AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.2.3 PLANT TISSUES, ORGANS AND SYSTEMS (PACK 3)

SCORE	PERCENTAGE
/123	%

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Q1.

This question is about stem cells.

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

_____

_____

(1)

(b) What is **one** economic use of plant stem cells?

Tick **one** box.

To create genetically modified crops ☐

To create new species of plants ☐

To increase variation in plants ☐

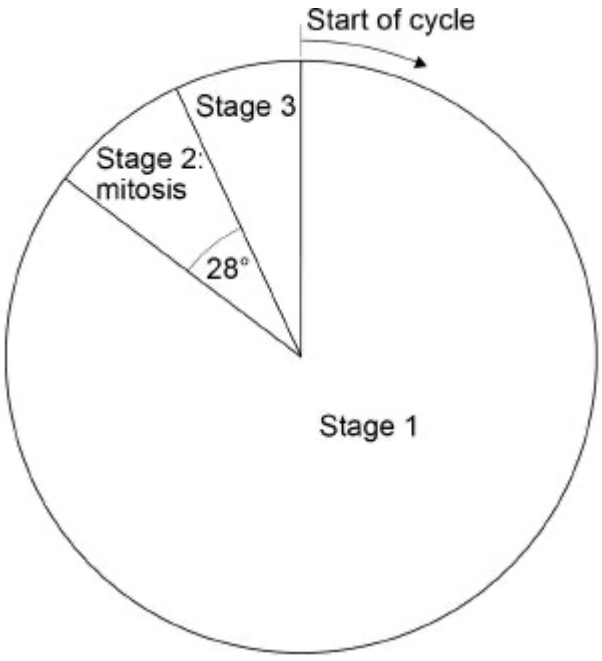
To produce large numbers of identical plants ☐

(1)

Embryonic stem cells divide by mitosis.

Figure 1 represents a cell cycle for a human embryonic stem cell.

Figure 1



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(c) The mass of DNA in the cell at the start of the cycle is 6 picograms.

A picogram is 10^{-3} nanograms.

Convert 6 picograms to grams.

Give your answer in standard form.

Mass = _____ g

(1)

(d) The time taken for this complete cell cycle is 15 hours.

Calculate how many hours the cell spent in mitosis.

Give your answer to 3 significant figures.

Time spent in mitosis = _____ hours

(2)

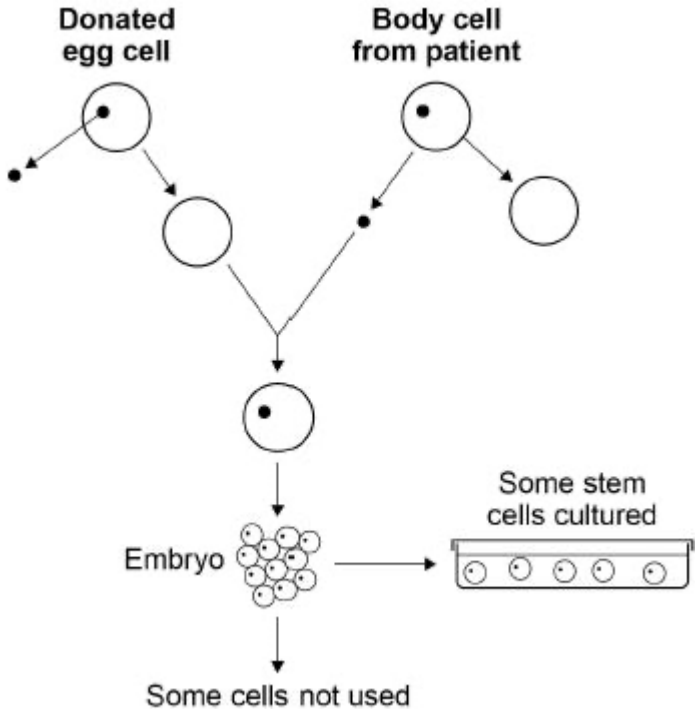
(e) Describe what happens in each of the three stages of the cell cycle.

(5)

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(f) **Figure 2** shows how embryonic stem cells are produced in therapeutic cloning for use in patients.

Figure 2



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

Use **Figure 2** to help you.

Advantage 1 _____

_____

Advantage 2 _____

_____

Disadvantage 1 _____

_____

Disadvantage 2 _____

_____

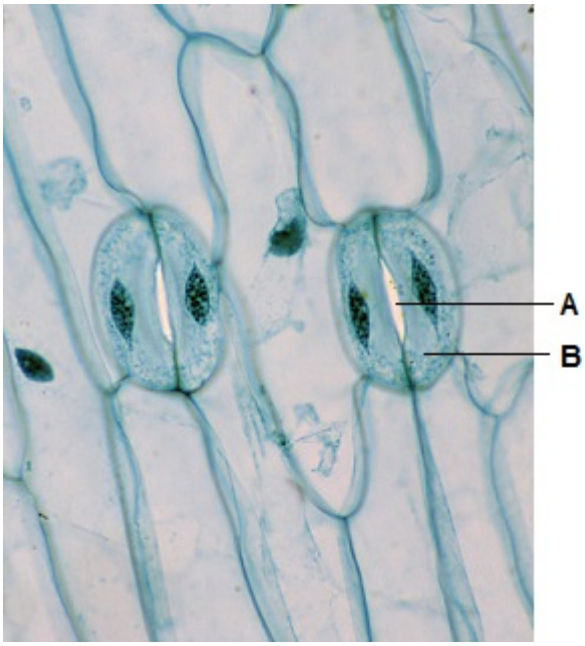
(4)

(Total 14 marks)

Q2.

The photograph below shows the lower surface of a leaf magnified 800 times.

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(a) Name hole **A** in the leaf surface.

_____

(1)

(b) Name cell **B**.

_____

(1)

(c) Cell **B** can lose or gain water.

Complete the sentences.

Choose answers from the box.

	active transport	**condensation**
osmosis	**photosynthesis**	**transpiration**

Cell **B** can gain water by _____ .

Water vapour can escape from the leaf through hole **A**

by _____ .

(2)

(d) Which factors increase the rate of water loss from hole **A**?

Tick **two** boxes.

Increasing acidity ☐

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Increasing nitrogen concentration ☐

Increasing oxygen concentration ☐

Increasing temperature ☐

Increasing wind speed ☐

(2)

(e) Give **one** reason why the movement of water in a plant is important.

_____

_____

(1)

(f) The African Baobab tree has no leaves for up to 9 months of the year.

Suggest how this helps the tree to survive in an area where there is not much rain.

_____

_____

(1)

(g) The photograph above is a photograph taken through a microscope.

The image is magnified 800 times.

One of the cells in the image has a width of 12 mm

Calculate the real width of this cell in micrometres.

Complete the following steps.

Use the equation to work out the real width of the cell in millimetres.

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

Real width of cell = _____ millimetres

Convert the real width of the cell from millimetres to micrometres.

1 millimetre = 1000 micrometres.

Real width of cell = _____ millimetres

(3)

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(Total 11 marks)

Q3.

Water travels through plants in xylem tissue.

(a) Describe the structure of xylem tissue.

_____

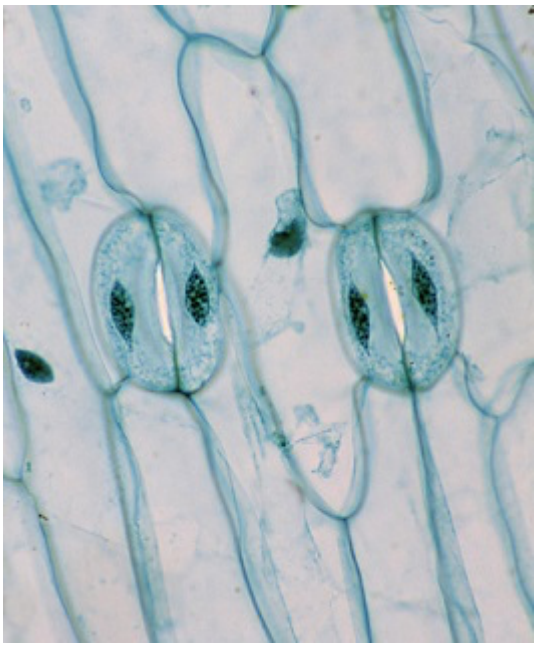
_____

_____

(2)

Figure 1 shows guard cells around open stomata magnified 800 times.

Figure 1



(b) The image size of one of the guard cells is 26 millimetres long.

Calculate the real length of the guard cell in micrometres.

Include the equation you are using to calculate your answer.

_____

_____

_____

_____

_____

_____

Real length of guard cell = _____ micrometres

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(3)

(c) Guard cells increase in volume and become curved to open stomata.

Explain how guard cells increase in volume.

_____

_____

_____

_____

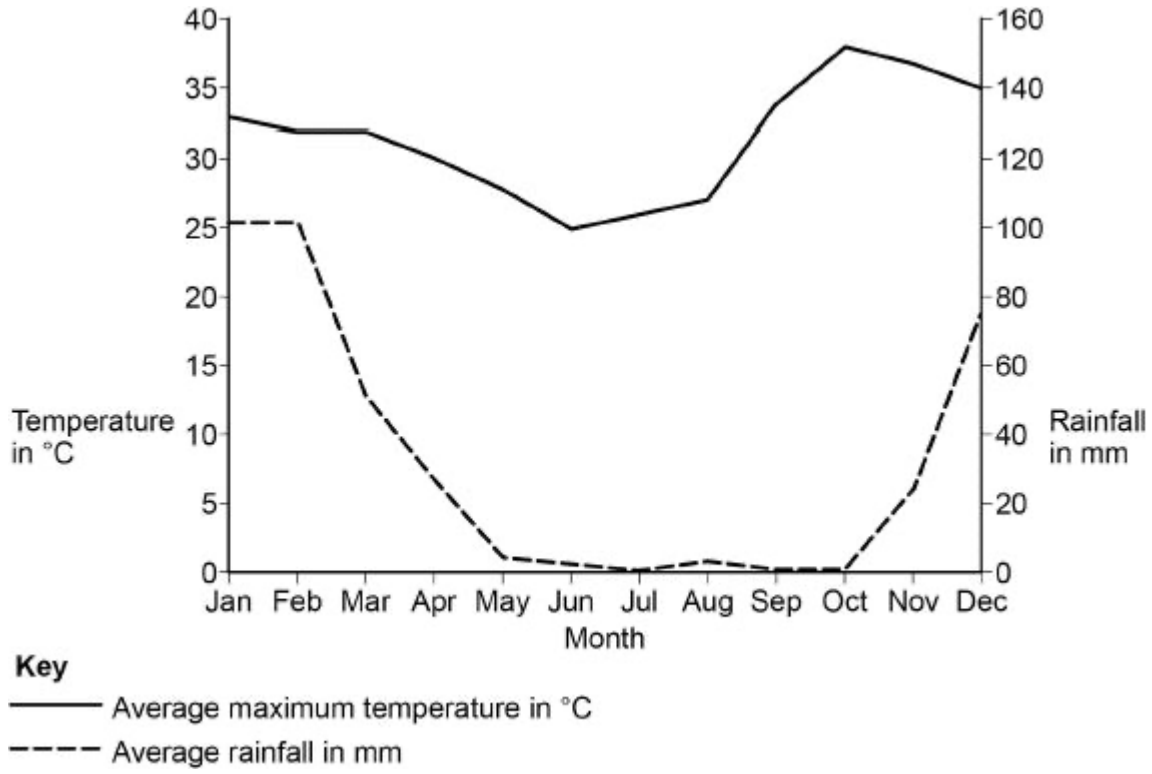
(2)

(d) The Baobab tree grows in Botswana, Africa.

The tree has no leaves for up to 9 months of the year.

Figure 2 shows the average temperature and rainfall each month in Botswana.

Figure 2



Explain how having no leaves from March to November allows the Baobab tree to survive in Botswana.

_____

_____

_____

_____

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_____

_____

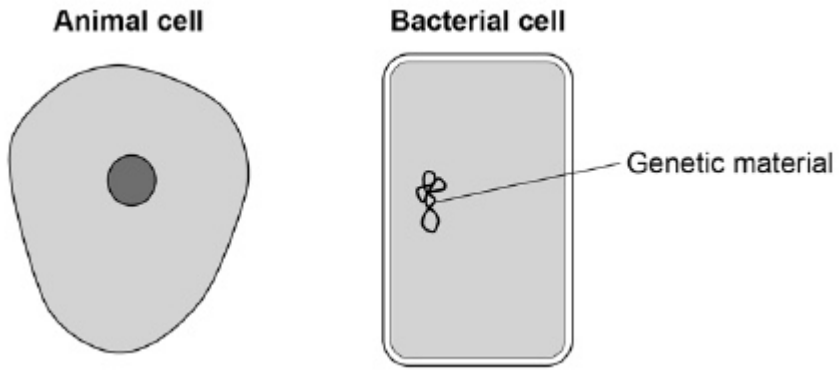
(3)

(Total 10 marks)

Q4.

Figure 1 shows an animal cell and a bacterial cell.

Figure 1



(a) Compare the structure of the cells in **Figure 1**.

Complete the sentences.

Choose the answers from the box.

cell membrane	**cell wall**	**chloroplast**
cytoplasm		**nucleus**

Only the animal cell contains a _____ .

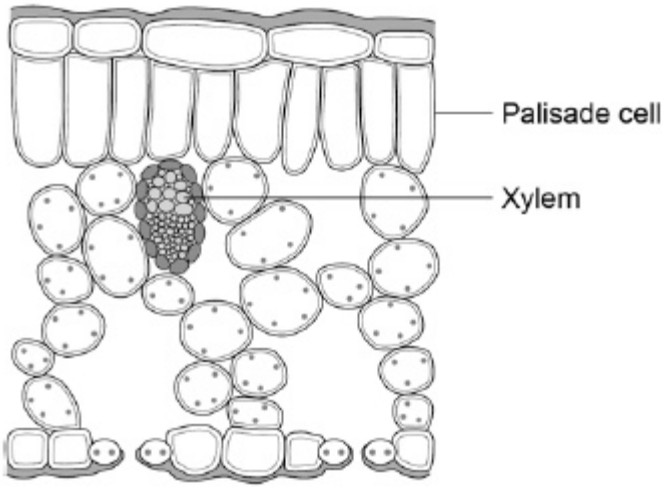
Only the bacterial cell contains a _____ .

(2)

Figure 2 shows a section through a leaf.

Figure 2

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(b) The function of palisade cells is to photosynthesise.

Describe **one** way palisade cells are adapted to carry out their function.

_____

_____

(1)

(c) Complete **Table 1** to show whether each structure is a tissue, an organ or an organ system.

Tick **one** box for each structure.

Table 1

Structure	**Tissue**	**Organ**	**Organ system**
Leaf			
Xylem			
Roots, stem and leaves			

(2)

A student observed palisade cells using a microscope.

The microscope had four objective lenses, each with a different magnification.

(d) Which objective lens should the student use first?

Tick **one** box.

Give a reason for your answer.

×4 magnification ☐

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×10 magnification ☐

×40 magnification ☐

×100 magnification ☐

Reason _____

_____

(2)

The student measured the width of 5 different palisade cells at a total magnification of ×400

(e) Eyepiece lenses are usually ×5 or ×10 magnification.

What combination of eyepiece and objective lenses would give a total magnification of ×400?

Eyepiece lens _____

Objective lens _____

(1)

(f) **Table 2** shows the student's results.

Table 2

Cell	Width of cell image in mm
1	12
2	13
3	16
4	10
5	11

(f) Calculate the mean width of the palisade cell images.

_____

_____

Mean width = _____ mm

(1)

(g) Calculate the real width of a palisade cell.

Use the mean width you calculated in part (f).

Use the equation:

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$$\text{real width} = \frac{\text{image width}}{\text{magnification}}$$

_____

_____

Real width = _____ mm

(2)

(Total 11 marks)

Q5.

Plants make glucose by photosynthesis.

(a) Complete the word equation for photosynthesis.

_____ + _____ → glucose + _____

(1)

(b) What is the name of the chemical that makes a leaf look green?

Tick **one** box.

Cellulose	☐
Chlorophyll	☐
Chloroplast	☐
Chromosome	☐

(1)

(c) A test for starch is used to show that a plant has photosynthesised.

How does the presence of starch show that photosynthesis has taken place?

_____

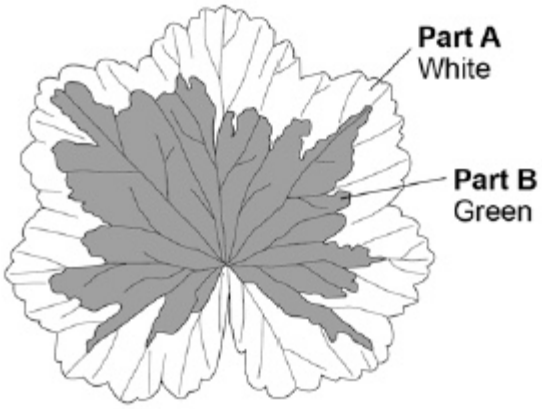
_____

(1)

A student investigated where starch was made in a leaf.

She used a leaf that was part green and part white as shown in the diagram.

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This is the method used.

1. Put the leaf in boiling water for 1 minute.
Reason: stops all chemical reactions in the leaf.

2. Transfer the leaf to boiling ethanol for 5 minutes.
Reason: removes the green colour.

3. Dip the leaf in hot water.
Reason: softens the leaf.

4. Spread the leaf on a white tile and test with iodine solution.
Reason: stains any starch.

(d) If the chemical reactions in the leaf were not stopped, the amount of starch in the leaf would decrease.

Give the reason why.

_____

_____

(1)

(e) Suggest why it is important to remove the green colour from the leaf before adding iodine solution.

_____

_____

(1)

(f) Ethanol is flammable.

The student wore safety goggles when testing the leaf for starch.

Give one other safety precaution the student should have taken.

_____

_____

(1)

(g) Look at the leaf in the diagram.

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What colour would part **A** and part **B** stain with iodine solution after the starch test?

A _____

B _____

(2)

(Total 8 marks)

Q6.

Plants have tissues that are specialised for the transport of food and water molecules.

(a) Which is a description of the role of the xylem?

Tick **one** box.

Transports dissolved sugars using translocation	☐
Transports starch in the transpiration stream	☐
Transports water in the transpiration stream	☐
Transports water using translocation	☐

(1)

(b) Which is a description of the role of the pholem?

Tick **one** box.

Transports dissolved sugars in the transpiration stream	☐
Transports dissolved sugars using translocation	☐
Transports starch using translocation	☐
Transports water in the transpiration stream	☐

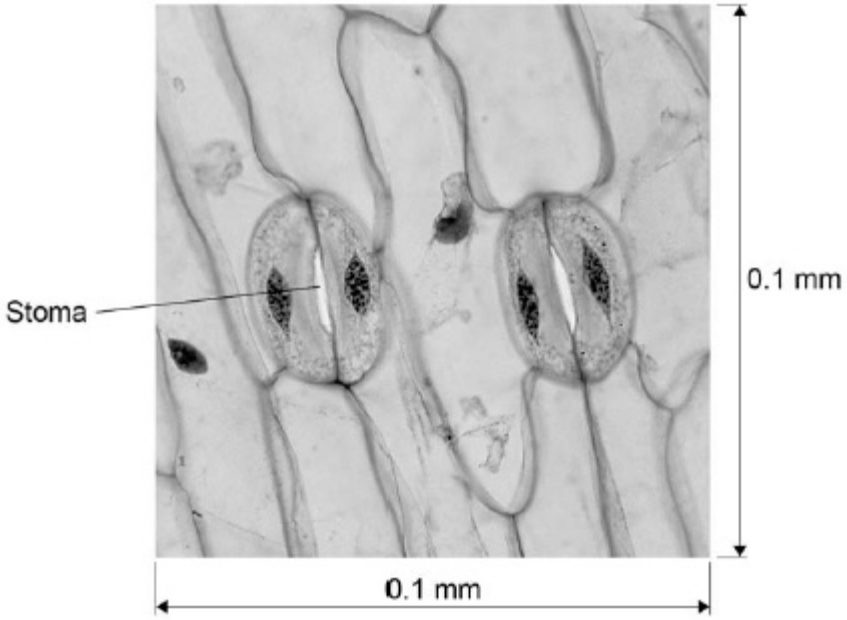
(1)

In plants water is lost through stomata.

Figure 1 shows stomata on the lower surface of a leaf.

Figure 1

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(c) Calculate the number of stomata per mm^2 for the leaf shown in **Figure 1**.

Number of stomata = _____

(2)

(d) Most plants have more stomata on the lower surface of a leaf than on the upper surface.

Explain why there are more stomata on the lower surface of a leaf.

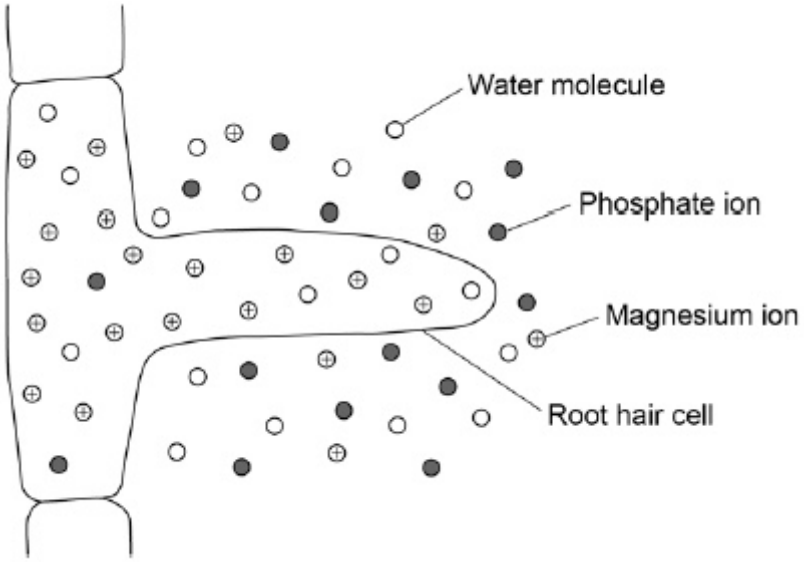
(3)

(e) Particles can move into and out of cells by different processes.

Figure 2 shows different particles inside and outside a root hair cell.

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Figure 2



Explain the processes by which the different particles would enter the root hair cell.

(6)
(Total 13 marks)

Q7.

Rose black spot is a disease that affects rose plants.

The leaves of infected plants develop black spots, then turn yellow and drop off the plant.

(a) Give the name of the substance in leaves that is broken down when leaves change from green to yellow.

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(1)

(b) Rose black spot can be transferred between plants in water droplets.

Draw **one** line from each method of black spot prevention to the explanation of why that method works.

Method	Explanation
	Fungus spores are removed
Plant roses with large gaps between plants	
	Helps leaves dry faster
	Increases infection in warm weather
Clear dead leaves	
	Prevents rain falling on the leaves

(2)

(c) Fungicides can be sprayed on rose plants to prevent infection with black spot.

Some fungicides appear to be less effective than they were 10 years ago.

Suggest why the fungicides are less effective now compared with 10 years ago.

(1)

Some gardeners claim that rose black spot has become more of a problem since the Clean Air Act of 1958.

The table shows how the mass of sulfur dioxide (SO2) emissions has changed.

Year	SO2 emissions from each source in megagrams			Total SO_2 emissions in megagrams
	Power stations	Manufacturing industry	Homes and transport	
1970	3300	1750	**X**	6200
1980	3250	900	550	4700
1990	2900	450	300	3650
2000	900	150	150	1200

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2010	250	100	50	400

(d) The sulfur dioxide emissions in the table are shown in megagrams.

Calculate value **X** in the table.

X = _____ Mg

(1)

(e) Give your answer to part (d) in kilograms.

1 megagram = 1000 kilograms

X = _____ Kg

(1)

(f) How have power stations reduced their sulfur dioxide emissions?

Tick **one** box.

- Power stations used more at night than during the day ☐
- Power stations generate more electricity ☐
- Power stations use less coal ☐
- Power stations use more oil ☐

(1)

A gardener concluded that the information in the table shows the Clean Air Act of 1958 changed sulfur dioxide emissions.

(g) Give **one** reason to support the conclusion.

(1)

(h) Give **one** reason why the conclusion may **not** be valid.

(1)

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(i) Suggest how changing sulfur dioxide emissions increased the number of cases of rose black spot.

_____

_____

_____

_____

(2)

(Total 11 marks)

Q8.

Tobacco mosaic virus (TMV) can infect many species of plant.

TMV spreads throughout the whole plant, causing discolouration of the leaves.

(a) Suggest how TMV spreads within the plant from one part to another.

_____

_____

(1)

(b) Describe how TMV can pass from one plant to another.

_____

_____

(1)

Plants can be genetically modified (GM) to be resistant to TMV.

(c) What **two** ways is the process of genetic modification different from selective breeding?

Tick **two** boxes.

GM is faster.	☐
GM is less dependent on chance at fertilisation.	☐
GM is less likely to give the desired characteristics in the offspring.	☐
GM is only used in plants, not animals.	☐
GM requires less specialist equipment.	☐

(2)

(d) Describe the process of genetic modification that is used to produce a plant that is resistant to a disease.

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(4)

(e) Fields planted with genetically modified (GM) crops may have lower biodiversity than fields planted with non-GM crops.

Why is a reduction in biodiversity more likely to result in the extinction of a species?

(2)

(f) Maintaining hedgerows around fields helps improve biodiversity.

Suggest **one** other reason why farmers maintain hedgerows around fields of crops.

(1)

(Total 11 marks)

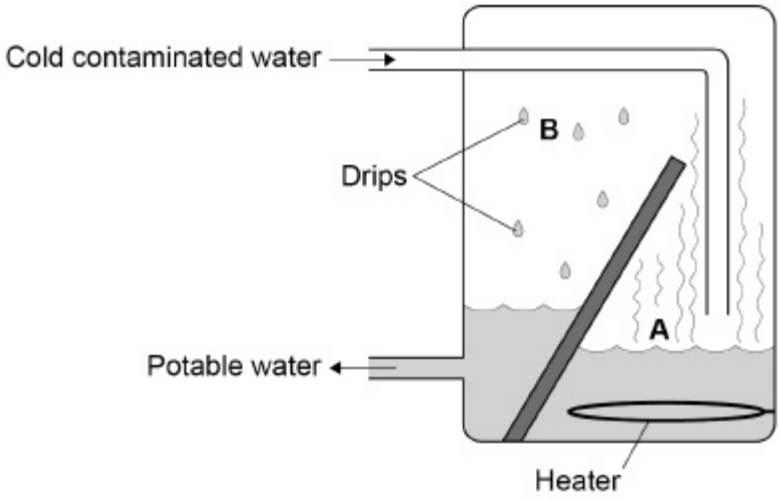
Q9.

Large water companies can treat millions of litres of water a day.

Figure 1 shows a distillation unit.

Figure 1

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(a) What is happening to the water at point **A**?

Tick **one** box.

Filtration	☐
Evaporation	☐
Melting	☐
Sublimation	☐

(1)

(b) What is happening at point B?

Tick **one** box.

Water is being boiled	☐
Water is being lost	☐
Water is condensing	☐
Water is freezing	☐

(1)

(c) The water collected from the distillation unit is called potable water.

Complete the sentence.

Potable water is water that is _____ to drink.

(1)

(d) Give one disadvantage of using the distillation unit in **Figure 1** to produce potable

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water.

_____

_____

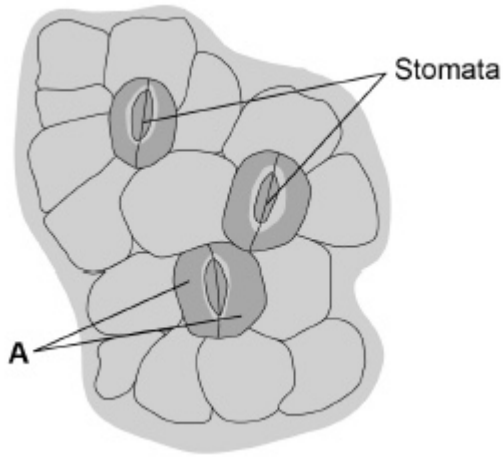
(1)

Plants need water to survive.

Water moves through a plant in the transpiration stream.

Figure 2 shows stomata on the underside of a leaf seen through a microscope.

Figure 2



(e) Name the cells labelled **A** in **Figure 2**.

_____

(1)

(f) Which **two** structures would you find in a plant cell and **not** in an animal cell?

Tick **two** boxes.

Chloroplasts	☐
Mitochondria	☐
Nucleus	☐
Permanent vacuole	☐
Ribosomes	☐

(2)

(g) One of the cells in **Figure 2** is 12 mm in length in the microscope image.

The size of the real cell is 0.03 mm

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Calculate the magnification of the microscope.

Use the equation:

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

_____

_____

_____

_____

Magnification = _____

(2)

(h) The table shows the number of stomata on the underside of leaves from different plants.

Plant	**Number of stomata per mm²**
A	423
B	146
C	549
D	109

Which plant is most likely to lose the most water in warm weather?

Give a reason for your answer.

Plant _____

Reason _____

_____

(2)

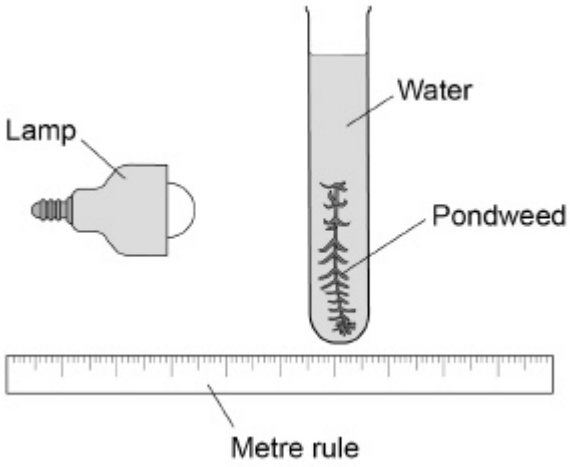
(Total 11 marks)

Q10.

Students investigated the effect of light intensity on the rate of photosynthesis in pondweed.

The diagram shows the equipment the students used.

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This is the method used.

1. Place the lamp 50 cm from the pondweed.
2. Count the number of bubbles of gas released in two minutes.
3. Repeat steps 1–2 with the lamp at different distances from the pondweed.

(a) The students could not make a firm conclusion because their method did not control enough variables.

Give **two** variables the students have **not** controlled that would affect the rate of photosynthesis.

1. _____

2. _____

(2)

The table shows the students' results.

Distance of lamp from the pondweed in cm	**Number of bubbles released in two minutes**				
	1	**2**	**3**	**4**	**Mean**
50	5	8	6	5	6
40	10	8	9	4	9
30	12	12	15	17	14
20	25	17	23	24	24
10	22	34	31	31	**X**

(b) Calculate the mean rate of bubbles produced per minute when the lamp was 10 cm from the pondweed.

_____

_____

_____

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_____

_____

_____

Mean rate = _____ bubbles per minute

(3)

(c) The mean number of bubbles released when the lamp was 30 cm away from the plant was greater than when the lamp was 50 cm away.

How many times greater?

_____

Number of times greater = _____

(1)

(d) The students wanted to find out if different wavelengths of light affect the number of bubbles released.

Describe how the method could be adapted to find the effect of different wavelengths of light.

_____

_____

_____

_____

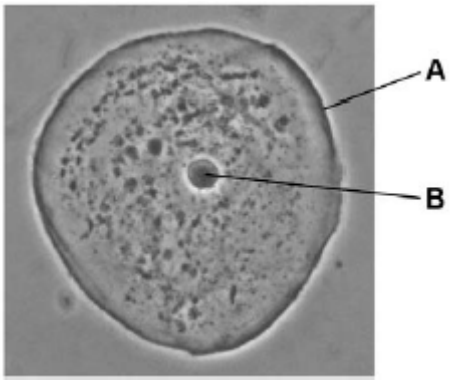
(2)

(Total 8 marks)

Q11.

Figure 1 shows an animal cell.

Figure 1



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(a) What is structure **A**?

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Tick **one** box.

Cell membrane ☐

Cell wall ☐

Chromosome ☐

Cytoplasm ☐

(1)

(b) What is structure **B**?

Tick **one** box.

Chloroplast ☐

Mitochondria ☐

Nucleus ☐

Vacuole ☐

(1)

(c) **Figure 2** shows a sperm cell.

Figure 2



Describe how a sperm cell is adapted to carry out its function.

_____

_____

(1)

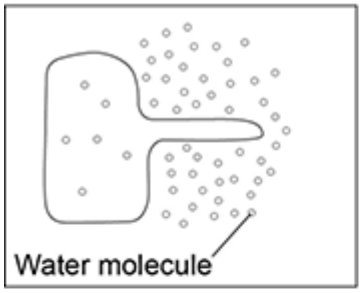
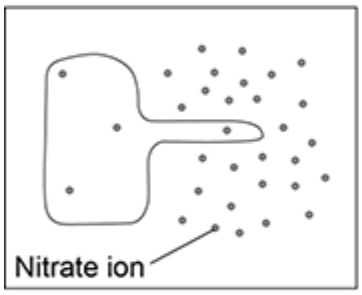
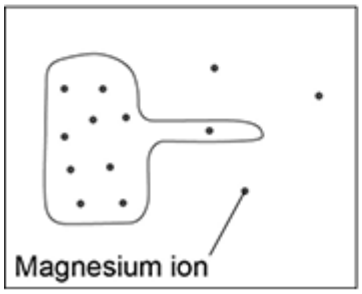
(d) Substances can move into and out of cells by three processes.

The diagrams show the concentration of different substances inside and outside a root hair cell.

How would each substance move into the root hair cell?

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Draw **one** line from each root hair cell to the correct process.

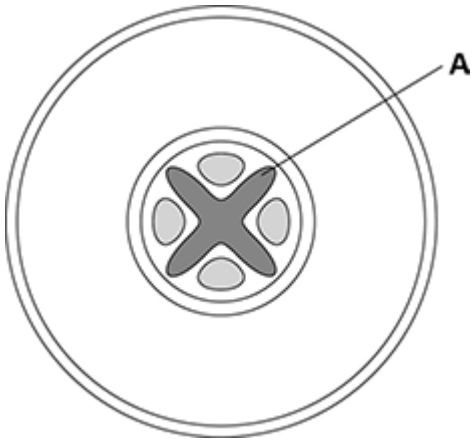
Root hair cell	Process
	Active transport
	Diffusion
	Osmosis

(2)

(Total 5 marks)

Q12.

The figure below shows a cross-section through a plant root.



(a) What is tissue **A**?

_____

(1)

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(b) A student is given samples of two fluids.

One fluid is from the phloem of a plant and one from the xylem of a plant.

The student is asked to work out which fluid is from the phloem and which is from the xylem.

She measures the pH and the concentrations of sugar, nitrate ions and potassium ions of each fluid.

The table below shows the student's results.

	Fluid A	**Fluid B**
pH	7.3	5.6
Sugar in mg / cm^3	118	1.18
Nitrate ions in mg / cm^3	10	600
Potassium ions in µg / cm^3	1.18	2500

Which fluid is from the phloem, and which is from the xylem?

Explain your answer.

Use the information from the table above.

(4)

(c) In fluid **A**, how many times greater is the concentration of sugar than the concentration of potassium ions?

(2)

(d) The concentration of potassium ions in the soil is 3.9 µg / cm^3

The concentration of potassium ions in the root tissue is 2500 µg / cm^3

Explain why the concentration is so much higher in the roots than in the soil.

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(3)
(Total 10 marks)

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