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.
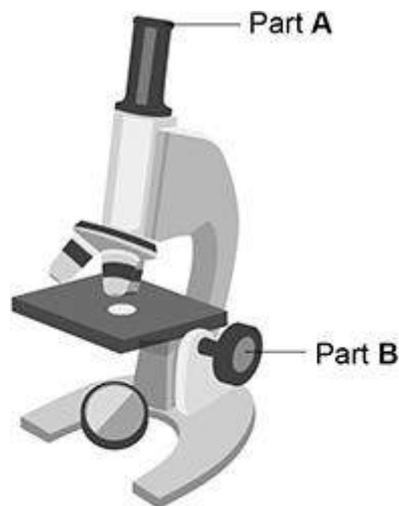
1 _____

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**.

_____

_____

(1)

(e)   Red blood cells are specialised animal cells.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(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.
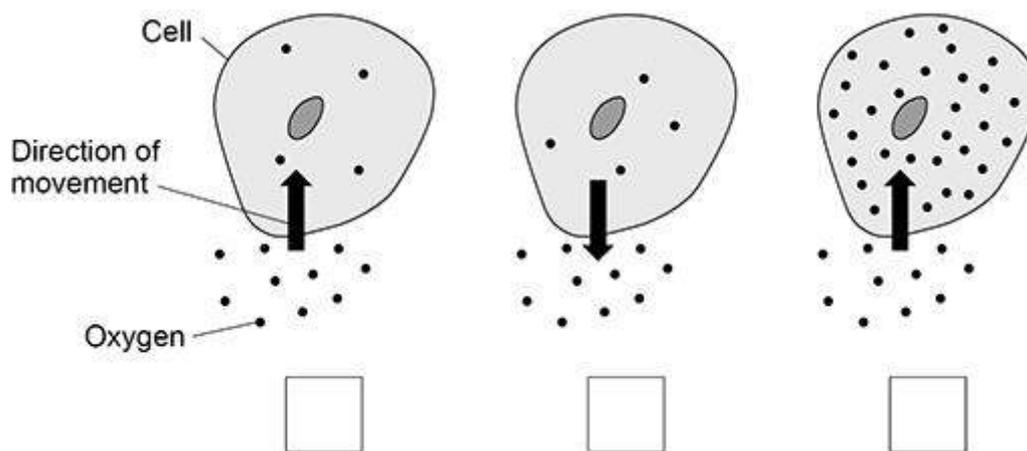
_____

_____

_____

_____

(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.

carbon dioxide	chlorophyll	energy
light	mineral ions	water

Plant cells absorb substances from the soil.

Plant cells use osmosis to absorb _____.
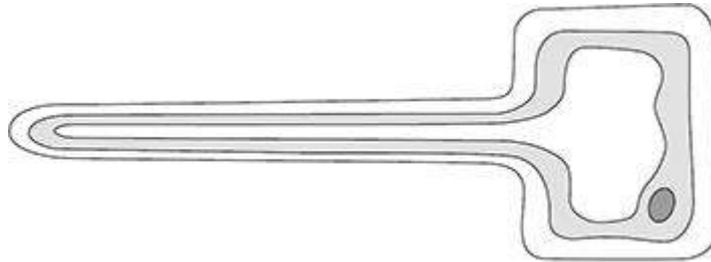
Plant cells use active transport to absorb
_____.

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**

| To break the outer layer of the egg |

| Contains a nucleus |

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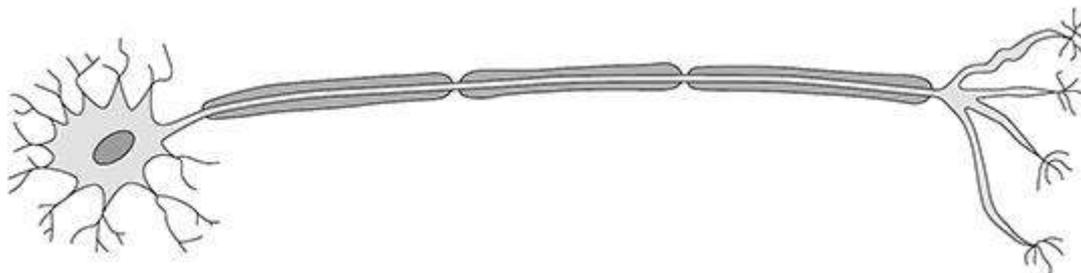
(f) Name the type of cell in **Figure 3**.

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

Name of the
cell _____

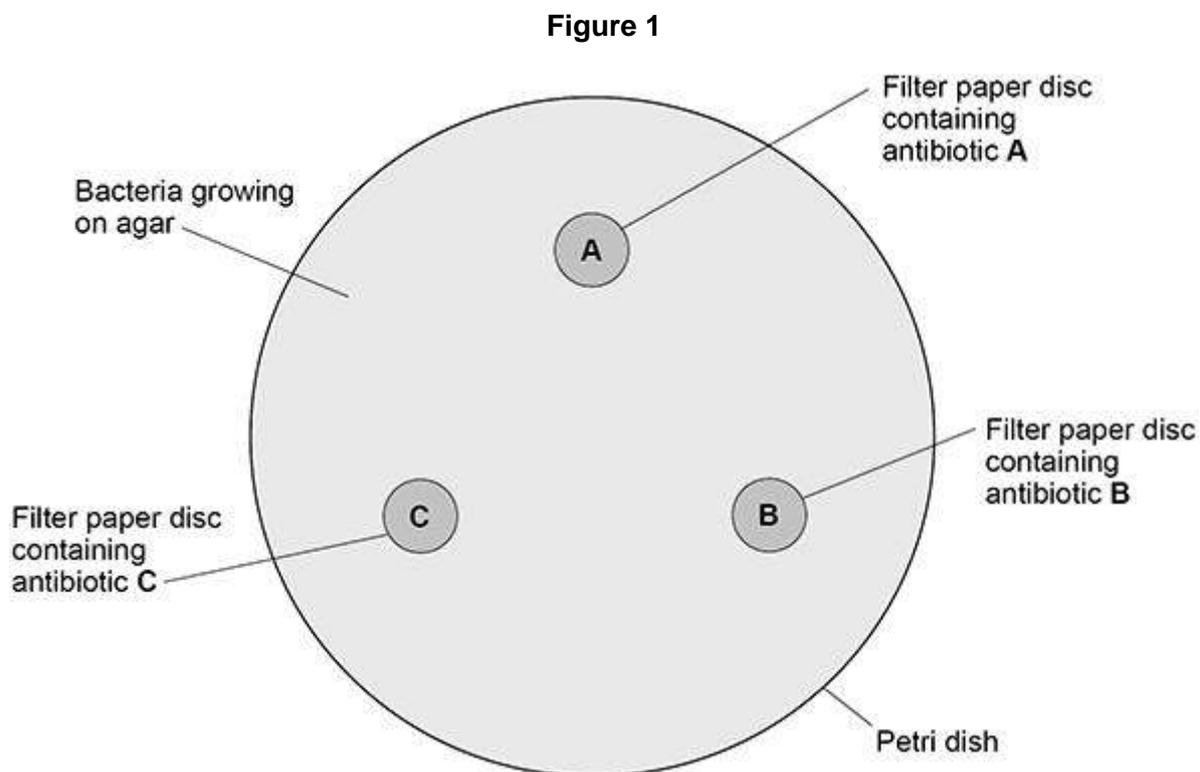Feature of the
cell _____

_____

(2)
(Total 10 marks)

Q3.

A student investigated the effectiveness of three different antibiotics.

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

Figure 1

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.

1   _____

_____

_____

2   _____

_____

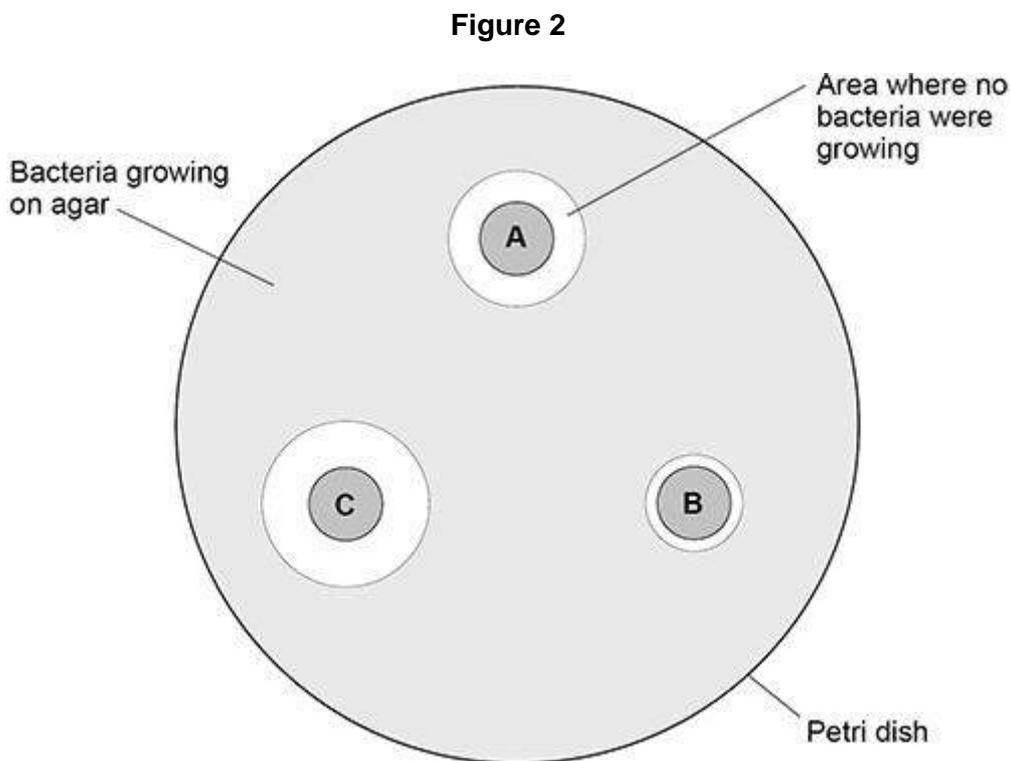_____

(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.

Figure 2

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

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.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Area = _____ Unit _____

(5)

(d) Suggest **one** way the student could improve the investigation.
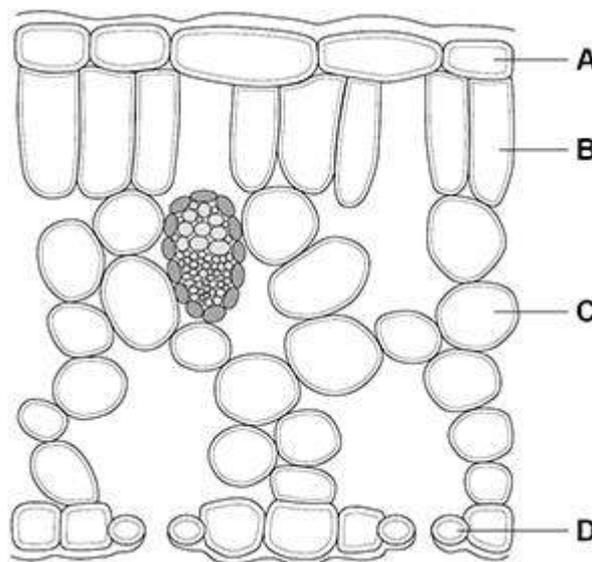
_____

_____

(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.

_____

_____

_____

_____

_____

_____
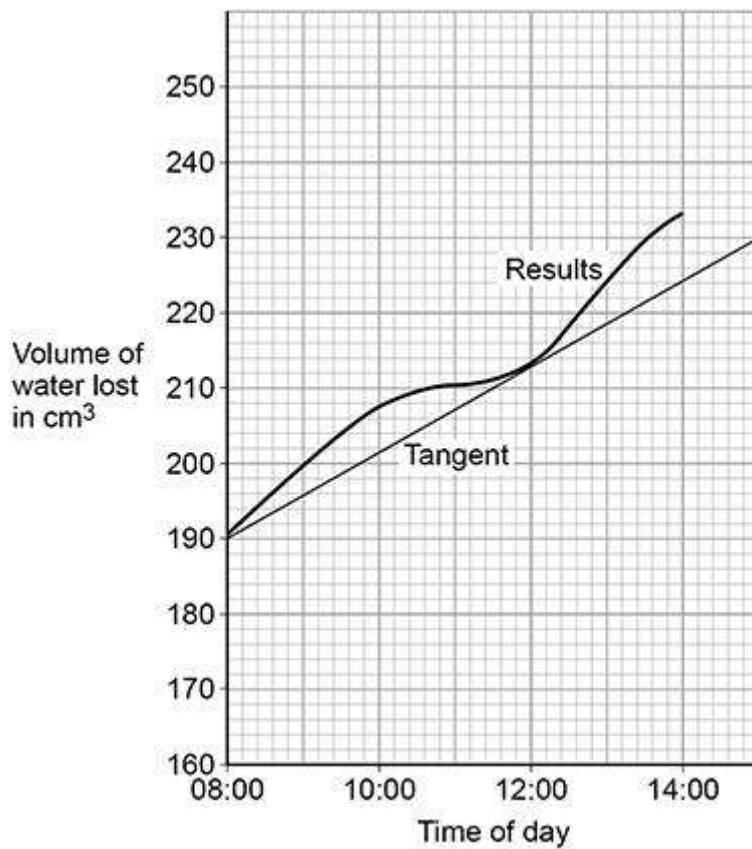
_____

_____

_____

_____

_____

_____

(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^3 per minute
•   in standard form.

_____

_____

_____

_____

_____

_____

_____

_____

Rate of water loss = _____ cm³ per minute

(4)

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

Explain why.
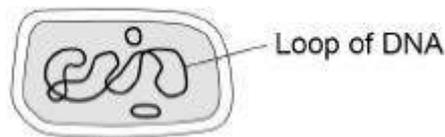
_____

_____

_____

_____

(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**?
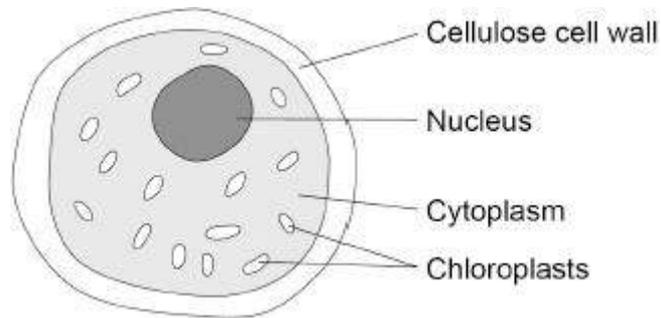
Tick (✓) **one** box.

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

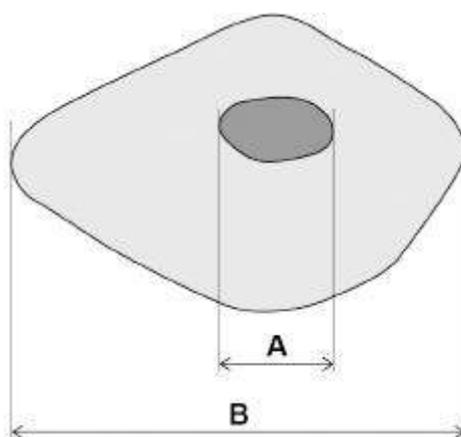Adjust the focus knob ☐

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:

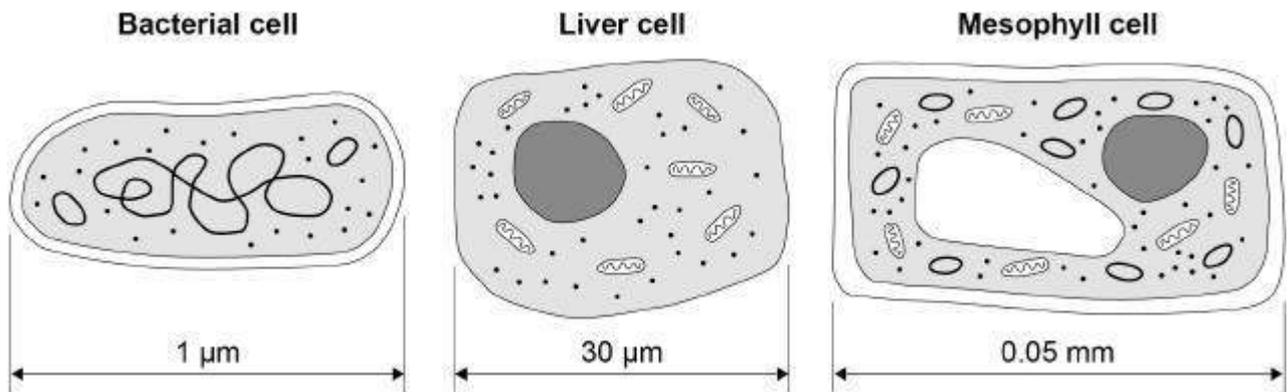$$\text{magnification} = \frac{\text{size of image}}{\text{size of real object}}$$

_____

_____

_____

Magnification = × _____

(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.
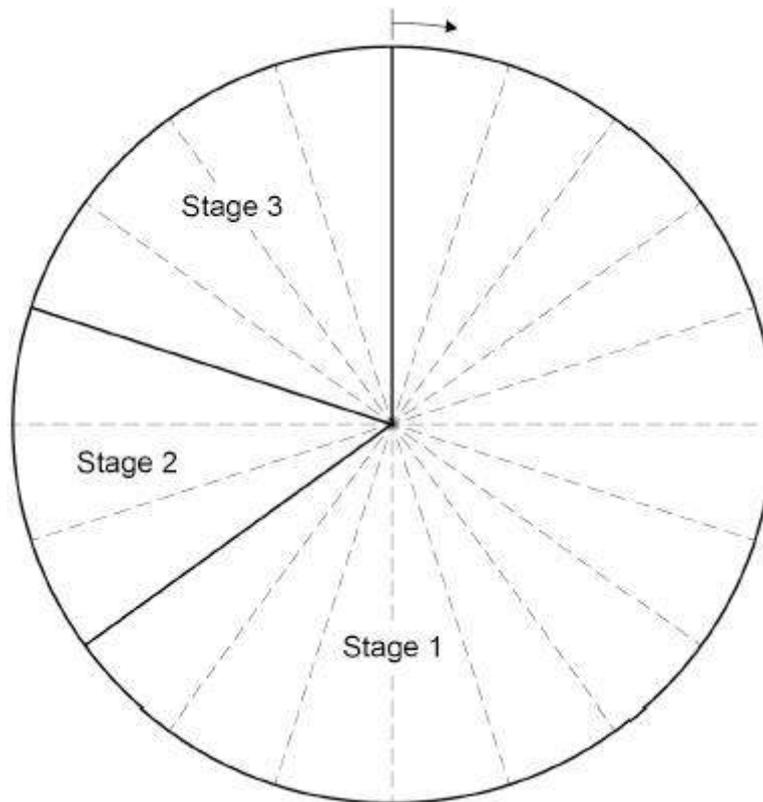
_____

_____

_____

_____

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

_____

_____

_____

_____

Stage 2

_____

_____

Stage 3

_____

_____

(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?

_____

(1)

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

_____

(1)

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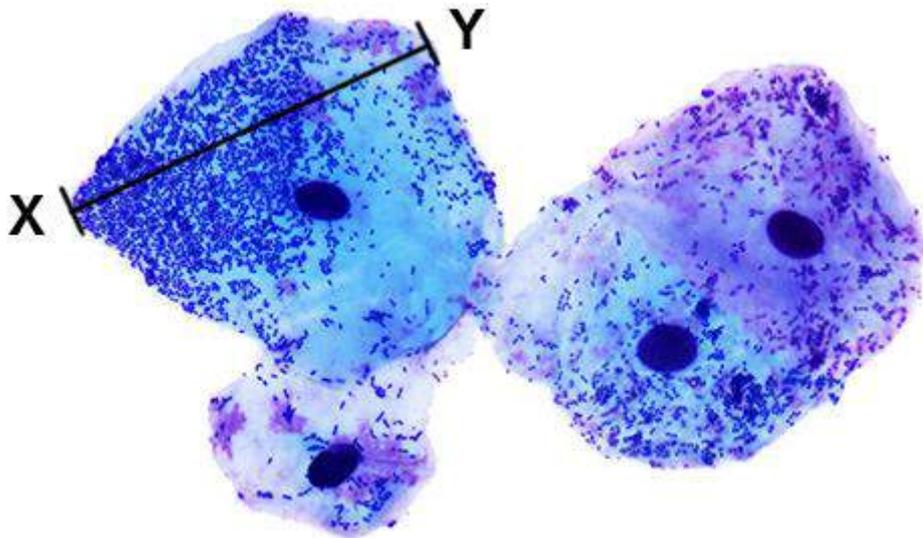
Label **two** parts of the cell.

(2)

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

_____

(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:

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

_____

_____

_____

_____

_____

_____

Magnification = × _____

(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 _____

_____

2 _____

_____

(2)
(Total 10 marks)

Q8.

Plants are made up of cells, tissues and organs.
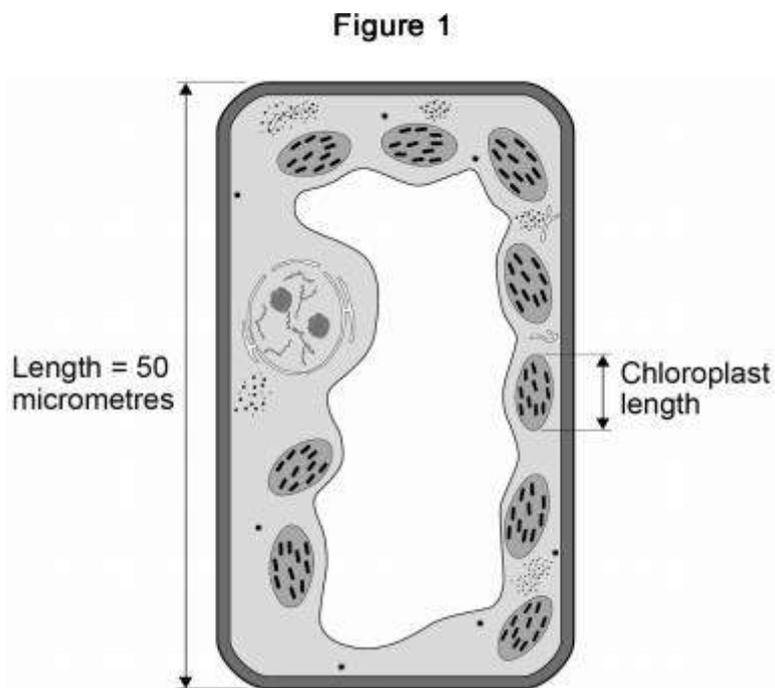
(a)   Draw **one** line from each level of organisation to the correct plant part.

Level of organisation	Plant part
	Leaf
Organ	Root hair
	Spongy mesophyll
Tissue	Vacuole
	Xylem cell

(2)

Figure 1 shows a plant cell drawn to scale.

Figure 1

Length = 50 micrometres

Chloroplast length

(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**.

_____

_____

_____

_____

Length = _____ micrometres

(2)

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

Give **one** reason why.

_____

_____

(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?
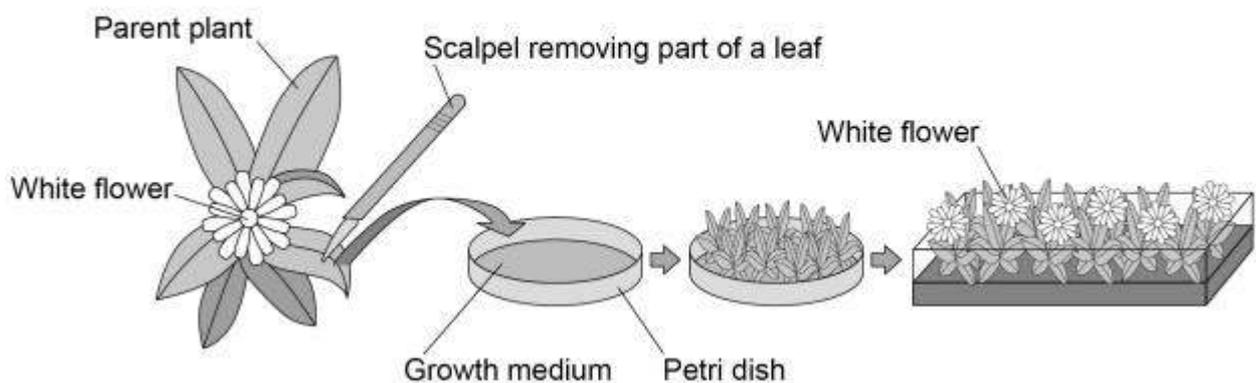
Tick **one** box.

Differentiation   ☐

Metabolism   ☐

Transpiration   ☐

Transport   ☐

(1)

Scientists can clone plants using tissue culture.

Figure 2 shows the process of tissue culture.

Figure 2

(f)   Why might scientists want to clone plants?

Tick **one** box.

To create new species of plants. ☐

To introduce variation into plants. ☐

To protect endangered plants from extinction. ☐

To reduce disease resistance in plants. ☐

(1)

(g)   What is the advantage of cloning plants using tissue culture?

Tick **one** box.

No special equipment is needed. ☐

Plants can be produced quickly. ☐

The flowers are all different colours. ☐

The offspring are all genetically different. ☐

(1)

(h)   The growth medium in **Figure 2** helps the plants to grow.

Name **one** substance in the growth medium.

_____

_____

(1)
(Total 10 marks)

Q9.

Cells can be classified according to their structure.

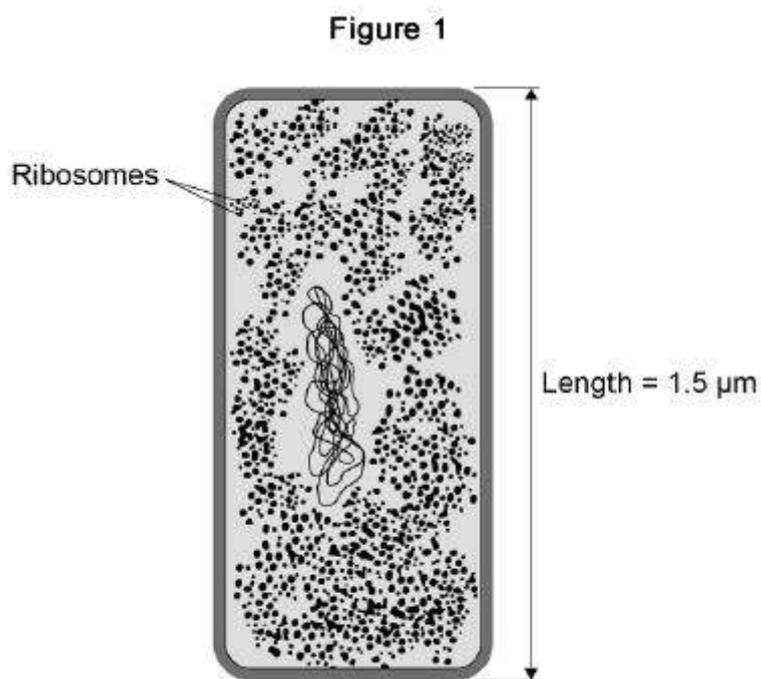(a)   Complete **Table 1** to show which features each cell type has.

Write a tick or a cross in each box.

Table 1

	Nucleus	Plasmids	Cytoplasm
Prokaryotic cell			
Eukaryotic cell			

(2)

Figure 1 shows a cell.

Figure 1

Ribosomes

Length = 1.5 µm

(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?

_____

_____

(1)

(d) There are 1000 micrometres (μm) in a millimetre (mm).

The length of the cell in **Figure 1** is 1.5 micrometres (μm).

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

_____

_____

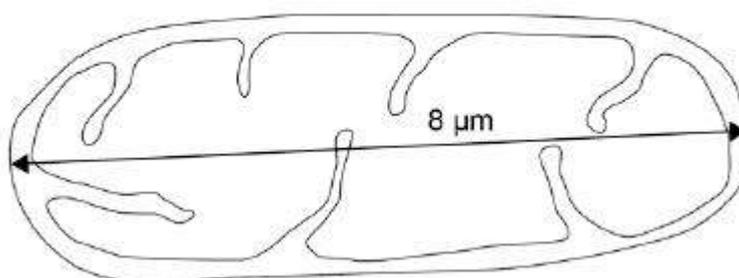Length of cell = _____ mm

(1)

Figure 2 shows a mitochondrion viewed with a microscope.

Figure 2

8 μm

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

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

_____

_____

(1)

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

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

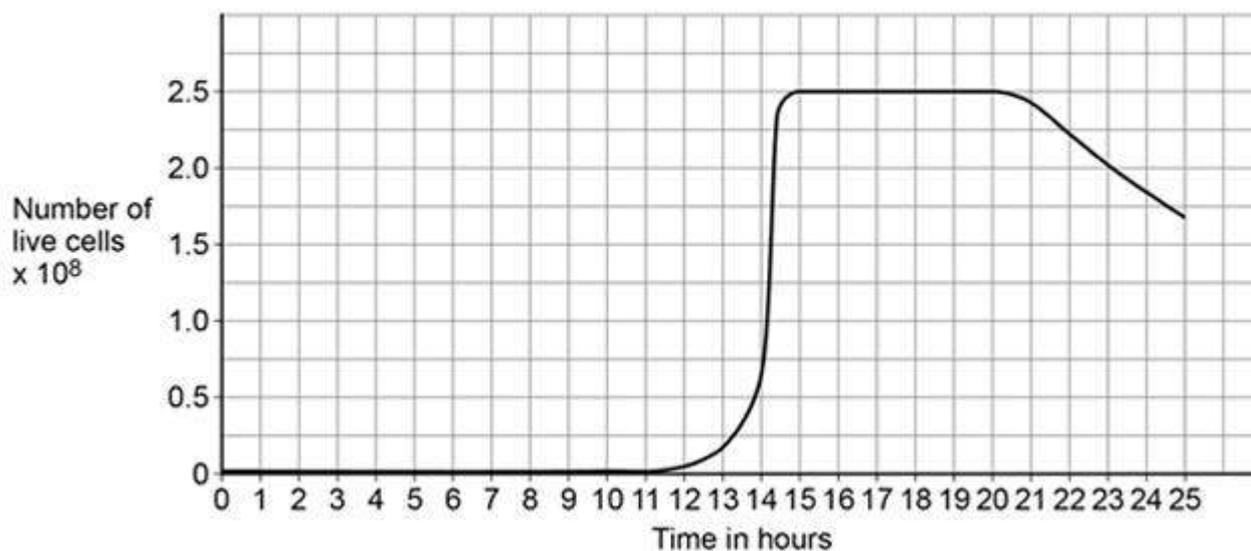(f) Calculate how many cells will be present after 2 hours.

_____

_____

_____

_____

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.

Use data from the graph in your answer.

_____

_____

_____

_____

_____

_____

(3)

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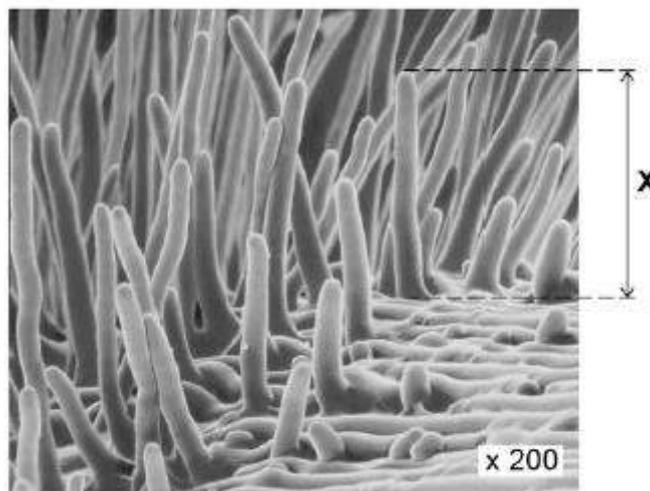
_____

_____

(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?

_____

(1)

(b)   The magnification of the cress root in the image above is × 200.
       There are 1000 micrometres (μm) in a millimetre (mm).

       Calculate the real length of the root hair, **X**.
       Give your answer in micrometres (μm).

       _____

       _____

       _____

       _____

                            Real length **X** = _____ μm

                                                                        (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.

       _____

       _____

       _____

       _____

                                                                        (2)

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

	Mean water uptake in cm³ 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.

       _____

       _____

       _____

       _____

       _____

       _____

                                                                        (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.

_____

_____
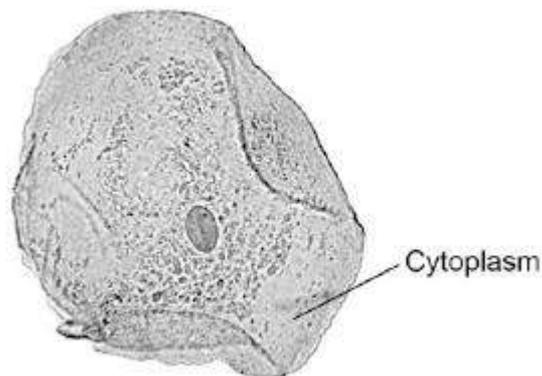
_____

_____

_____

_____

_____

_____

(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?

_____

(1)

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

Tick **one** box.

Cheaper ☐
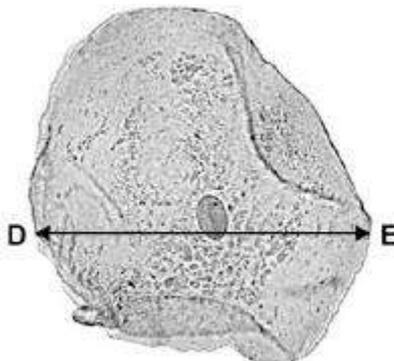
Higher magnification ☐

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 (µm).

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 $=\dfrac{\text{image size}}{\text{magnification}}$ _____
mm

Convert mm to µm   _____
µm

(3)

(f)   A red blood cell is 8 µm in diameter.

A bacterial cell is 40 times smaller.

Calculate the diameter of the bacterial cell.

Tick **one** box.

0.02 µm   ☐

0.2 µm   ☐

2.0 µm   ☐

20.0 µm

☐

(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**

| | Where most energy is released in respiration |

| Cell membrane |

| | Controls the movement of substances into and out of the cell |

| Mitochondria |

| | Controls the activities of the cell |

| Nucleus |

| | Where proteins are made |

(3)

(b)   The diagram below shows a cell from a plant leaf.
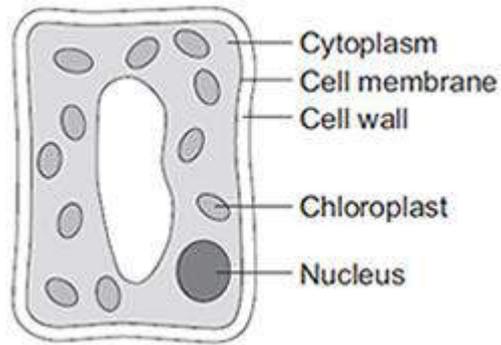
Which **two** parts in the diagram above are **not** found in an animal cell?

1. _____

2. _____

(2)
(Total 5 marks)