AQA GCSE Biology | 8461

SPECIFICATION POINT 4.1.3.2

Osmosis

Past-paper questions

Tier	**Higher**
Question groups	**6**
Available paper years	**2013–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.1.3.2 Osmosis

Question 01

June 2013 | BL3HP | Original Q4 | Legacy

4 Plants exchange substances with the environment.

4 (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)

4 (b) What is meant by the *transpiration stream*?

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(3 marks)

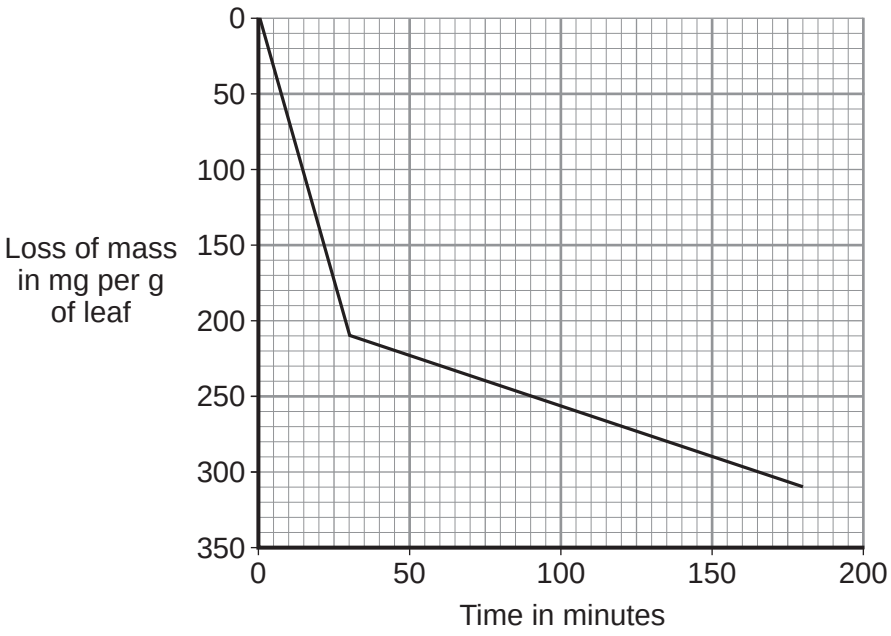
4.1.3.2 Osmosis

Question 01 · continued

4 (c) Students investigated the loss of water vapour from leaves.

The students:
- cut some leaves off a plant
- measured the mass of these leaves every 30 minutes for 180 minutes.

The graph shows the students' results.



4 (c) (i) The rate of mass loss in the first 30 minutes was 7 milligrams per gram of leaf per minute.

Calculate the rate of mass loss between 30 minutes and 180 minutes.

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Rate of mass loss = ... milligrams per gram of leaf per minute

(2 marks)

4 (c) (ii) The rate of mass loss between 0 and 30 minutes was very different from the rate of mass loss between 30 and 180 minutes.

Suggest an explanation for the difference between the two rates.

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(2 marks)

11

4.1.3.2 Osmosis

Question 02

June 2014 | BL3HP | Original Q3 | Legacy

3 Plant roots absorb water from the soil by osmosis.

3 (a) What is osmosis?

[3 marks]

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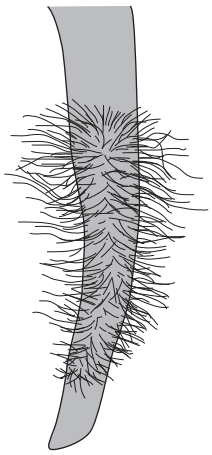
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3 (b) **Figure 3** shows part of a plant root.

Figure 3



The plant root is adapted for absorbing water from the soil.

Use information from **Figure 3** to explain how this plant root is adapted for absorbing water.

[3 marks]

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6

4.1.3.2 Osmosis

Question 03

June 2016 | BL3HP | Original Q1 | Legacy

1 Cells, tissues and organs are adapted to take in different substances and get rid of different substances.

Table 1 shows the concentration of four ions outside cells and inside cells.

Table 1

Ion	Concentration outside cells in mmol per dm^3	Concentration inside cells in mmol per dm^3
Sodium	140	9
Potassium	7	138
Calcium	2	27
Chloride	118	3

1 (a) Use information from **Table 1** to complete the following sentences.

[2 marks]

Sodium ions will move into cells by the process

of _____ .

Potassium ions will move into cells by the process

of _____ .

1 (b) Some students investigated the effect of the different concentrations of sugar in four drinks, **A**, **B**, **C** and **D**, on the movement of water across a partially permeable membrane.

The students:

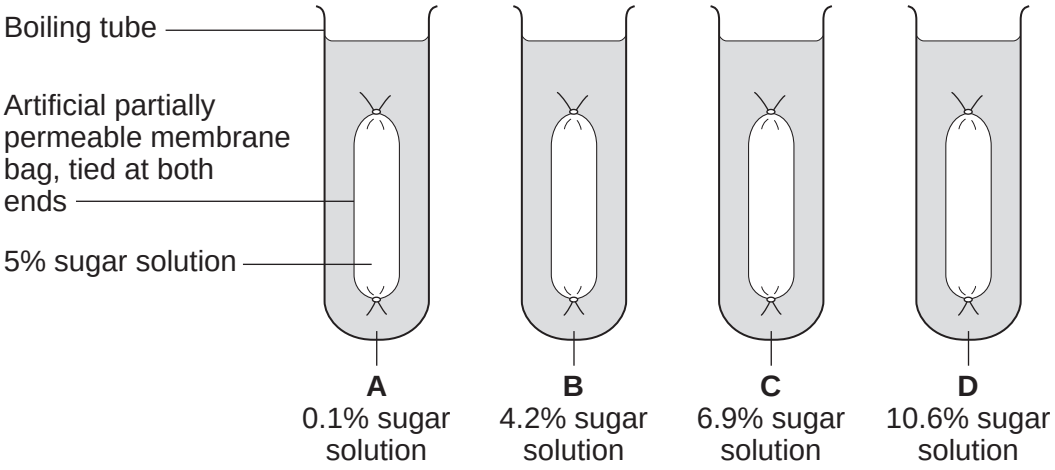
- made four bags from artificial partially permeable membrane
- put equal volumes of 5% sugar solution in each bag
- weighed each bag containing the sugar solution
- placed one bag in each of the drinks, **A**, **B**, **C** and **D**
- after 20 minutes removed the bags containing the sugar solution and weighed them again.

4.1.3.2 Osmosis

Question 03 · continued

Figure 1 shows how they set up the investigation.

Figure 1



1 (b) (i) The bag in drink **A** got heavier after 20 minutes.

Explain why.

[3 marks]

1 (b) (ii) In which drink, **A**, **B**, **C** or **D**, would you expect the bag to show the smallest change in mass?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

1 (b) (iii) Explain why you think the bag you chose in part **(b)(ii)** would show the smallest change.

[2 marks]

8

4.1.3.2 Osmosis

Question 04

June 2022 | 8461/1H | Original Q1

0 1 This question is about cells and transport.

0 1 . 1 Complete **Table 1**.

[3 marks]

Table 1

Name of cell part	Function of cell part
	Contains genetic information
Mitochondria	
	Controls the movement of substances into and out of the cell

Cells in potatoes are plant cells.

Cells in potatoes do **not** contain chloroplasts.

0 1 . 2 What is the function of chloroplasts?

[1 mark]

0 1 . 3 Name **one** type of cell in a potato plant that does **not** contain chloroplasts.

[1 mark]

Question 1 continues on the next page

4.1.3.2 Osmosis

Question 04 · continued

A student investigated the effect of salt concentration on pieces of potato.

This is the method used.

1. Cut three pieces of potato of the same size.
2. Record the mass of each potato piece.
3. Add 150 cm^3 of 0.4 mol/dm^3 salt solution to a beaker.
4. Place each potato piece into the beaker.
5. After 30 minutes, remove each potato piece and dry the surface with a paper towel.
6. Record the mass of each potato piece.
7. Repeat steps 1 to 6 using different concentrations of salt solution.

0 1 . 4 What is the independent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

- Concentration of salt solution ☐
- Mass of potato piece ☐
- Time potato is left in salt solution ☐
- Volume of salt solution ☐

0 1 . 5 Why did the student dry the surface of each potato piece with a paper towel in step **5**?

[1 mark]

4.1.3.2 Osmosis

Question 04 · continued

The student calculated the percentage change in mass of each potato piece.

0 1 . 6 For one potato piece:

- the starting mass was 2.5 g
- the end mass was 2.7 g.

Calculate the percentage increase in mass of the potato piece.

[2 marks]

Use the equation:

$$\text{percentage increase in mass} = \frac{\text{increase in mass}}{\text{starting mass}} \times 100$$

Percentage increase in mass = _____ %

Question 1 continues on the next page

4.1.3.2 Osmosis

The student used the results from each potato piece to calculate the mean percentage change in mass at each concentration.

Table 2 shows the results.

Table 2

Concentration of salt solution in mol/dm^3	Mean percentage (%) change in mass
0.0	9.8
0.1	9.5
0.2	7.0
0.3	0.4
0.4	−1.4

0 1 . 7 Complete **Figure 1**.

You should:

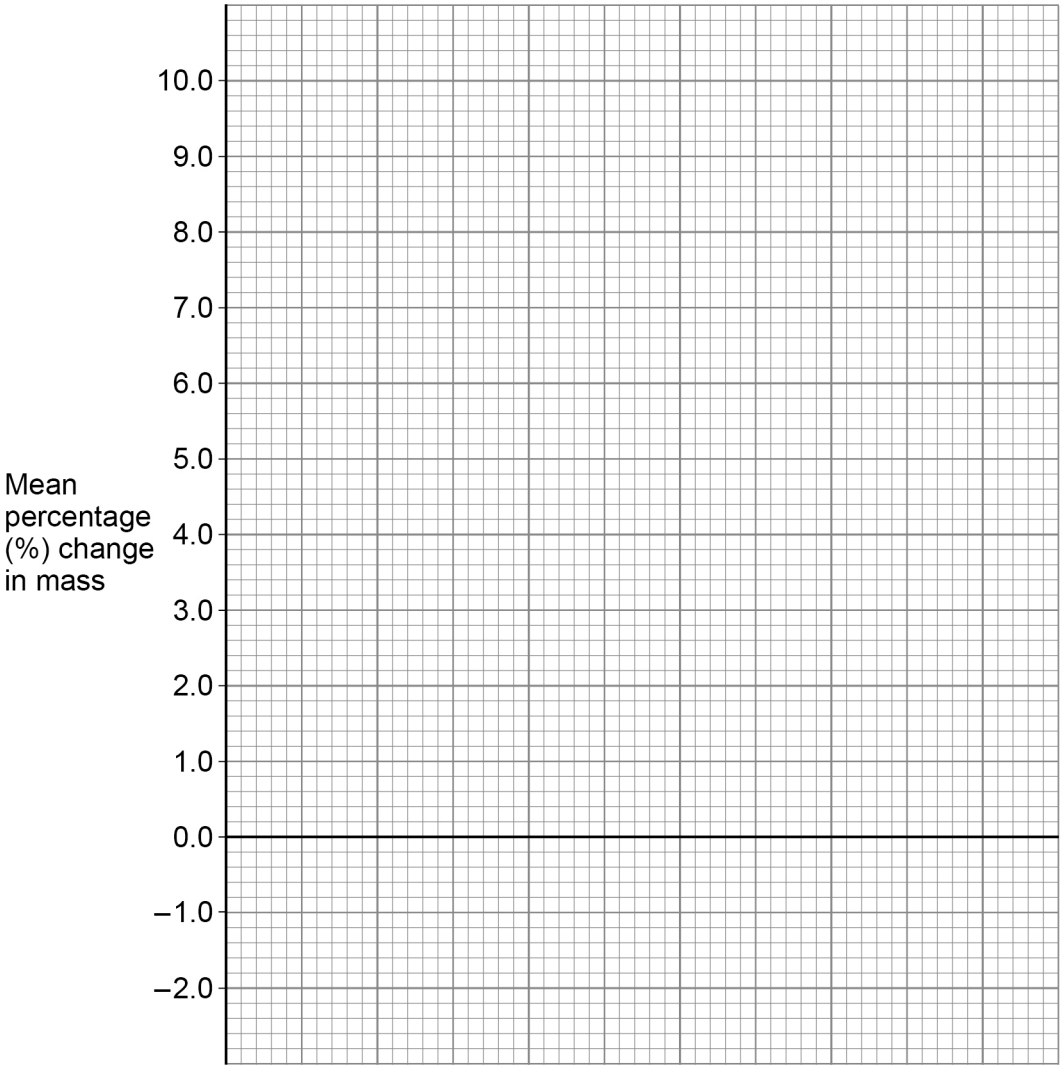
- label the x-axis
- use a suitable scale for the x-axis
- plot the data from **Table 2**
- draw a line of best fit.

[4 marks]

4.1.3.2 Osmosis

Question 04 · continued

Figure 1



0 1 . 8 What concentration of salt solution was equal to the concentration of the solution inside the potato pieces?

Use **Figure 1**.

[1 mark]

Concentration = _____ mol/dm^3

Question 1 continues on the next page

4.1.3.2 Osmosis

Question 04 · continued

0 1 . 9 Explain why the potato pieces in the 0.4 mol/dm^3 salt solution decreased in mass.

[3 marks]

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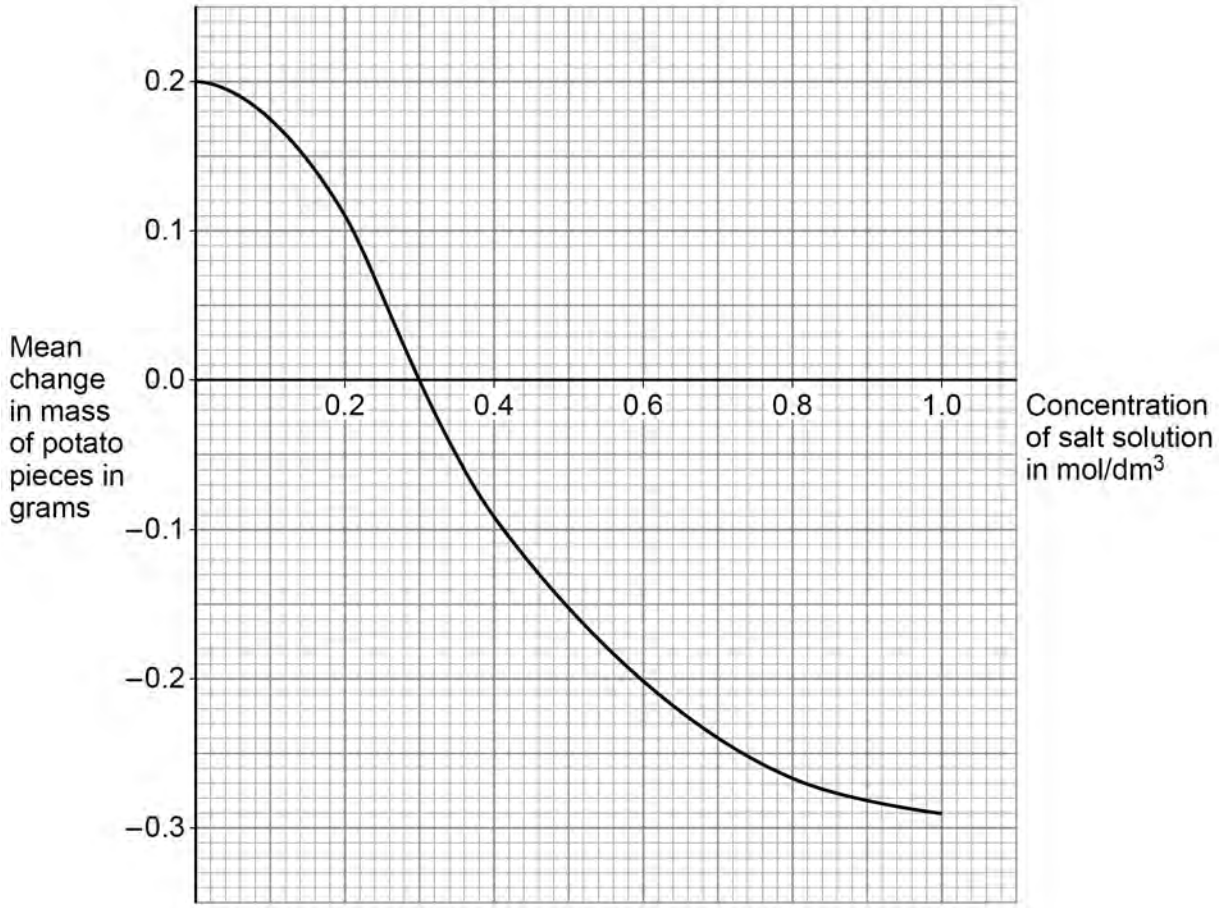
4.1.3.2 Osmosis

Question 05

0 5 A student investigated the effect of concentration of salt solution on the mass of uncooked potato pieces.

Figure 4 shows the results.

Figure 4



0 5 . 1 Plan a method that could be used to obtain the results in **Figure 4**.

[6 marks]

4.1.3.2 Osmosis

Question 05 · continued

0 5 . 2 Explain the result for the potato pieces in the 0.6 mol/dm^3 salt concentration.

[3 marks]

0 5 . 3 Explain why the result for the potato pieces at 1.0 mol/dm^3 was different from the result at 0.6 mol/dm^3.

[2 marks]

11

4.1.3.2 Osmosis

Question 06

0 3 A student investigated osmosis in pieces of potato.

This is the method used.

1. Cut a piece of potato into a cube.
2. Record the mass of the cube.
3. Place the cube into a beaker containing 0.4 mol/dm^3 salt solution.
4. After some time, remove the cube and record the mass.
5. Calculate the change in the mass of the cube.
6. Repeat steps 1 to 5 using two more different concentrations of salt solution.

0 3 . 1 Evaluate the student's method.

You should include how the student could improve the validity of their results.

[6 marks]

4.1.3.2 Osmosis

Question 06 · continued

0 3 . 2 Why would a potato cube placed into distilled water increase in mass?

[1 mark]

Tick (✓) **one** box.

- The solution in the potato cells was less concentrated than the distilled water. ☐
- The solution in the potato cells was more concentrated than the distilled water. ☐
- The volume of water in the potato cells was greater than the volume of distilled water. ☐
- The volume of water in the potato cells was less than the volume of distilled water. ☐

0 3 . 3 Active transport is another process used by potato cells.

Give **one** way active transport is different from osmosis.

[1 mark]

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