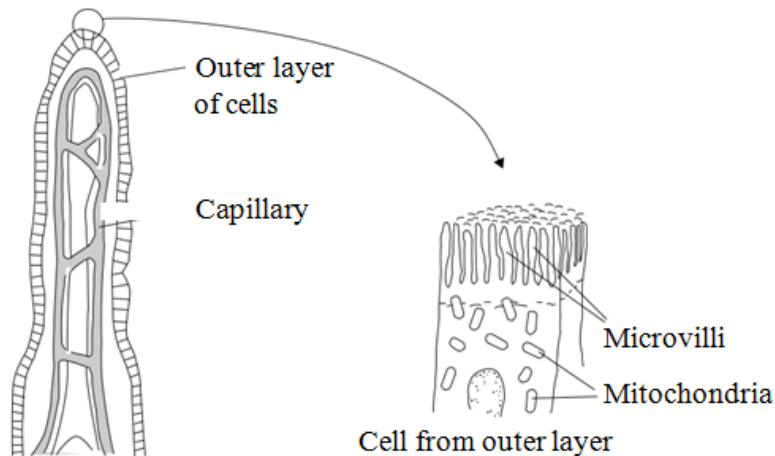


# DIFFUSION, OSMOSIS AND ACTIVE TRANSPORT

**Q:1** The small intestine is lined with millions of villi. The diagram shows the structure of a villus.



In the small intestine, some of the products of digestion are absorbed into the blood by active transport.

**(a)** Explain what is meant by active transport.

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**(2 marks)**

**(b)** How do microvilli and mitochondria help in the active transport of the products of digestion from the small intestine into the blood?

Microvilli \_\_\_\_\_

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Mitochondria \_\_\_\_\_

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**(2 marks)**

**Q:2** Some scientists investigated the rates of absorption of different sugars by the small intestine.

In one experiment they used a piece of normal intestine.

In a second experiment they used a piece of intestine poisoned by cyanide. Cyanide is poisonous because it prevents respiration.

The results are shown in the table.

Sugar	Relative rates of absorption	
	Normal intestine	Intestine poisoned by cyanide
Glucose	1.00	0.33
Galactose	1.10	0.53
Xylose	0.30	0.31
Arabinose	0.29	0.29

**(a)(i)** Name two sugars from the table which can be absorbed by active transport.

1 \_\_\_\_\_

2 \_\_\_\_\_

**(1 mark)**

**(a)(ii)** Use evidence from the table to explain why you chose these sugars.

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**(3 marks)**

**(b)** All of the sugars named in the table can be absorbed by diffusion.

Explain how information from the table provides evidence for this.

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**(2 marks)**

**Q:3** Read the following information about how the small intestine absorbs sugars.

The blood absorbs glucose and some other sugars, like xylose, from the small intestine.

Glucose molecules are the same size as xylose molecules, but glucose is absorbed more quickly than xylose.

Experiments with pieces of intestine show that the uptake of oxygen by the intestine

is 50 % higher in the presence of glucose than in the absence of glucose. Xylose does not have this effect on the uptake of oxygen.

The cells lining the small intestine have many mitochondria.

Explain how this information provides evidence that glucose is absorbed by the small intestine using active transport

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**(4 marks)**

**Q:4 (a)** The concentration of sulfate ions was measured in the roots of barley plants and in the water in the surrounding soil.

The table shows the results.

	Concentration of sulfate ions in mmol per dm <sup>3</sup>
Roots of barley plants	1.4
Soil	0.15

Is it possible for the barley roots to take up sulfate ions from the soil by diffusion?

Draw a ring around your answer.      Yes / No

Explain your answer.

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**(2 marks)**

**(b)** Some scientists investigated the amounts of sulfate ions taken up by barley roots in the presence of oxygen and when no oxygen was present.

The graph on the opposite page shows the results.

**(b)(i)** The graph shows that the rate of sulfate ion uptake between 100 and 200 minutes, without oxygen, was 0.4 arbitrary units per minute.

The rate of sulfate ion uptake between 100 and 200 minutes, with oxygen, was greater.

How much greater was it? Show clearly how you work out your answer.

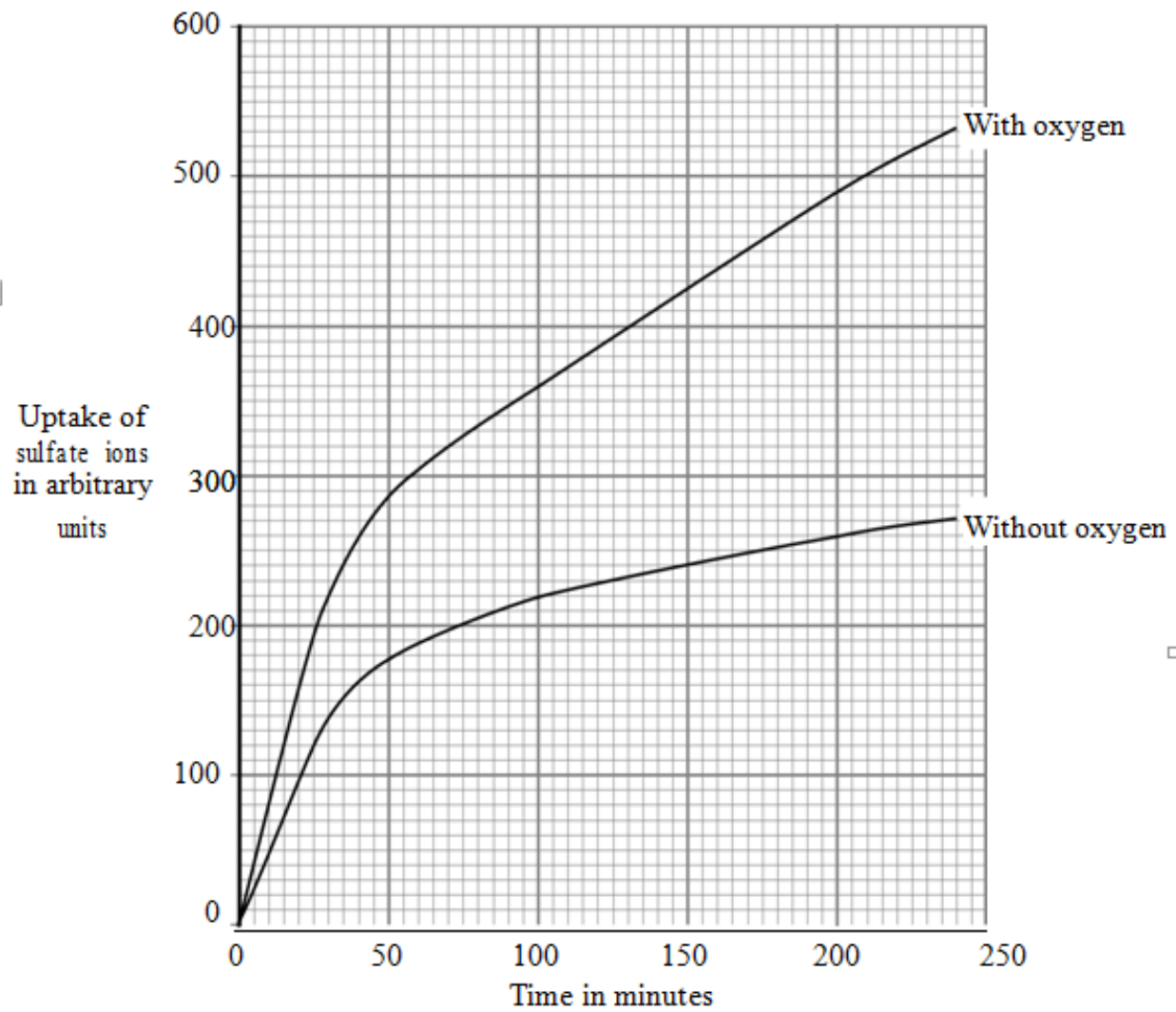
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Answer \_\_\_\_\_ arbitrary units

**(2 marks)**



**(b) (ii)** The barley roots were able to take up more sulfate ions with oxygen than without oxygen. Explain how.

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(3 marks)

**Q:5** Diffusion and active transport take place in healthy kidneys.

**(a)** Explain what is meant by:

**(a) (i)** diffusion

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**(2 marks)**

**(a) (ii)** active transport

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**(2 marks)**

**Q:6** Plants exchange substances with the environment.

**(a)** Plant roots absorb water mainly by osmosis.

Plant roots absorb ions mainly by active transport.

Explain why roots need to use the two different methods to absorb water and ions.

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**(4 marks)**

**Q:7** Substances can move into cells and out of cells.

**(a)** Draw a ring around the correct answer to complete each sentence.

Water moves into cells and out of cells by

active transport.

osmosis.

reabsorption.

The water moves through a

freely permeable

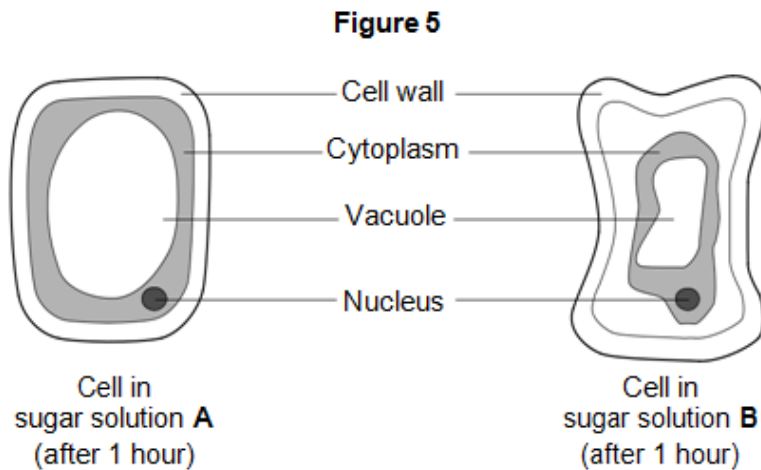
non-permeable membrane.

partially permeable

[2 marks]

**(b)** Students put plant cells into two different strengths of sugar solutions, A and B.

Figure 5 shows what the cells looked like after 1 hour.



**(b) (i)** Describe two ways in which the cell in sugar solution B is different from the cell in sugar solution A.

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

**[2 marks]**

**(b) (ii)** A student put red blood cells into water. Suggest what would happen to the cells.

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**[1 mark]**

**(c)** In the human body, glucose is absorbed into the blood from the small intestine.

The small intestine contains many villi.

Which two of the following help the absorption of glucose in the small intestine?

Tick (☑) two boxes.

Villi have a cell wall.

Villi are covered in thick mucus.

Villi give the small intestine a large surface area.

Villi have many blood capillaries.

**[2 marks]**



**Q:8** Plant roots absorb water from the soil by osmosis.

**(a)** What is osmosis?

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[3 marks]

**TOTAL MARKS=39**