed using a light microscope.

Give **two** advantages of using an electron microscope instead of a light microscope.

1 \_\_\_\_\_

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2 \_\_\_\_\_

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(2)

(Total 10 marks)

**Q8.**

Plants are made up of cells, tissues and organs.

(a) Draw **one** line from each level of organisation to the correct plant part.

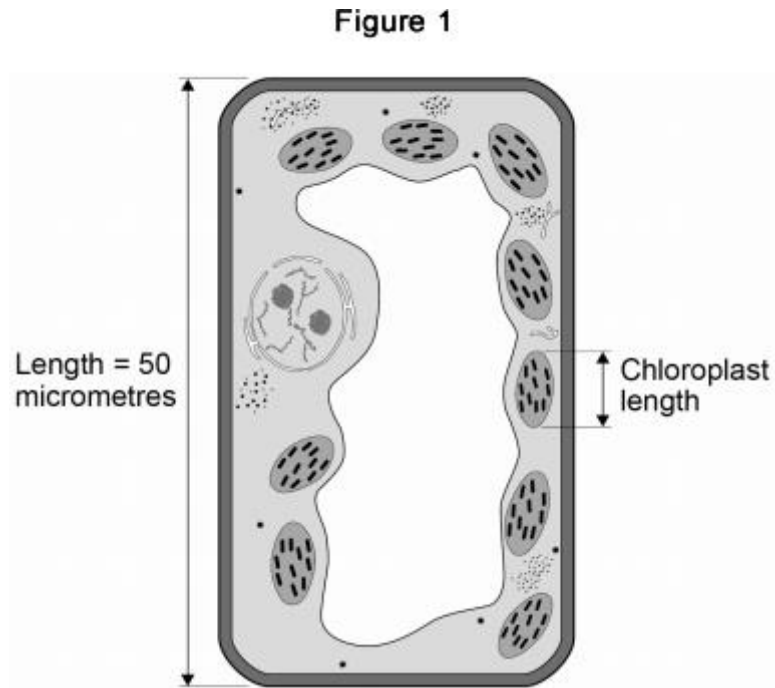
**Level of organisation**

**Plant part**

	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Leaf</div>
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Organ</div>	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Root hair</div>
	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Spongy mesophyll</div>
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Tissue</div>	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Vacuole</div>
	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Xylem cell</div>

(2)

Figure 1 shows a plant cell drawn to scale.



(b) Where in a plant would the cell in **Figure 1** be found?

Tick **one** box.

- Epidermis
- Palisade mesophyll
- Phloem
- Xylem

(1)

(c) Calculate the length of the chloroplast labelled in **Figure 1**.

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Length = \_\_\_\_\_ micrometres

(2)

- (d) Cells in plant roots do **not** photosynthesise.

Give **one** reason why.

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(1)

- (e) As a plant grows, new root hair cells are formed from unspecialised cells.

How does an unspecialised cell become a new root hair cell?

Tick **one** box.

Differentiation

Metabolism

Transpiration

Transport

(1)

(Total 7 marks)

**Q9.**

Cells can be classified according to their structure.

(a) Complete **Table 1** to show which features each cell type has.

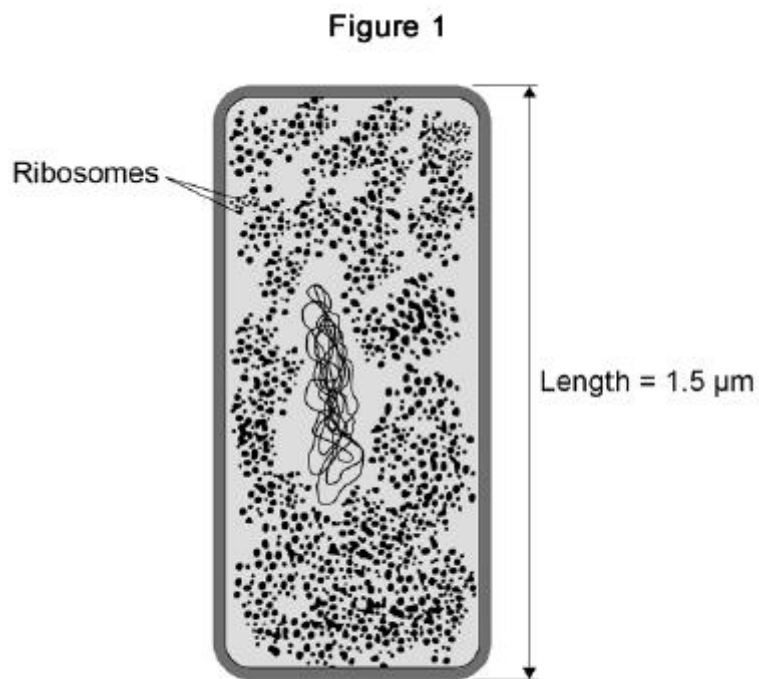
Write a tick or a cross in each box.

**Table 1**

	<b>Nucleus</b>	<b>Plasmids</b>	<b>Cytoplasm</b>
Prokaryotic cell			
Eukaryotic cell			

(2)

**Figure 1** shows a cell.



(b) What type of cell is shown in **Figure 1**.

Tick **one** box.

An animal cell

A bacterial cell

A plant cell 

(1)

(c) The cell in **Figure 1** contains ribosomes.

What is the function of ribosomes?

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(1)

(d) There are 1000 micrometres ( $\mu\text{m}$ ) in a millimetre (mm).

The length of the cell in **Figure 1** is 1.5 micrometres ( $\mu\text{m}$ ).

Give the length of the cell in millimetres (mm).

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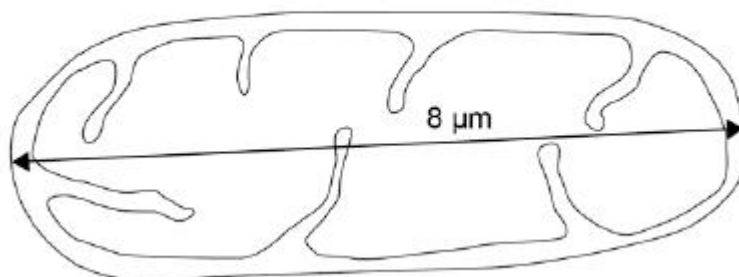
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Length of cell = \_\_\_\_\_ mm

(1)

**Figure 2** shows a mitochondrion viewed with a microscope.

**Figure 2**



(e) Give **one** reason why the cell in **Figure 1** does **not** contain mitochondria.

Use information from **Figure 1** and **Figure 2**.

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(1)



The cell in **Figure 1** divides once every 30 minutes.

**(separate only)**

**Table 2** shows how many cells are present after a given time.

**Table 2**

Time in minutes	Number of cells present
0	1
30	2
60	4

(f) Calculate how many cells will be present after 2 hours.

**(separate only)**

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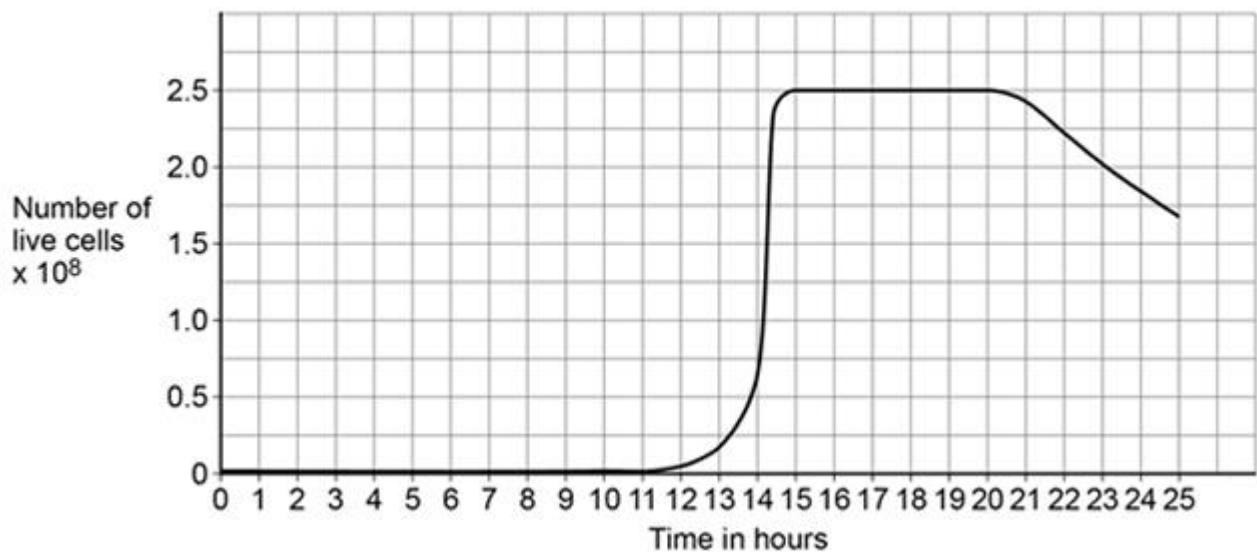
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Number of cells = \_\_\_\_\_

**(2)**

Cells like the one in **Figure 1** are kept in a culture solution for 25 hours.

The graph below shows the number of live cells present.



(g) Describe the changes in the number of live cells shown in the graph above in the first 20 hours. **(separate only)**

Use data from the graph in your answer.

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(3)

- (h) Suggest **one** reason why the number of live cells decreases after 20 hours.  
**(separate only)**

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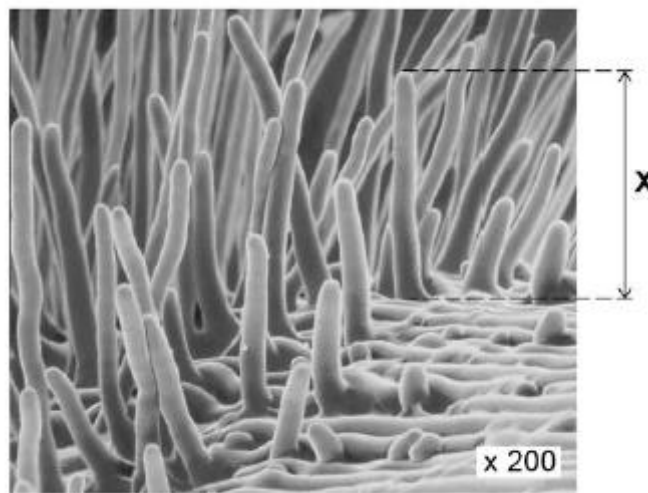
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(1)

(Total 12 marks)

**Q10.**

The image below shows part of a root from a cress plant.



- (a) What type of microscope was used to create the image above?

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(1)

- (b) The magnification of the cress root in the image above is  $\times 200$ .  
There are 1000 micrometres ( $\mu\text{m}$ ) in a millimetre (mm).

Calculate the real length of the root hair, **X**.  
Give your answer in micrometres ( $\mu\text{m}$ ).

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Real length **X** = \_\_\_\_\_  $\mu\text{m}$

**(2)**

- (c) Root hair cells take up water from the soil.

Explain **one** way in which the root hair cell is adapted to this function.

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**(2)**

The table shows the water uptake by a plant's roots on two different days.

	Mean water uptake in $\text{cm}^3$ per hour
Cold day	1.8
Hot day	3.4

- (d) Explain why the mean rate of water uptake is higher on a hot day than on a cold day.

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**(3)**

- (e) The concentration of mineral ions in the soil is lower than in root hair cells.  
 Root hair cells take up mineral ions from the soil.  
 Root hair cells contain mitochondria.

Explain why root hair cells contain mitochondria.

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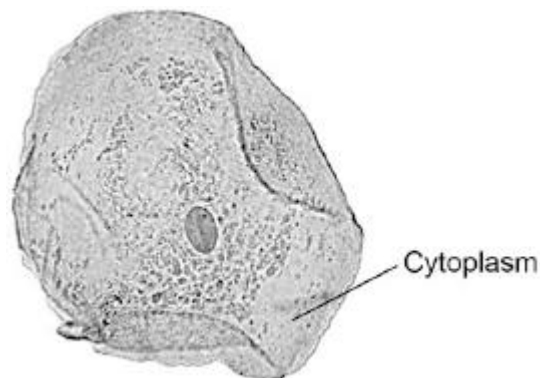
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(4)  
 (Total 12 marks)

**Q11.**

**Figure 1** shows a human cheek cell viewed under a light microscope.

**Figure 1**



© Ed Reschke/Photolibrary/Getty Images

- (a) Label the nucleus **and** cell membrane on **Figure 1**.

(2)

- (b) Cheek cells are a type of body cell.

Body cells grow through cell division.

What is the name of this type of cell division?

Tick **one** box.

Differentiation

Mitosis

Specialisation

(1)

- (c) Ribosomes and mitochondria are **not** shown in **Figure 1**.

What type of microscope is needed to see ribosomes and mitochondria?

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(1)

- (d) What is the advantage of using the type of microscope you named in part **(c)**?

Tick **one** box.

Cheaper

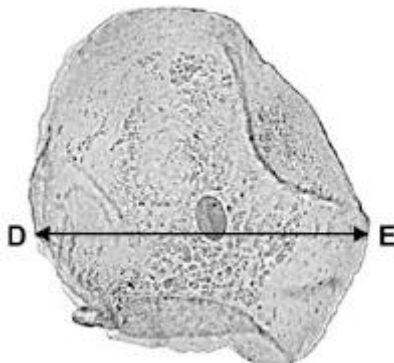
Higher magnification

Lower resolution

(1)

- (e) The cheek cell in **Figure 2** is magnified 250 times.  
The width of the cell is shown by the line **D** to **E**.

**Figure 2**



Calculate the width of the cheek cell in micrometres ( $\mu\text{m}$ ).

Complete the following steps.

Measure the width of the cell using a ruler \_\_\_\_\_  
mm

Use the equation to work out the real width of the cell in mm:

**real size** =  $\frac{\text{image size}}{\text{magnification}}$  \_\_\_\_\_  
mm

Convert mm to  $\mu\text{m}$  \_\_\_\_\_  
 $\mu\text{m}$

**(3)**

- (f) A red blood cell is  $8 \mu\text{m}$  in diameter.  
A bacterial cell is 40 times smaller.  
Calculate the diameter of the bacterial cell.

Tick **one** box.

0.02  $\mu\text{m}$

0.2  $\mu\text{m}$

2.0  $\mu\text{m}$

20.0  $\mu\text{m}$



(1)

(Total 9 marks)

**Q12.**

Living organisms are made of cells.

- (a) Animal and plant cells have several parts. Each part has a different function.

Draw **one** line from each cell part to the correct function of that part.

**Cell part**

**Function**

Cell membrane

Mitochondria

Nucleus

Where most energy is released in respiration

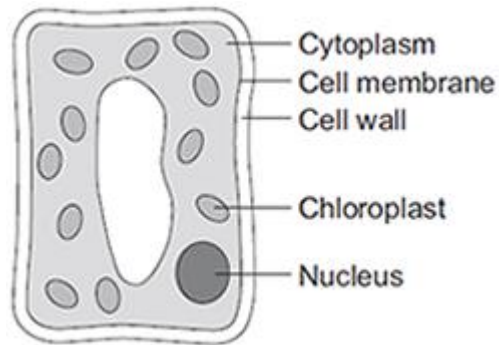
Controls the movement of substances into and out of the cell

Controls the activities of the cell

Where proteins are made

(3)

(b) The diagram below shows a cell from a plant leaf.



Which **two** parts in the diagram above are **not** found in an animal cell?

1. \_\_\_\_\_

2. \_\_\_\_\_

(2)

(Total 5 marks)