

GCSE Combined Science: Trilogy

Worksheet: Active transport

TIME 35 min	TOTAL 31 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Active transport

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Some substances enter cells by active transport.

0 1 . 1 What is meant by **active transport**?

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.....

.....

.....

[2 marks]

0 1 . 2 Which process needs energy from respiration?

Tick (✓) **one** box.

Active transport

Diffusion

Osmosis

Evaporation

☐
☐
☐
☐

[1 mark]

0 1 . 3

Name **one** type of substance that plant root hair cells absorb from the soil by active transport.

.....

.....

[1 mark]

0 2

Scientists measured the concentrations of some ions in the cells of a freshwater alga and in the pond water around them.

Table 1 shows the results.

Table 1

Ion	Concentration in pond water in mmol/dm ³	Concentration in the cells in mmol/dm ³
Sodium	5	1
Potassium	1	120
Phosphate	0.05	4

0 2 . 1

Calculate how many times more concentrated potassium ions are in the cells than in the pond water.

.....

.....

.....

[1 mark]

0 2 . 2

Which ion in Table 1 could enter the cells by diffusion?
Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 3

Scientists measured the concentrations of some ions in the root cells of a crop plant and in the soil water around them.

Table 2 shows the results.

Table 2

Ion	Concentration in soil water in mmol/dm ³	Concentration in the cells in mmol/dm ³
Potassium	0.1	100
Calcium	5	1
Magnesium	0.2	15

0 3 . 1

Calculate how many times more concentrated potassium ions are in the cells than in the soil water.

.....

.....

.....

.....

[1 mark]

0 3 . 2

Which ion in Table 2 could enter the cells by diffusion?
Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

.....

0 4

When soil is waterlogged, the air spaces between the soil particles fill with water. The roots of plants growing in waterlogged soil get very little oxygen.

0 4 . 1

Explain why plants growing in waterlogged soil absorb fewer mineral ions.

.....

.....

.....

.....

.....

.....

[3 marks]

0 4 . 2

Explain why mineral ions cannot be absorbed from the soil by diffusion.

.....

.....

.....

.....

[2 marks]

0 4 . 3

Farmers sometimes break up hard, compacted soil to make more air spaces in it.

Suggest how this helps crop plants to grow.

.....

.....

.....

.....

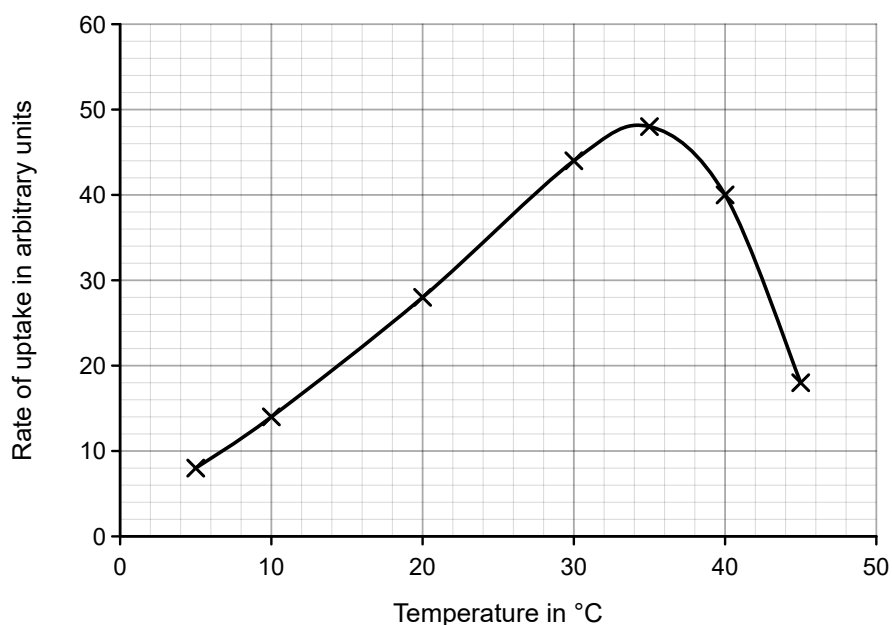
[2 marks]

0 5

A scientist measured the rate of uptake of potassium ions by the roots of barley plants at different temperatures. The concentration of potassium ions in the solution around the roots was lower than in the root cells.

Figure 1 shows the results.

Figure 1



0 5 . 1

Use Figure 1 to estimate the temperature at which the rate of uptake was highest.

.....

.....

.....

Temperature = °C

[1 mark]

0 5 . 2

Describe the effect of temperature on the rate of uptake of potassium ions.

.....

.....

.....

.....

[2 marks]

0 5 . 3

Explain why the rate of uptake increases between 5 °C and 35 °C.

.....

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.....

.....

[2 marks]

0 5 . 4

Suggest why the rate of uptake decreases above 35 °C.

.....

.....

.....

.....

[2 marks]

0 5 . 5

Calculate how many times faster the rate of uptake was at 30 °C than at 10 °C.

.....

.....

.....

.....
[1 mark]

0 6

Substances move into and out of cells by diffusion, osmosis and active transport.

0 6 . 1

Give **two** differences between active transport and diffusion.

.....

.....

.....

.....

[2 marks]

0 6 . 2

Give **one** similarity between osmosis and active transport.

.....

.....

[1 mark]

0 6 . 3

After a meal, sugar molecules are absorbed from the small intestine into the blood.

Explain why active transport is needed to absorb all of the sugar.

.....

.....

.....

.....

[2 marks]

0 6 . 4

Give **one** use of the sugar absorbed into the blood.

.....

.....

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Active transport · 31 marks

Question 1 (4 marks)

01.1 [2 marks]

- movement of substances from a more dilute solution to a more concentrated solution / against a concentration gradient (1)
 - using energy from respiration (1)
-

01.2 [1 mark]

Correct: Active transport

01.3 [1 mark]

- mineral ions (1)

Notes: Allow named ions, e.g. nitrate / magnesium / potassium ions. Do not accept water.

Question 2 (3 marks)

02.1 [1 mark]

Answer: 120 times

- $(120 \div 1 =) 120$ (1)
-

02.2 [2 marks]

Answer: sodium

- sodium (1)
- its concentration is higher in the pond water than in the cells, so it can move down its concentration gradient (1)

Notes: The reason mark can only be awarded if sodium is chosen.

Question 3 (3 marks)

03.1 [1 mark]

Answer: 1000 times

- $(100 \div 0.1 =) 1000$ (1)

03.2 [2 marks]

Answer: calcium

- calcium (1)
- its concentration is higher in the soil water than in the cells, so it can move down its concentration gradient (1)

Notes: The reason mark can only be awarded if calcium is chosen.

Question 4 (7 marks)

04.1 [3 marks]

- less oxygen means less aerobic respiration in the root cells (1)
- so less energy is released (1)
- mineral ions are absorbed by active transport, which needs energy (1)

04.2 [2 marks]

- the concentration of mineral ions in the soil water is lower than in the root hair cells (1)
- diffusion only moves substances from a higher to a lower concentration, so the ions must be moved against the concentration gradient (1)

04.3 [2 marks]

- more oxygen reaches the roots, so more (aerobic) respiration and more active transport of mineral ions (1)
 - the plants get more mineral ions, e.g. nitrate for making proteins / for growth (1)
-

Question 5 (8 marks)

05.1 [1 mark]

Answer: about 35 °C (allow 33–37 °C)

- 33–37 (°C) (1)
-

05.2 [2 marks]

- the rate increases as the temperature increases up to about 35 °C (1)
 - then the rate decreases (rapidly) above about 35 °C (1)
-

05.3 [2 marks]

- the enzymes controlling respiration work faster, so the rate of respiration increases (1)
 - so more energy is released for active transport (1)
-

05.4 [2 marks]

- the enzymes (for respiration) are denatured / their active sites change shape (1)
 - so less energy is released for active transport (1)
-

05.5 [1 mark]

Answer: 3.1 times

- $(44 \div 14 =) 3.1$ (1)
-

Question 6 (6 marks)

06.1 [2 marks]

- active transport needs energy from respiration, but diffusion does not (1)
 - active transport moves substances from a dilute to a more concentrated solution / against the concentration gradient, but diffusion moves substances from a higher to a lower concentration (1)
-

06.2 [1 mark]

- both move substances across (partially permeable) cell membranes (1)
-

06.3 [2 marks]

- (as sugar is absorbed) the sugar concentration in the gut becomes lower than in the blood (1)
 - so sugar cannot be absorbed by diffusion / must be moved against the concentration gradient (1)
-

06.4 [1 mark]

- (cell) respiration (1)

Notes: Allow 'to release energy'. Allow 'converted to glycogen / fat for storage'.
