AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.1.3.2

Osmosis

Past-paper questions

Tier	**Foundation**
Question groups	**4**
Available paper years	**2018–2025**

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 2018 | 8464/B/1F | Original Q3

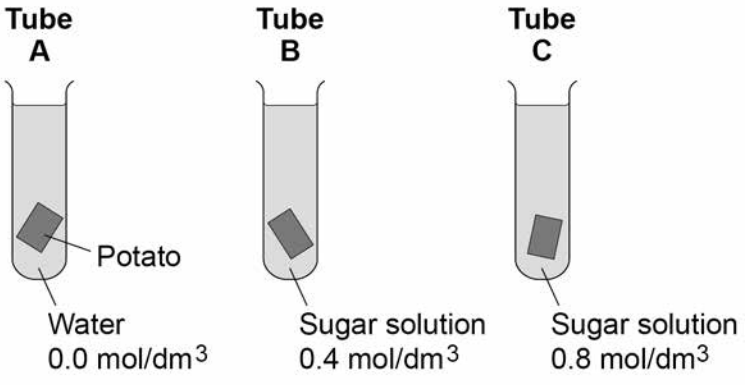
0 3 A student investigated the effect of different concentrations of sugar solution on pieces of potato.

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 6 shows how the investigation was set up.

Figure 6



0 3 . 1 Why did the student dry each piece of potato before weighing it?

[1 mark]

4.1.3.2 Osmosis

Question 01 · continued

0 3 . 2 What **two** changes would you expect in the potato in **tube A** after 2 hours?

[2 marks]

Tick **two** boxes.

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

0 3 . 3 Complete the sentences.

[3 marks]

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.

0 3 . 4 The potato in **tube B** did **not** change.

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

[1 mark]

_____

_____

Question 3 continues on the next page

4.1.3.2 Osmosis

Question 01 · continued

0 3 . 5 **Figure 7** shows the root of a germinating seed.

Figure 7



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

[2 marks]

1 _____

_____

2 _____

_____

9

4.1.3.2 Osmosis

Question 02

November 2020 | 8464/B/1F | Original Q5

0 5 A student investigated the effect of different concentrations of sugar solution on pieces of potato.

This is the method used.

1. Cut five pieces of potato.

2. Record the starting mass of each piece of potato.

3. Place each piece of potato in a different concentration of sugar solution.

4. After 24 hours remove the pieces of potato from the solutions.

5. Record the final mass of each piece of potato.

6. Calculate the change in mass for each piece of potato.

0 5 . 1 What is the independent variable?

[1 mark]

Tick (✓) **one** box.

- Change in mass of the pieces of potato ☐
- Concentration of the sugar solution ☐
- Length of time the pieces of potato are in the solution ☐
- Starting mass of the pieces of potato ☐

Question 5 continues on the next page

4.1.3.2 Osmosis

Table 3 shows the results.

Table 3

Concentration of sugar solution in mol/dm^3	Mass of potato at start in grams	Mass of potato after 24 hours in grams	Change in mass in grams
0.0	7.94	10.14	2.20
0.1	7.95	9.10	1.15
0.2	7.96	8.21	0.25
0.3	7.93	7.53	–0.40
0.4	7.93	7.18	–0.75
0.5	7.95	7.00	–0.95

0 5 . 2 Explain why the potato in 0.0 mol/dm^3 sugar solution increased in mass.

[2 marks]

4.1.3.2 Osmosis

Question 02 · continued

0 5 . 3 Complete **Figure 5**.

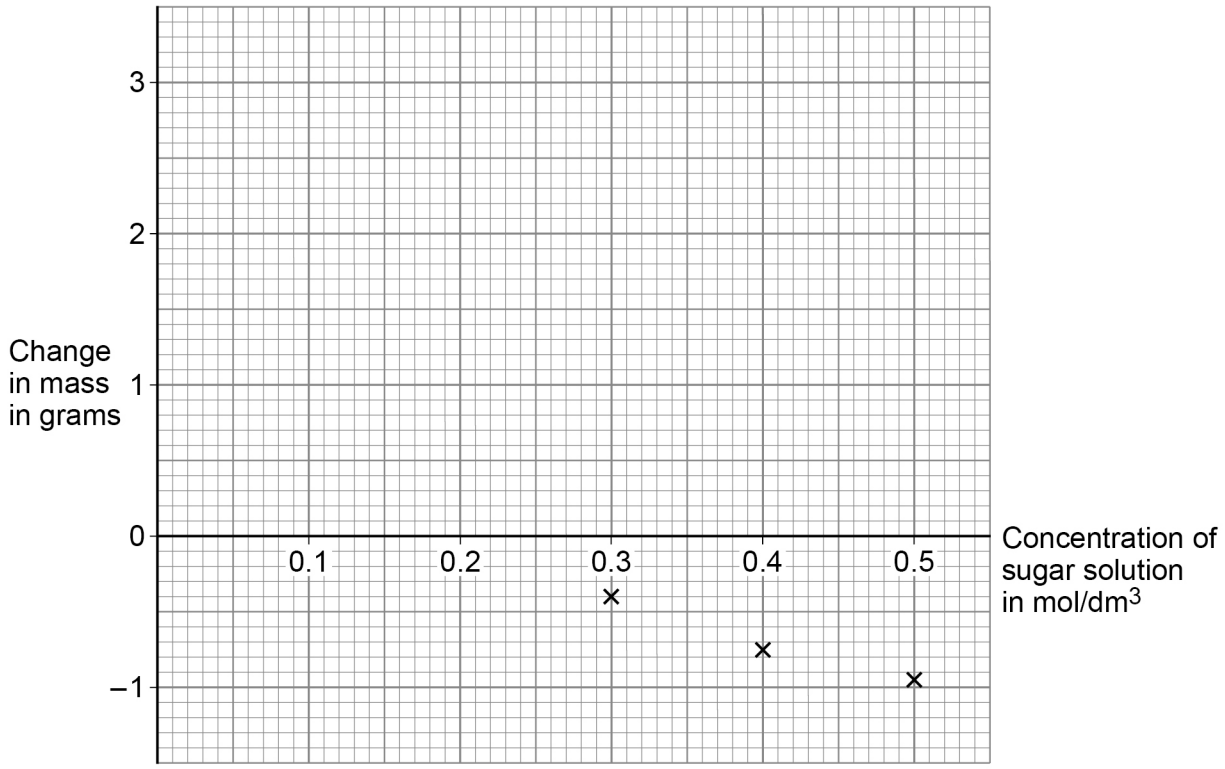
Some of the results have been plotted for you.

You should:

- plot the data from **Table 3**
- draw a line of best fit through all the points.

[2 marks]

Figure 5



0 5 . 4 The mass of a piece of potato does **not** change when:

concentration of solution inside cells = concentration of solution outside cells

Determine the concentration of sugar solution inside the potato cells.

Use **Figure 5**.

[1 mark]

Concentration = _____ mol/dm^3

4.1.3.2 Osmosis

Table 3 is repeated below.

Table 3

Concentration of sugar solution in mol/dm^3	Mass of potato at start in grams	Mass of potato after 24 hours in grams	Change in mass in grams
0.0	7.94	10.14	2.20
0.1	7.95	9.10	1.15
0.2	7.96	8.21	0.25
0.3	7.93	7.53	–0.40
0.4	7.93	7.18	–0.75
0.5	7.95	7.00	–0.95

0 5 . 5 Calculate the percentage change in mass for the potato in 0.2 mol/dm^3 sugar solution.

Use **Table 3**.

Use the equation:

$$\text{percentage change in mass} = \frac{\text{change in mass}}{\text{mass of potato at start}} \times 100$$

Give your answer to 3 significant figures.

[3 marks]

Percentage change in mass (3 significant figures) = _____ %

9

4.1.3.2 Osmosis

Question 03

June 2024 | 8464/B/1F | Original Q7

0 7 A student investigated the concentration of salt in solution **Z**.

The student used a method involving osmosis.

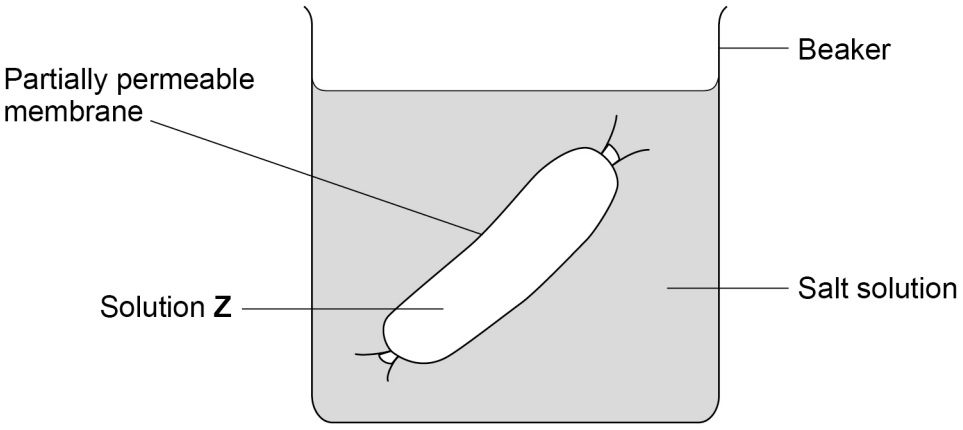
The student used tubing made of partially permeable membrane.

This is the method used.

1. Cut six pieces of tubing to the same length.
2. Tie one end of each piece of tubing.
3. Put the same volume of solution **Z** into each piece of tubing.
4. Tie the other end of each piece of tubing to form a sealed tube.
5. Record the mass of each tube.
6. Place each tube into a different concentration of salt solution.
7. After 2 hours, remove each tube from the salt solutions.
8. Record the mass of each tube.

Figure 8 shows one of the sealed tubes in a salt solution.

Figure 8



4.1.3.2 Osmosis

Question 03 · continued

0 7 . 1 What was the independent variable for the investigation?

[1 mark]

Tick (✓) **one** box.

- Change in mass of tube ☐
- Concentration of salt solution ☐
- Time in salt solution ☐
- Volume of solution **Z** ☐

0 7 . 2 The student dried the outside of each tube with a paper towel before recording the mass.

Why was it important to dry the tubes?

[1 mark]

_____

_____

Question 7 continues on the next page

Question 03 · continued

Table 3 shows the results.

Table 3

Concentration of salt solution in mol/dm^3	Mass of tube in grams			Percentage (%) change in mass
	At start	After 2 hours	Change	
0.0	15.54	16.50	0.96	**X**
0.2	15.16	15.78	0.62	4.1
0.4	15.00	15.35	0.35	2.3
0.6	15.29	15.37	0.08	0.5
0.8	14.95	14.75	–0.20	–1.3
1.0	14.77	14.40	–0.37	–2.5

0 7 . 3 Calculate value **X** in **Table 3**.

Give your answer to 1 decimal place.

[3 marks]

Value **X** (1 decimal place) = _____ %

0 7 . 4 Complete **Figure 9**.

You should:

- plot the percentage change in mass from **Table 3** for salt concentrations of **only** 0.2 mol/dm^3 to 1.0 mol/dm^3
- draw a line of best fit.

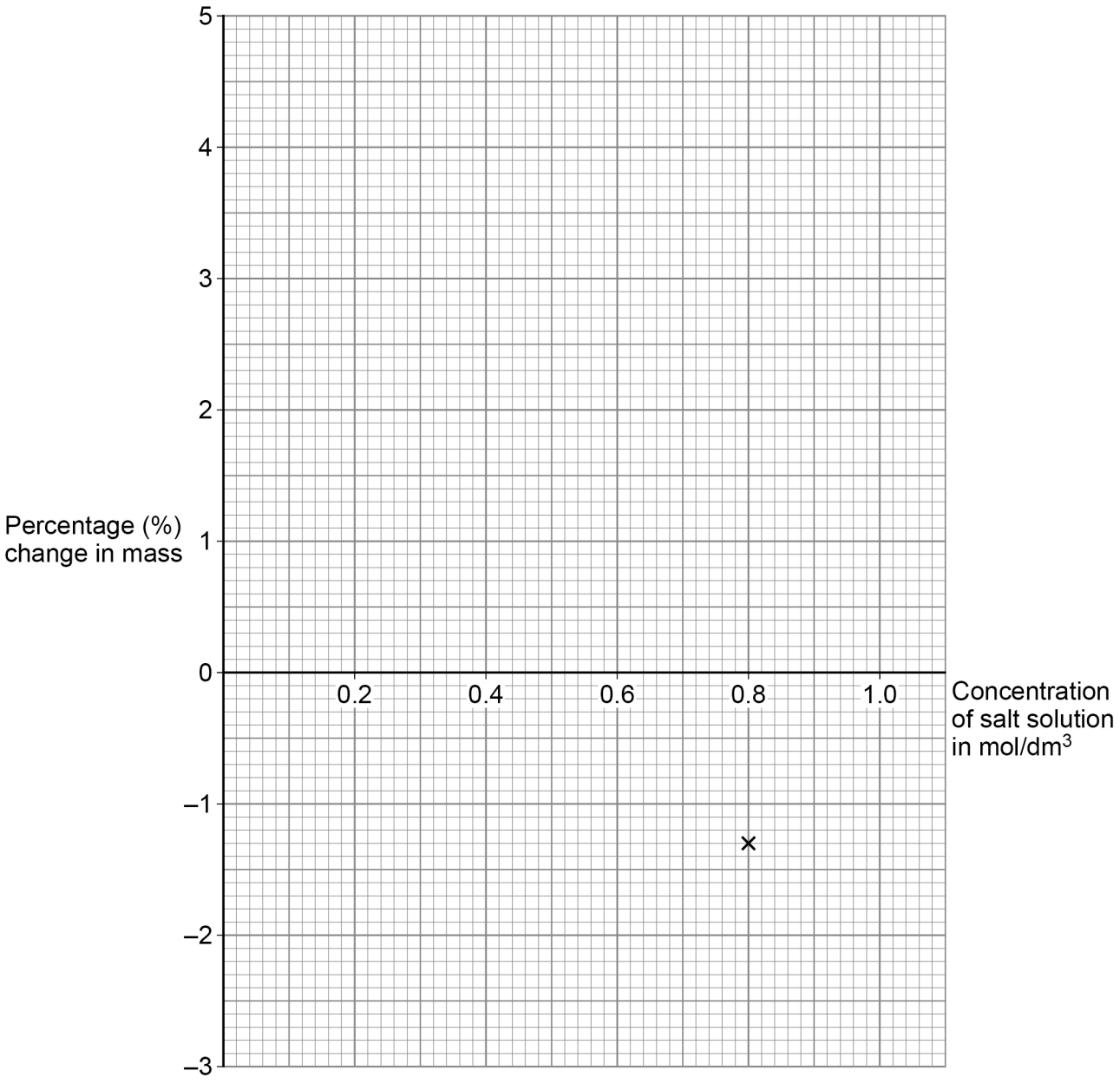
One of the results has been plotted for you.

[3 marks]

4.1.3.2 Osmosis

Question 03 · continued

Figure 9



0 7 . 5 Determine the concentration of salt in solution **Z**.

Use **Figure 9**.

[1 mark]

Concentration = _____ mol/dm^3

9

4.1.3.2 Osmosis

Question 04

June 2025 | 8464/B/1F | Original Q3

0 3 A student investigated the effect of concentration of salt solution on the mass of potato cubes.

This is the method used.

1. Cut a piece of potato into four cubes.
2. Record the mass of each cube.
3. Put each cube into a different beaker.
4. Pour a different concentration of salt solution into each beaker.
5. After 1 hour, remove each cube.
6. Record the mass of each cube.

0 3 . 1 Suggest **two** improvements to the investigation.

[2 marks]

1 _____

_____

2 _____

_____

Question 3 continues on the next page

The student improved the investigation.

Table 3 shows the results.

Table 3

Concentration of salt solution in mol/dm^3	Mass of potato cube at the start in grams	Mass of potato cube after one hour in grams	Change in mass in grams
0.0	30.6	30.7	+0.1
0.5	30.8	30.8	0.0
1.0	30.8	30.7	–0.1
2.0	30.5	30.3	–0.2

0 3 . 2 What was the concentration of the solution inside the potato cells?

[1 mark]

Tick (✓) **one** box.

- 0.0 mol/dm^3 ☐
- 0.5 mol/dm^3 ☐
- 1.0 mol/dm^3 ☐
- 2.0 mol/dm^3 ☐

4.1.3.2 Osmosis

Question 04 · continued

0 3 . 3 Changes in mass of the potato cubes are due to water moving into and out of the cells.

What is the name of the process that allows water to move into and out of cells?

[1 mark]

Tick (✓) **one** box.

Active transport ☐

Osmosis ☐

Respiration ☐

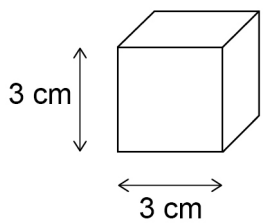
Question 3 continues on the next page

4.1.3.2 Osmosis

Question 04 · continued

0 3 . 4 **Figure 7** shows one of the potato cubes.

Figure 7



Calculate the surface area of the potato cube.

Give the unit.

[3 marks]

Surface area = _____ Unit _____

0 3 . 5 The student then investigated the effect of **surface area** on the change in mass of a piece of potato.

Describe how the student could increase the surface area of the piece of potato shown in **Figure 7**.

[1 mark]

4.1.3.2 Osmosis

Potatoes contain varying amounts of carbohydrates and proteins.

Starch and sugar are different types of carbohydrate.

0 3 . 6 Draw **one** line from each carbohydrate to the chemical used to test for the carbohydrate.

[2 marks]

Carbohydrate	Chemical used for test
Starch	Benedict's reagent
Sugar	Biuret reagent
	Ethanol
	Iodine solution

0 3 . 7 A potato was tested for protein, sugar and starch.

Table 4 shows the results.

Table 4

	Test for protein	Test for sugar	Test for starch
Result	Blue	Red	Blue-black

Which substances were found in the potato?

[1 mark]

Tick (✓) **one** box.

- Protein and starch ☐
- Protein and sugar ☐
- Sugar and starch ☐

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