AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.1.3 TRANSPORT IN CELLS

SCORE	PERCENTAGE
/133	%

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Q1.

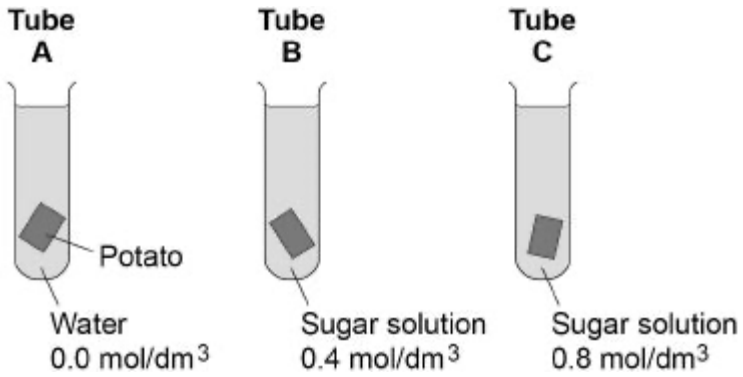
A student investigated the effect of different concentrations of sugar solution on pieces of potato.

This is the method used.

1. Cut three pieces of potato to the same length.
2. Dry each piece on a paper towel.
3. Weigh each piece.
4. Place each piece in a different concentration of sugar solution.
5. Leave all three pieces for 2 hours.
6. Remove the three pieces of potato from the solutions.
7. Dry each piece on a paper towel.
8. Measure the length and mass of each piece of potato.

Figure 1 shows how the investigation was set up.

Figure 1



(a) Why did the student dry each piece of potato before weighing it?

_____

_____

(1)

(b) What **two** changes would you expect in the potato in **tube A** after 2 hours?

Tick **two** boxes.

- Breaks into pieces ☐
- Decrease in hardness ☐
- Decrease in size ☐
- Increase in mass ☐

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Increase in length ☐

(2)

(c) Complete the sentences.

Water moves into and out of cells by a process called _____ .

Water would move _____ the potato cells in **tube A**.

The solution outside the potato in **tube A** is at a _____

concentration than the solution inside the potato cells.

(3)

(d) The potato in **tube B** did not change.

Give **one** conclusion that can be made from this observation.

_____

_____

(1)

(e) **Figure 2** shows the root of a germinating seed.

Figure 2



Describe **two** ways the root is adapted to absorb water efficiently.

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1. _____

_____

2. _____

_____

(2)

(Total 9 marks)

Q2.

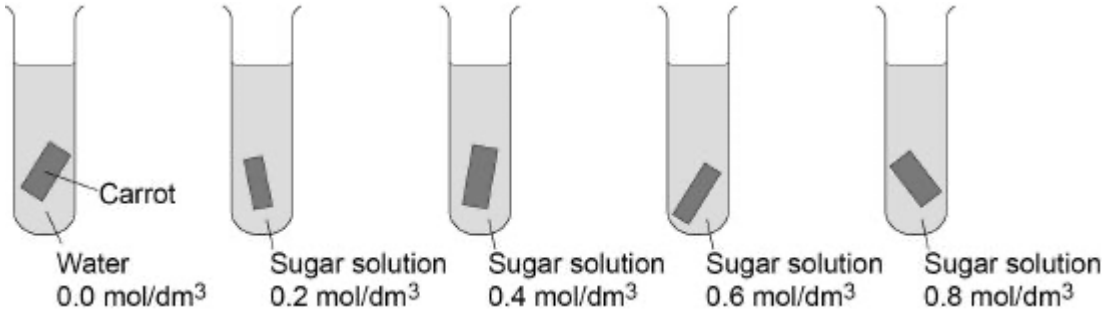
A student investigated the effect of different concentrations of sugar solution on pieces of carrot.

This is the method used.

1. Weigh five pieces of carrot.
2. Place each piece into a different tube.
3. Into each tube add 20 cm^3 of water or one of the sugar solutions as shown in **Figure 1**
4. Leave the apparatus for 2 hours.
5. Remove the carrot and dry each piece on paper towel.
6. Reweigh each piece.
7. Calculate the percentage (%) change in mass of each piece.

Figure 1 shows how the investigation was set up.

Figure 1



The table below shows the results.

Concentration of sugar solution in mol/dm^3	**Percentage (%) change in mass**
0.0	+24
0.2	+12
0.4	+1
0.6	−8
0.8	−15

(a) Suggest why the student calculated the percentage (%) change in mass of each

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piece of carrot.

_____

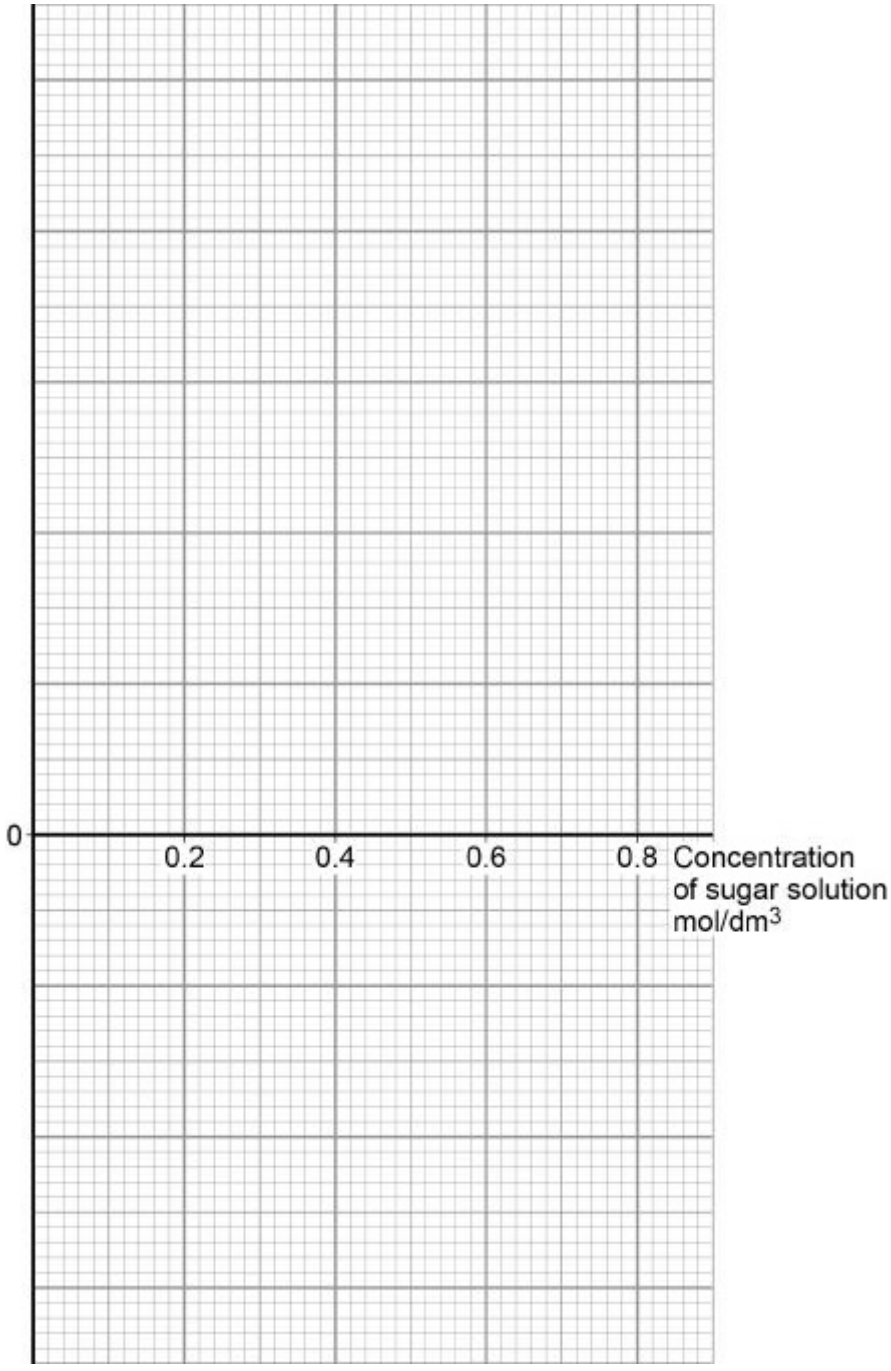
_____

(1)

(b) Complete **Figure 2** using the results in the table above

- Choose a suitable scale and label for the y-axis.
- Plot the results.
- Draw a line of best fit.

Figure 2



(4)

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(c) Estimate the concentration of sugar solution inside the carrot cells.

Use your completed graph on **Figure 2**

Concentration = _____ mol/dm^3

(1)

(d) Explain why the mass of the carrot in the 0.6 mol/dm^3 sugar solution changed.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(e) The student repeated the investigation using boiled pieces of carrot.

The pieces of carrot did **not** change in mass.

Suggest why.

_____

_____

(1)

(Total 11 marks)

Q3.

An understanding of relative size is essential in science.

(a) Draw **one** line from each structure to the approximate radius of that structure.

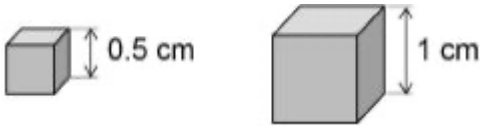
Structure	Approximate radius
	1×10^{-14} m
a bacterial cell	5×10^{-10} m
a large molecule	1×10^{-10} m

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an animal cell	1×10^{-6} m
an atom	2×10^{-5} m
	3×10^{-9} m

(4)

The diagram below shows two model cells.



(b) Describe how the surface area to volume ratio changes as the length of the side of the model cell increases.

You should include calculations in your answer.

(3)

(c) Explain why a bacterium can rely on diffusion for gas exchange, but animals need a transport system.

(3)

(d) Some sugar molecules are absorbed from the small intestine into the blood by active transport.

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Explain why the rate of absorption of these sugar molecules can depend on the concentration of oxygen in the cells lining the small intestine.

(3)

(Total 13 marks)

Q4.

Osmosis is the movement of water through partially permeable cell membranes.

A group of students investigated the effect of temperature on the rate of osmosis in potato cells. The students used five potato chips all cut to the same size.

Figure 1 shows one chip.

Figure 1



This is the method used.

1. Half fill a boiling tube with distilled water.
2. Heat the water to 25 °C
3. Place one potato chip in the boiling tube.
4. Keep the boiling tube and potato chip at 25 °C for 30 minutes.
5. Repeat steps 1−4 at four other temperatures.

(a) All of the potato chips gained water by osmosis.

Explain how the students would find out the rate of water uptake by osmosis in each potato chip.

(3)

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(b) One of the students used a knife to cut the potato chips.

Suggest how the student could improve the method of cutting the potato chips to make sure they are all the same size.

_____

_____

(1)

(c) Another student cut their potato chips as shown in **Figure 2**.

Figure 2



Suggest how the rate of water uptake by osmosis in this investigation was different from the investigation with the chips shown in **Figure 2**.

Give a reason for your answer.

_____

_____

_____

_____

(2)

(d) The students carried out the experiment at 25 °C, 30 °C, 35 °C, 40 °C and 45 °C

Predict what you would expect the results to show as the temperature increases.

Give a reason for your answer.

Prediction _____

_____

Reason _____

_____

(2)

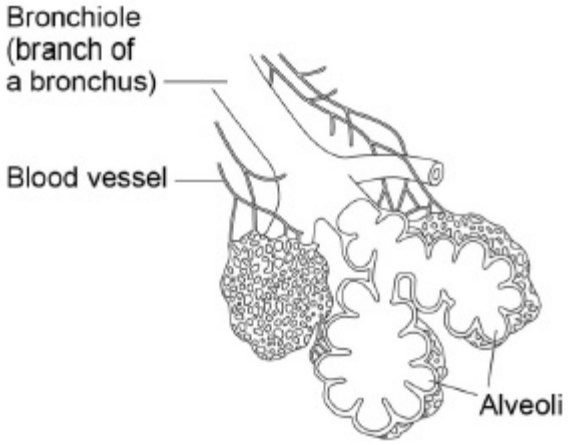
(Total 8 marks)

Q5.

Figure 1 shows part of the lungs.

Figure 1

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(a) Give **two** ways the lungs are adapted for efficient exchange of gases.

Describe how each adaptation helps to maintain efficient gas exchange.

Adaptation 1 _____

_____

Description _____

_____

Adaptation 2 _____

_____

Description _____

_____

(4)

(b) There are 5.4 million people with asthma in the UK.

What type of disease is asthma?

Tick **one** box.

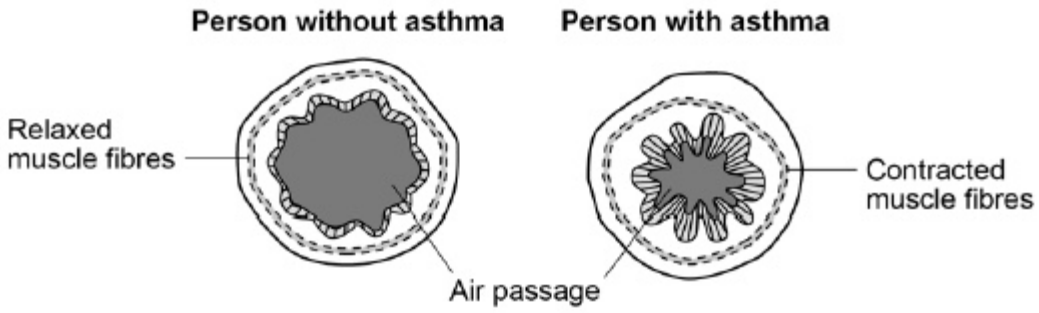
An allergy	☐
A bacterial infection	☐
A cancer	☐
A viral infection	☐

(1)

(c) **Figure 2** shows cross-sections of bronchioles of two people.

Figure 2

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Suggest why people with asthma often find it difficult to breathe.

_____

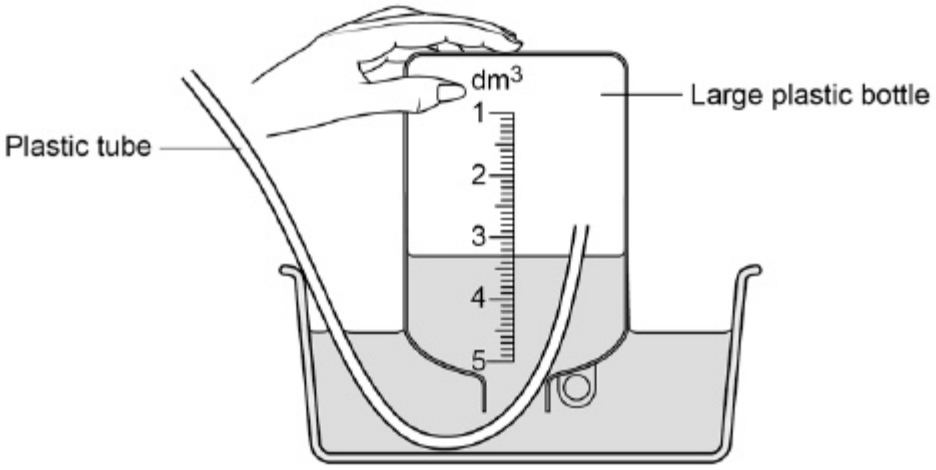
_____

(1)

(d) People with asthma often have a reduced lung volume.

Figure 3 shows the apparatus a student used to measure his lung volume.

Figure 3



This is the method used.

1 Fill the bottle with water.

2 Breathe out through the tube.

The volume of water pushed out of the bottle is equal to his lung volume.

What is the student's lung volume?

Volume = _____ dm^3

(1)

Scientists tested a new drug to treat asthma.

The scientists measured the lung volume of:
- volunteers without asthma
- some volunteers during a mild asthma attack
- other volunteers during a severe asthma attack.

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Half the people in each group were given a placebo.

The other half of the people in each group were given the new drug.

The tests were carried out as a double blind trial.

(e) What is a placebo?

_____

_____

(1)

(f) Who knows which volunteers in a double blind trial are given the drug and which volunteers are given the placebo?

Tick **one** box.

The scientists but not the volunteers	☐
The scientists and the volunteers	☐
The volunteers but not the scientists	☐
Neither the volunteers nor the scientists	☐

(1)

(g) Suggest why it is a good idea that double blind trials should be used in drug testing?

_____

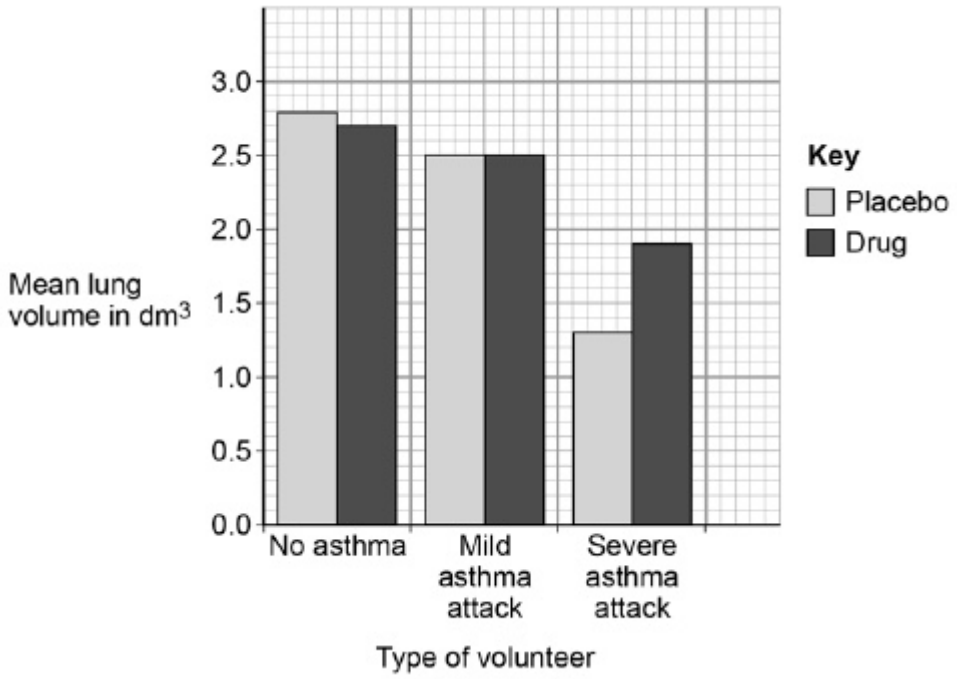
_____

(1)

(h) **Figure 4** shows the results of the drug tests.

Figure 4

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Give **two** conclusions that can be made about the usefulness of the drug.

1. _____

_____

2. _____

_____

(2)

(Total 12 marks)

Q6.

A student investigated the effect of different concentrations of a salt solution on the mass of pieces of potato.

This is the method used.

1. Weigh five pieces of potato.

2. Put each piece of potato into a different concentration of salt solution.

3. Leave the potato pieces for 24 hours.

4. Remove each piece of potato, dry it and re-weigh it.

5. Calculate the change in mass of each piece of potato.

The table shows the results.

Concentration of salt solution in arbitrary units	**Mass at start in g**	**Final mass in g**	**Change in mass in g**

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0	2.60	3.04	0.44
1	2.71	2.98	**X**
2	2.60	2.70	0.10
3	2.63	2.56	−0.07
4	2.46	2.22	−0.24

(a) Calculate value **X** in the table.

_____

_____

X = _____ g

(1)

(b) Two of the numbers for the change in mass have a negative value.

What do these negative values indicate?

_____

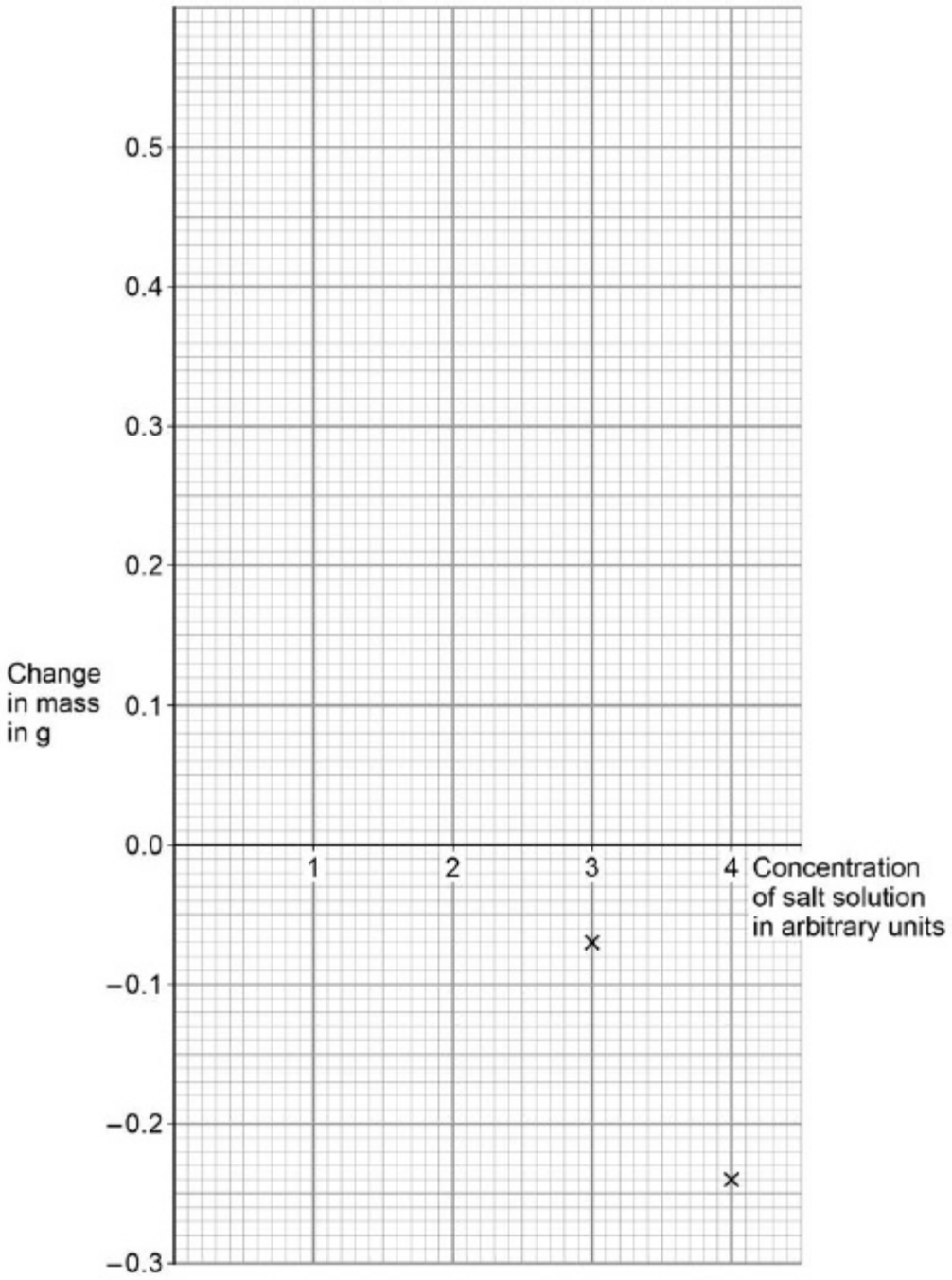
_____

(1)

(c) Complete the graph.

- Plot data from the table and your answer to part (a).
- Draw a line of best fit.

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(3)

(d) Which concentration of salt solution would give no change in mass?

Use the graph.

Concentration = _____ arbitrary units

(1)

(e) Explain why there would be no change in mass of a piece of potato at the salt concentration you gave in part (d).

_____

_____

_____

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_____

_____

(3)

(Total 9 marks)

Q7.

Eukaryotic cells respire continuously to transfer energy.

(a) Give **two** uses of energy transferred by respiration in eukaryotes.

1. _____

2. _____

(2)

(b) Name the cell structure in a eukaryotic cell where aerobic respiration occurs.

_____

(1)

(c) Muscle cells and plant cells can respire anaerobically.

Compare the processes of anaerobic respiration in muscle and plant cells.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(d) Anaerobic respiration in muscle cells creates an oxygen debt.

What does oxygen debt mean?

_____

_____

(1)

(Total 8 marks)

Q8.

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

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(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 ☐

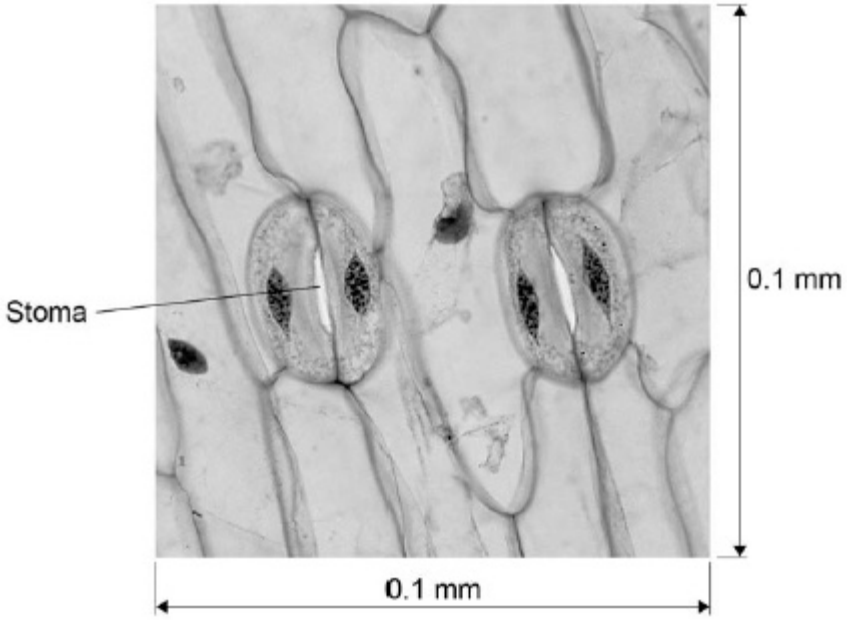
(1)

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.

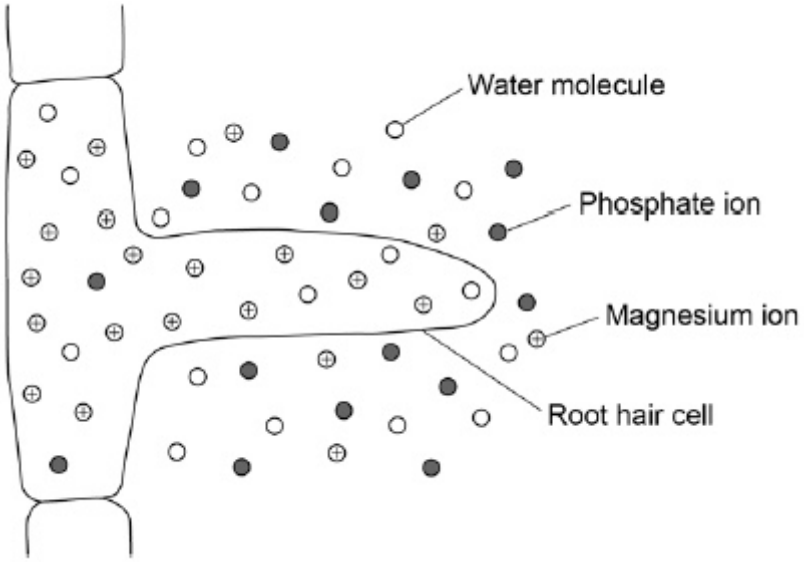
(3)

(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)

Q9.

Respiration occurs in living cells.

(a) Complete the word equation for aerobic respiration.

_____ + oxygen → _____ + _____

(3)

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Lactic acid is produced in muscles when there is insufficient oxygen for aerobic respiration.

(b) Suggest how muscles feel when lactic acid levels increase.

_____

_____

(1)

Scientists investigated the concentration of lactic acid in the blood of an athlete running at different speeds.

This is the method used.

1. An athlete runs on a treadmill at a speed of 3.0 metres per second (m/s).

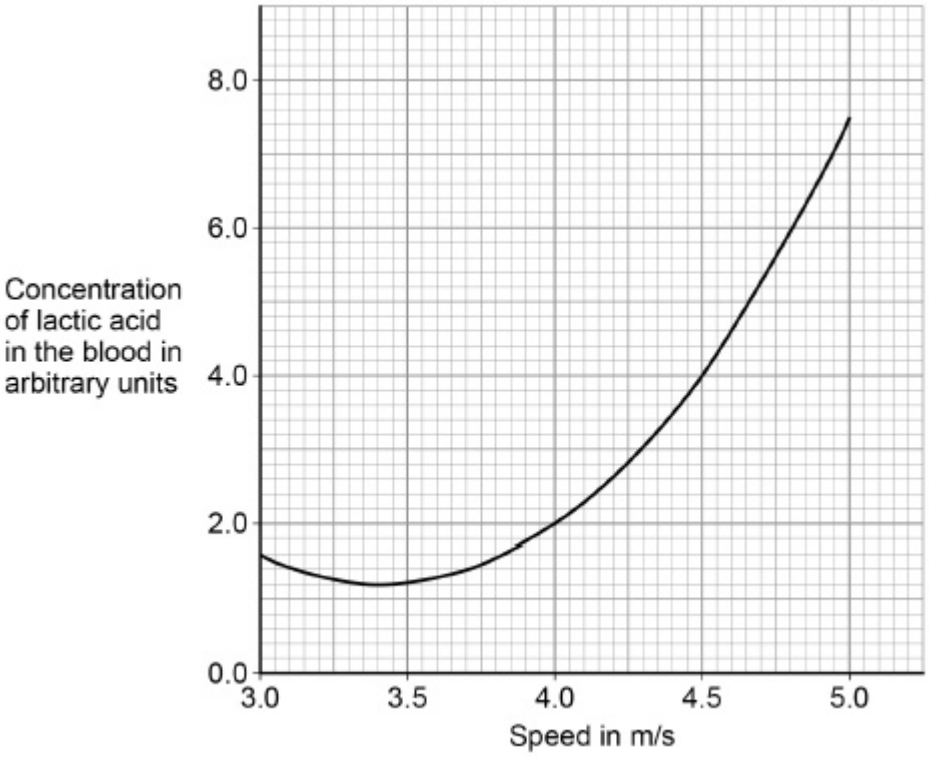
2. After 10 minutes her blood lactic acid concentration is recorded.

3. The athlete rests until her lactic acid concentration returns to normal.

4. She repeats the investigation at different speeds.

The room was kept at 18 °C.

The graph shows the scientists' results.



(c) Give **three** control variables in this investigation.

1. _____

_____

2. _____

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3. _____

(3)

(d) Describe the trend shown in **Figure 2** between 3.5 m/s and 5.0 m/s

(2)

(e) Determine the change in lactic acid concentration in the blood between 3.5 m/s and 5.0 m/s

Change in lactic acid concentration = _____ arbitrary units

(2)

(f) As the speed increases the heart rate of the athlete increases.

As the speed increases from 3.0 m/s to 3.4 m/s lactic acid concentration in the blood decreases.

Explain how an increase in heart rate could cause the decrease in lactic acid concentration.

Use words from the box.

blood flow	**muscle**	**oxygen**	**respiration**

(3)

(g) After the athlete stops running, her heart rate and breathing rate do **not** immediately return to normal.

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Why does it take time for her heart rate and breathing rate to return to normal?

Tick **two** boxes.

After anaerobic respiration oxygen debt must be repaid. ☐

Carbon dioxide is not being produced. ☐

Increased breathing rate delivers more carbon dioxide to muscles. ☐

Increased heart rate delivers more glucose to muscles. ☐

Oxygen is needed to remove lactic acid from muscles. ☐

(2)

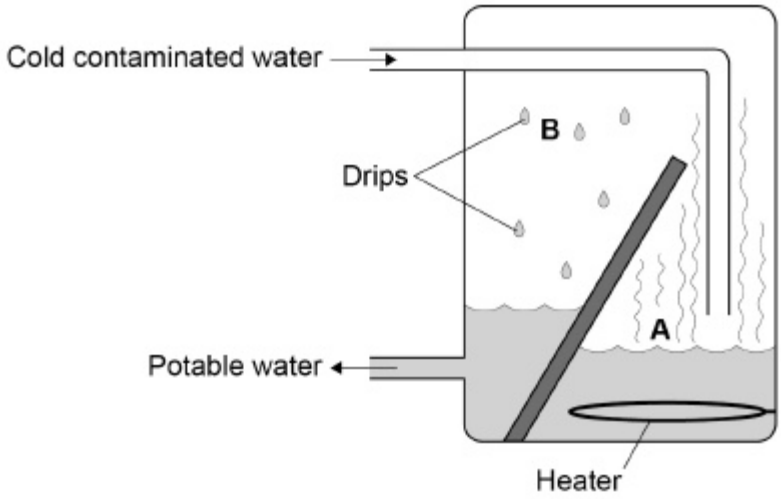
(Total 16 marks)

Q10.

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

Figure 1 shows a distillation unit.

Figure 1



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

Tick **one** box.

Filtration ☐

Evaporation ☐

Melting ☐

Sublimation ☐

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(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 water.

_____

_____

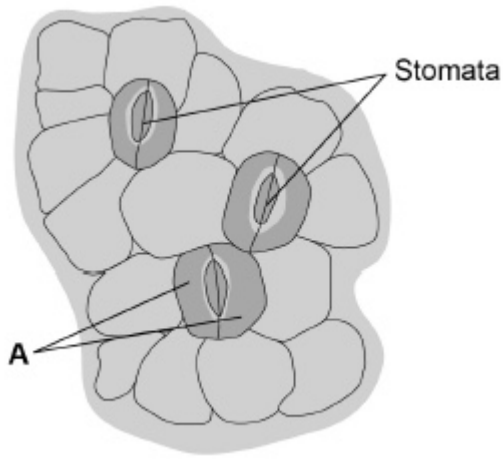
(1)

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



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(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

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

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D	109

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

Give a reason for your answer.

Plant _____

Reason _____

_____

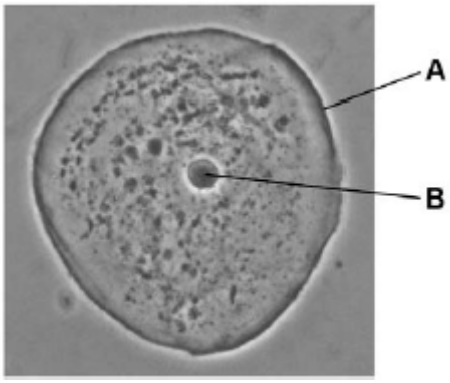
(2)

(Total 11 marks)

Q11.

Figure 1 shows an animal cell.

Figure 1



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

Tick **one** box.

Cell membrane ☐

Cell wall ☐

Chromosome ☐

Cytoplasm ☐

(1)

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

Tick **one** box.

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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.

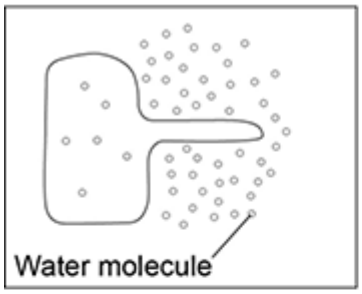
The diagrams show the concentration of different substances inside and outside a root hair cell.

How would each substance move into the root hair cell?

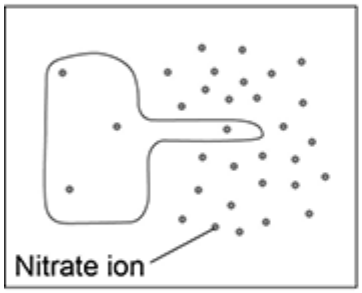
Draw **one** line from each root hair cell to the correct process.

Root hair cell	**Process**

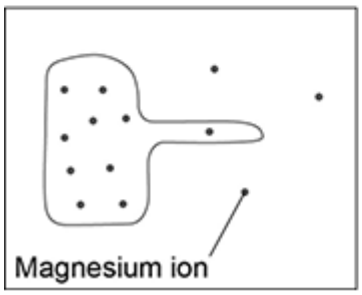
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Active transport



Diffusion



Osmosis

(2)
(Total 5 marks)

Q12.

Plants need nitrate ions in order to make proteins.

A plant is growing in soil flooded with water.

Explain why the plant cannot absorb enough nitrate ions.

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(Total 5 marks)

Q13.

Students used quadrats to estimate the population of dandelion plants on a field.

(a) Describe how quadrats should be used to estimate the number of dandelion plants in a field.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(b) The field measured 40 m by 145 m.

The students used 0.25 m^2 quadrats.

The students found a mean of 0.42 dandelions per quadrat.

Estimate the population of dandelions on the field.

_____

_____

_____

_____

Estimated population of dandelions = _____

(2)

(c) In one area of the field there is a lot of grass growing in the same area as dandelions.

Suggest why the dandelions may **not** grow well in this area.

_____

_____

_____

_____

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_____

_____

_____

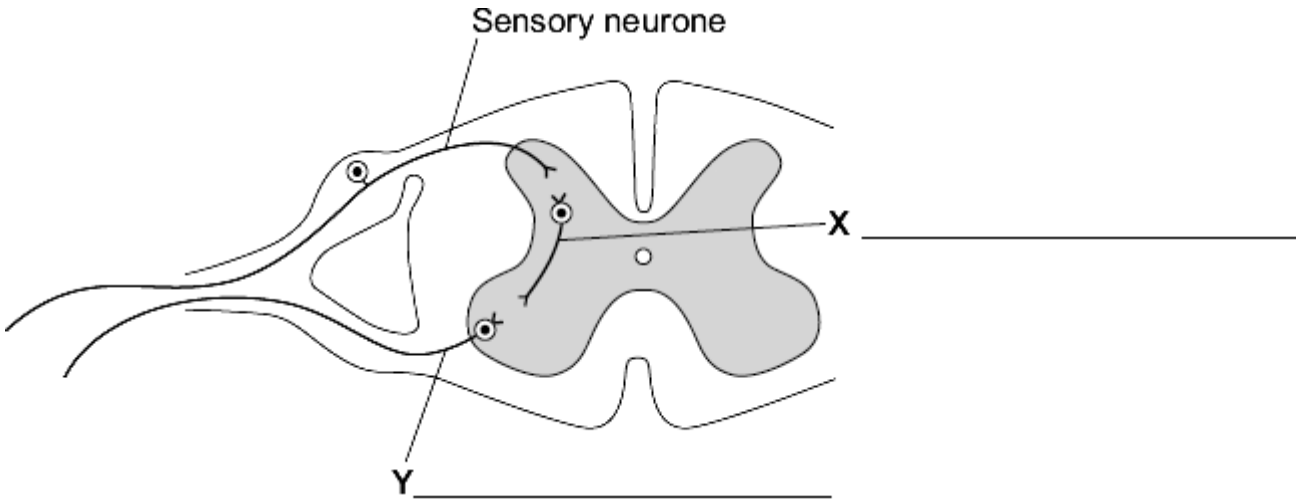
_____

(4)

(Total 10 marks)

Q77.

The diagram shows some of the structures involved in a reflex action.



(a) On the diagram, name the neurones labelled **X** and **Y**.

(1)

(b) Describe how information is transmitted from neurone **X** to neurone **Y**.

_____

_____

_____

_____

(2)

(Total 3 marks)

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