AQA GCSE Biology | 8461

SPECIFICATION POINT 4.1.3.2

Osmosis

Past-paper questions

Tier	**Foundation**
Question groups	**17**
Available paper years	**2008–2025**

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.

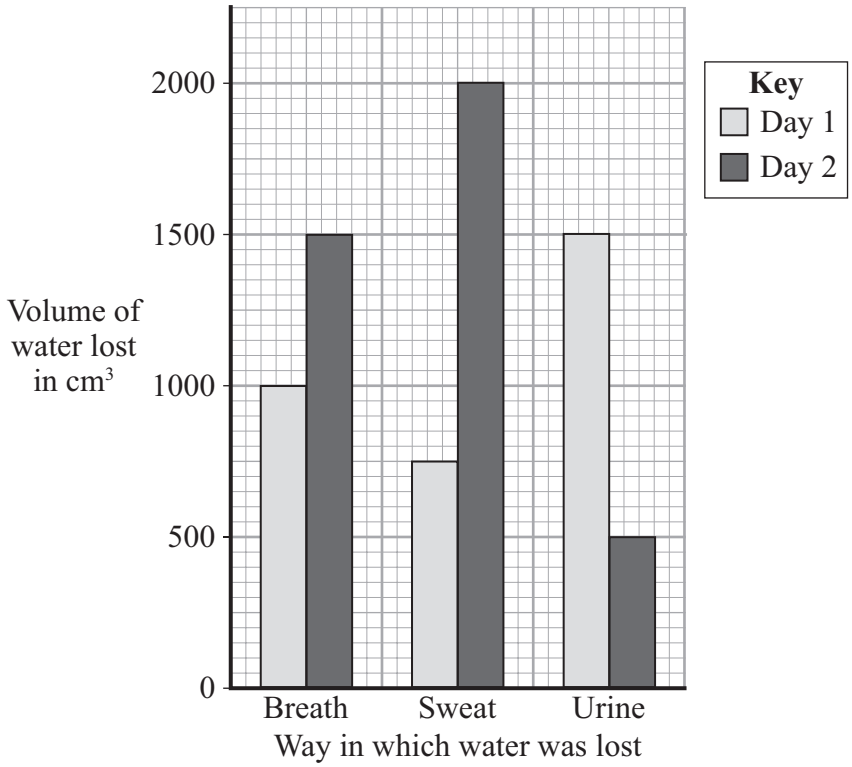
4.1.3.2 Osmosis

Question 01

January 2008 | BLY2F | Original Q2 | Legacy

2 The bar chart shows the amount of water lost from the body of a student on two different days.

The student ate the same amount of food and drank the same amount of liquid on the two days. The temperature of the surroundings was similar on the two days.



(a) The total volume of water lost on day 1 was 3250 cm^3.

How much water was lost on day 2? Show all your working.

.....

..... cm^3

(2 marks)

(b) The student did much more exercise on one of the days than on the other.

On which day did he do more exercise? Day .....

Give **two** reasons for your answer.

1 .....

.....

2 .....

.....

(2 marks)

4.1.3.2 Osmosis

Question 01 · continued

BLANK

(c) (i) Which **one** of these is a chemical reaction that produces water in the body?

Put a tick (✓) in the box next to your choice.

Breathing ☐

Osmosis ☐

Respiration ☐

Sweating ☐

(1 mark)

(ii) How does sweating help the body?

.....

.....

(1 mark)

(iii) If the body loses more water than it gains, it becomes dehydrated.
The concentration of the solution surrounding the body cells increases.
This causes the cells to lose water.

By which process do cells lose water?

Put a tick (✓) in the box next to your choice.

Breathing ☐

Osmosis ☐

Respiration ☐

Sweating ☐

(1 mark)

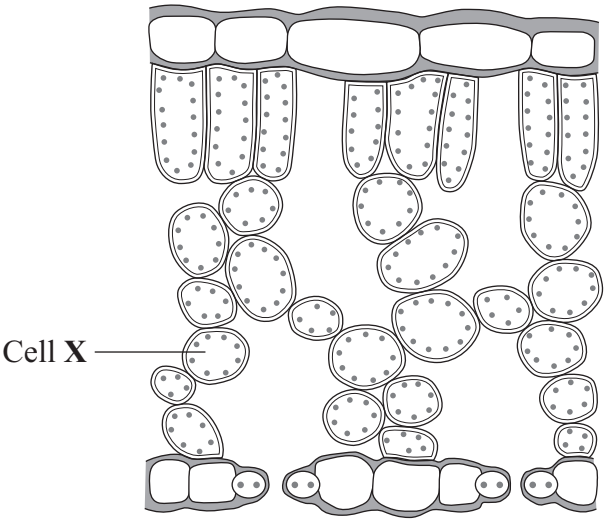
7

4.1.3.2 Osmosis

Question 02

January 2008 | BLY3F | Original Q4 | Legacy

4 (a) The diagram shows a section through a plant leaf.
Water evaporates from cell **X**.



(i) **On the diagram**, draw an arrow to show how water vapour from cell **X** gets out of the leaf.

(1 mark)

(ii) Name the process by which water vapour is lost from a leaf.

Draw a circle around **one** answer.

osmosis **transpiration** **wilting**

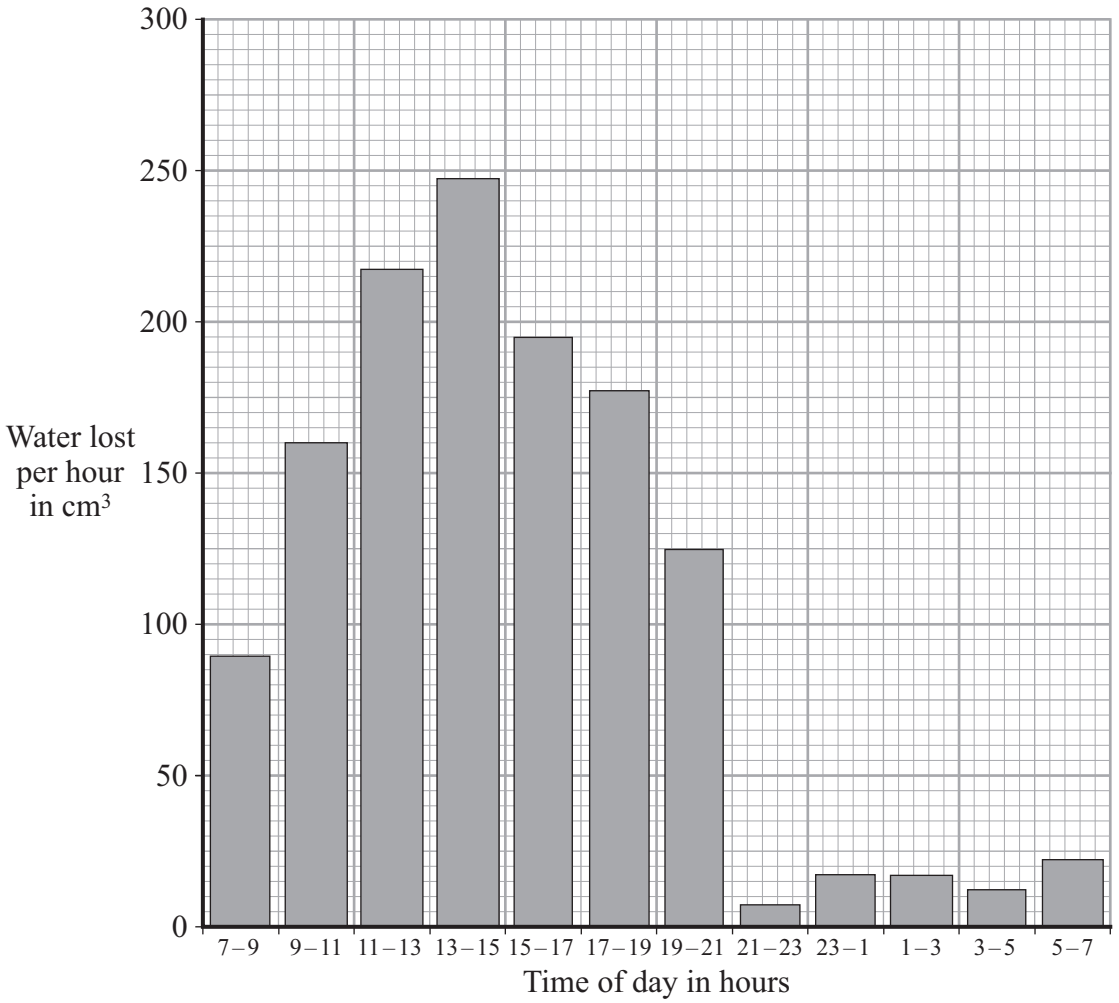
(1 mark)

4.1.3.2 Osmosis

Question 02 · continued

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(b) The graph shows how much water was lost from a plant at different times of the day.



(i) During which 2-hour period was water lost most quickly?

.....

(1 mark)

(ii) Give **one** possible explanation why water was lost most quickly at this time.

.....

.....

.....

.....

(2 marks)

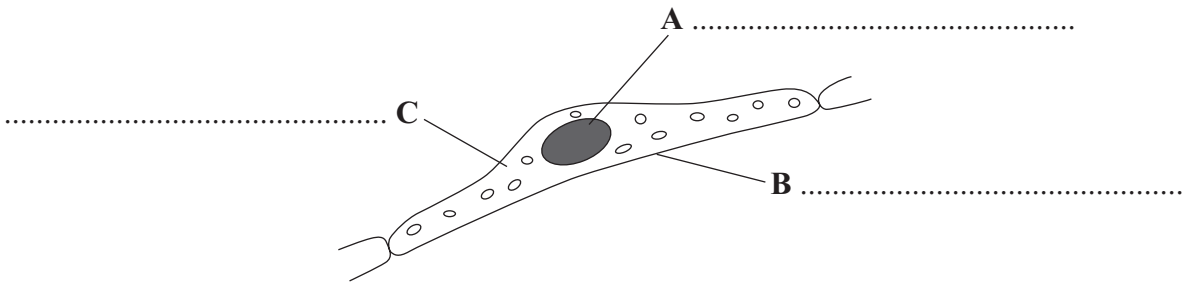
5

4.1.3.2 Osmosis

Question 03

June 2008 | BLY2F | Original Q1 | Legacy

1 The diagram shows a cell from the lining of the lung. This cell is specialised to allow gases to pass through quickly.



1 (a) Use words from the box to label structures **A**, **B** and **C**.

cell membrane	**chloroplast**	**cytoplasm**	**mitochondria**	**nucleus**

(3 marks)

1 (b) (i) Which feature of this cell allows oxygen to pass through quickly?

Put a tick (✓) in the box next to your choice.

It is thin. ☐

It has a large nucleus. ☐

It has many mitochondria. ☐

(1 mark)

1 (b) (ii) Complete the sentence by drawing a ring around the correct answer in the box.

Oxygen passes through this cell by [diffusion / osmosis / respiration] .

(1 mark)

5

4.1.3.2 Osmosis

Question 04

June 2008 | BLY2F | Original Q5 | Legacy

5 In fish and chip shops, potatoes are cut into chips several hours before they are cooked.

The amount of water in the chips must be kept constant during this time.

To keep the water in the chips constant, the chips are kept in salt solution.

A student investigated the effect of different concentrations of salt solution on the mass of chips.

- He weighed each of five chips.
- He placed each chip into a different concentration of salt solution.
- After one hour he removed the chips, then reweighed them.

His results are shown in the table.

Concentration of salt solution	**0 M**	**0.5 M**	**1 M**	**2 M**	**3 M**
Mass of chip at start in grams	2.6	2.8	2.8	2.5	2.6
Mass of chip after one hour in grams	2.7	2.8	2.7	2.3	2.1

5 (a) (i) In which concentration of salt solution did the chip gain mass?

..... M

(1 mark)

5 (a) (ii) Complete the sentence by drawing a ring around the correct answer in the box.

The chip gained mass because water entered by

digestion
osmosis
respiration

.

(1 mark)

4.1.3.2 Osmosis

Question 04 · continued

for mark

5 (b) In which concentration of salt solution should the chips be kept?

..... M

Give a reason for your answer.

.....

.....

(2 marks)

5 (c) How could the student have made his investigation more reliable?

.....

.....

(1 mark)

5

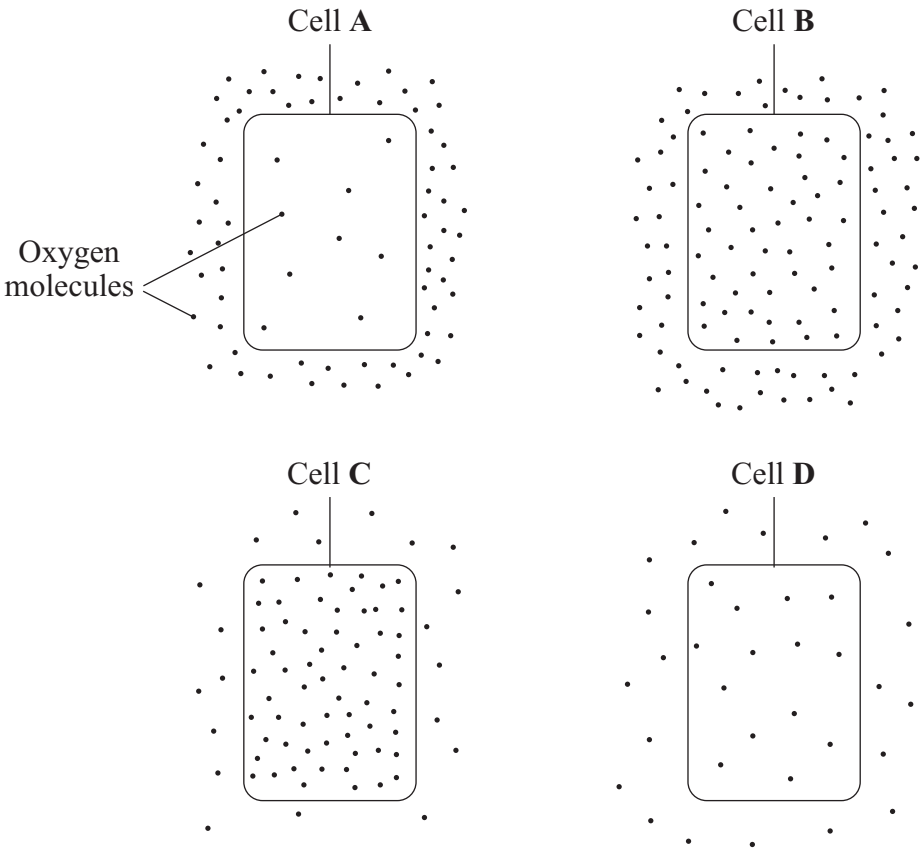
Turn over for the next question

4.1.3.2 Osmosis

Question 05

June 2009 | BLY2F | Original Q2 | Legacy

2 (a) The diagrams show cells containing and surrounded by oxygen molecules. Oxygen can move into cells or out of cells.



Into which cell, **A**, **B**, **C** or **D**, will oxygen move the fastest?

Write your answer, **A**, **B**, **C** or **D**, in the box.

(1 mark)

4.1.3.2 Osmosis

Question 05 · continued

for mark

2 (b) Draw a ring around the correct word to complete each sentence.

2 (b) (i) Oxygen is taken into cells by the process of

diffusion
osmosis
respiration

.

(1 mark)

2 (b) (ii) Cells need oxygen for

breathing
photosynthesis
respiration

.

(1 mark)

2 (b) (iii) The parts of cells that use up the most oxygen are the

membranes
mitochondria
nuclei

.

(1 mark)

2 (b) (iv) Some cells produce oxygen in the process of

diffusion
photosynthesis
respiration

.

(1 mark)

5

4.1.3.2 Osmosis

Question 06

June 2010 | BLY2F | Original Q2 | Legacy

2 This question is about what happens during decay.

Draw a ring around the correct word to complete each sentence.

2 (a) After living things die, they are decayed by

animals.
microorganisms.
plants.

(1 mark)

2 (b) Decay happens faster when there is plenty of oxygen and conditions are

cold.
dry.
moist.

(1 mark)

2 (c) During decay carbon dioxide is produced by

osmosis.
respiration.
photosynthesis.

(1 mark)

2 (d) Decay releases mineral salts into the soil.

These mineral salts are absorbed by plant

leaves.
roots.
stems.

(1 mark)

4

4.1.3.2 Osmosis

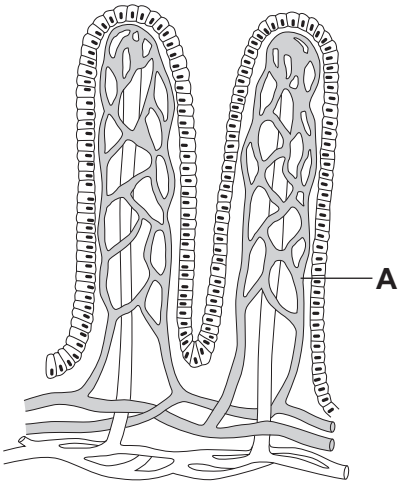
Question 07

January 2011 | BLY3F | Original Q2 | Legacy

2 Villi are found in some parts of the digestive system.

Diagram 1 shows two villi.

Diagram 1



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

2 (a) (i) Structure **A** is a

muscle.

nerve.

capillary.

(1 mark)

2 (a) (ii) The villi absorb the products of digestion by

dialysis.

diffusion.

osmosis.

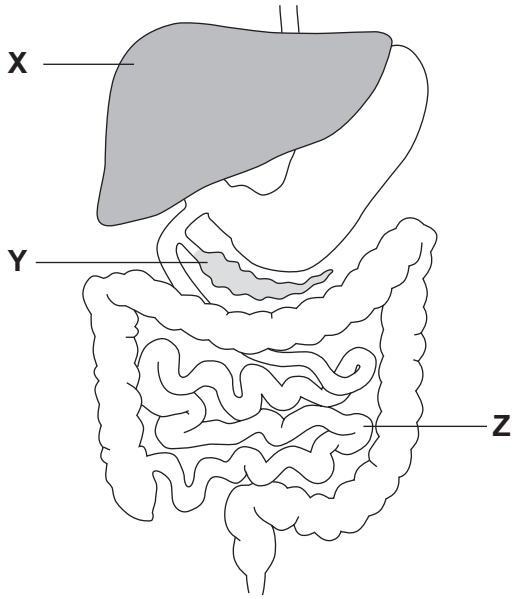
(1 mark)

4.1.3.2 Osmosis

Question 07 · continued

2 (b) **Diagram 2** shows the digestive system.

Diagram 2



2 (b) (i) In which part of the digestive system, **X**, **Y** or **Z**, are most villi found?

(1 mark)

2 (b) (ii) There are about 2000 villi in each cm^2 of this part of the digestive system.

Why is it helpful to have lots of villi?

.....

.....

(1 mark)

4

4.1.3.2 Osmosis

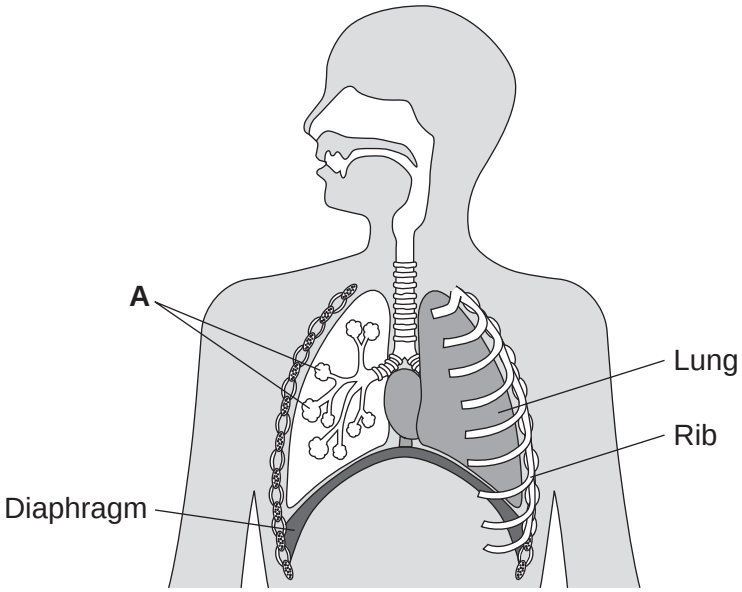
Question 08

June 2015 | BL3FP | Original Q1 | Legacy

1 Our lungs help us to breathe.

Figure 1 shows the human breathing system.

Figure 1



1 (a) (i) Name part **A** in **Figure 1**.

[1 mark]

.....

1 (a) (ii) Give **one** function of the ribs.

[1 mark]

.....

1 (b) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

active transport	**diffusion**	**osmosis**

Oxygen moves from the air inside the lungs into the blood by the process of ..... .

4.1.3.2 Osmosis

Question 08 · continued

1 (b) (ii) Use the correct answer from the box to complete the sentence.

[1 mark]

arteries	capillaries	veins

Oxygen moves from the lungs into the blood through the walls

of the ..... .

1 (b) (iii) Inside the lungs, oxygen is absorbed from the air into the blood.

Give **two** adaptations of the lungs that help the rapid absorption of oxygen into the blood.

[2 marks]

1 .....

.....

2 .....

.....

6

4.1.3.2 Osmosis

Question 09

June 2016 | BL3FP | Original Q7 | Legacy

7 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

7 (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 _____ .

7 (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.

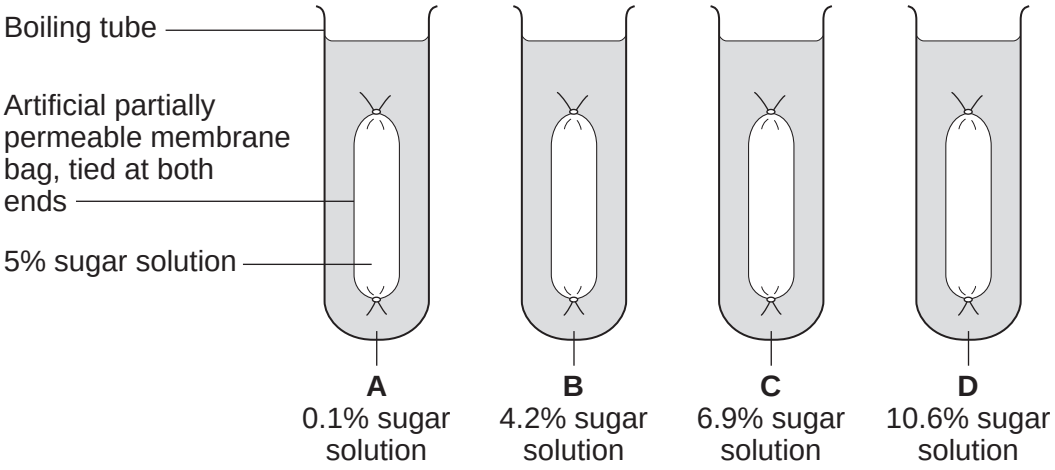
The students:

- 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.

Question 09 · continued

Figure 9 shows how they set up the investigation.

Figure 9



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

Explain why.

[3 marks]

7 (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** ☐

7 (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 10

June 2017 | BL3FP | Original Q2 | Legacy

2 Substances travel from the soil into plant roots by different processes.

2 (a) One of these processes is osmosis.

What is the definition of osmosis?

[1 mark]

Tick (✓) **one** box.

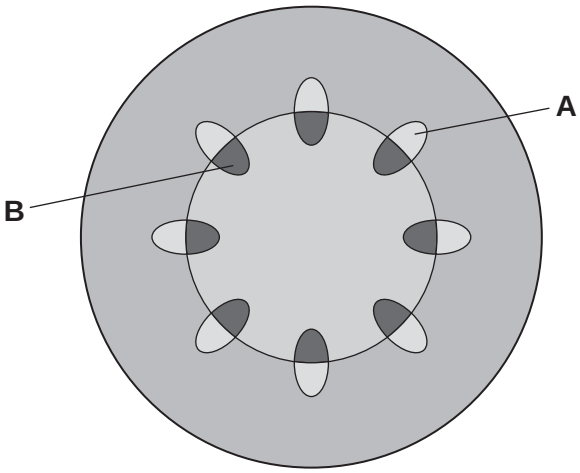
The movement of water from a concentrated solution to a more dilute solution through a partially permeable membrane. ☐

The movement of water from a dilute solution to a more concentrated solution through a partially permeable membrane. ☐

The movement of water through a partially permeable membrane using energy. ☐

2 (b) **Figure 2** shows a cross-section through a plant stem.

Figure 2



Parts **A** and **B** in **Figure 2** contain tubes that transport materials in plants.

A student collected fluid from parts **A** and **B**.

The fluid from **A** contained a lot of sugar.

The fluid from **B** contained a lot of mineral ions.

4.1.3.2 Osmosis

Question 10 · continued

What are the names of parts **A** and **B** in **Figure 2**?

[2 marks]

Use the correct answers from the box.

guard cells	**phloem**	**stomata**	**storage organ**	**xylem**

A _____

B _____

2 (c) In plants water moves from the roots, up through the stem and out of the leaves.

What is the name of this movement of water?

[1 mark]

Complete the sentence.

The _____ stream.

Question 2 continues on the next page

4.1.3.2 Osmosis

Question 10 · continued

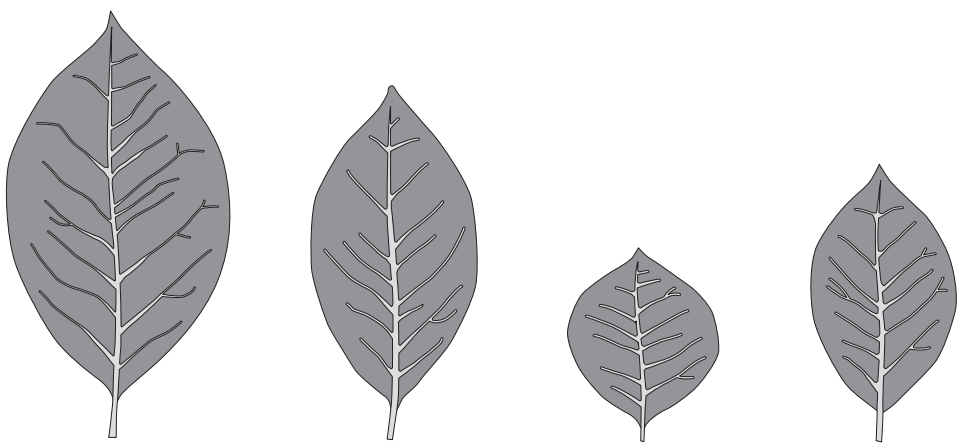
2 (d) The student investigated the rate of water loss from leaves.

The student:

- took four leaves, **A**, **B**, **C** and **D**, from the same plant
- measured the mass of each leaf
- kept the leaves in the same room for 3 hours
- measured the mass of each leaf again.

Figure 3 shows the four leaves she used.

Figure 3



2 (d) (i) How could the student calculate the mass of water lost for each leaf?

[1 mark]

Tick (✓) **one** box.

mass after ÷ mass before ☐

mass after × mass before ☐

mass before + mass after ☐

mass before − mass after ☐

4.1.3.2 Osmosis

Question 10 · continued

2 (d) (ii) Suggest which leaf, **A**, **B**, **C** or **D**, lost the most water.

Give a reason for your answer.

[2 marks]

Leaf _____

Reason _____

_____

2 (d) (iii) The student changed the conditions in the room.

Suggest **two** conditions that would increase the rate of water loss from the leaves.

[2 marks]

1 _____

2 _____

9

4.1.3.2 Osmosis

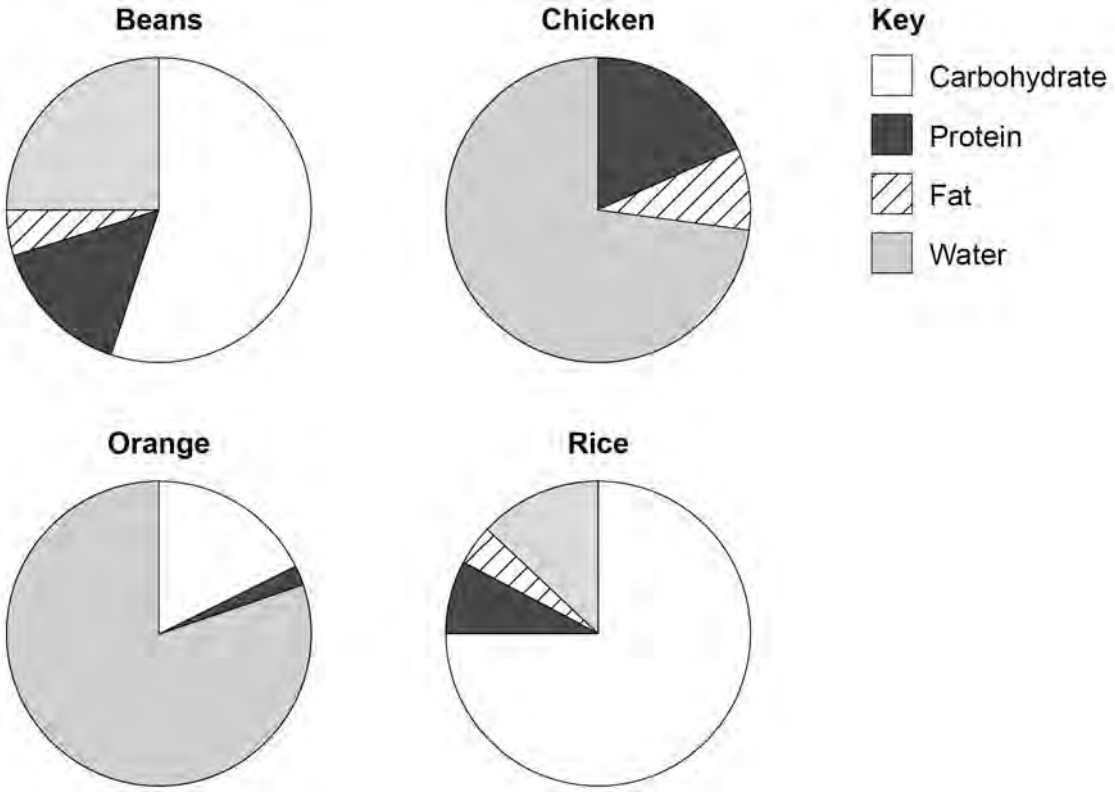
Question 11

June 2019 | 8461/1F | Original Q1

0 1 Many foods contain carbohydrates.

Figure 1 shows information about four different foods.

Figure 1



0 1 . 1 Which food contains the highest percentage of carbohydrate?

[1 mark]

Tick (✓) **one** box.

- Beans ☐
- Chicken ☐
- Orange ☐
- Rice ☐

4.1.3.2 Osmosis

Question 11 · continued

0 1 . 2 Estimate the percentage of water found in beans.

[1 mark]

Percentage = _____ %

0 1 . 3 Look at **Figure 1**.

Why would eating only beans provide a more balanced diet than eating only chicken?

[1 mark]

_____

_____

0 1 . 4 Sugars are produced when enzymes break down starch.

What is the name of the enzyme which breaks down starch to produce sugars?

[1 mark]

Tick (✓) **one** box.

- Amylase ☐
- Bile ☐
- Lipase ☐
- Protease ☐

0 1 . 5 Which chemical could be used to test for glucose?

[1 mark]

Tick (✓) **one** box.

- Benedict's reagent ☐
- Biuret reagent ☐
- Iodine solution ☐
- Sulfuric acid ☐

Question 11 · continued

0 1 . 6 What colour change would be seen in a positive test for glucose?

[1 mark]

From blue to _____.

0 1 . 7 People with diabetes have difficulty controlling the concentration of glucose in their blood.

The blood of four people was tested.

Table 1 shows the results.

Table 1

Person	Concentration of glucose in blood in arbitrary units
A	4.2
B	6.9
C	7.1
D	5.1

Table 2 shows the information used to help decide if a person has diabetes.

Table 2

Concentration of glucose in blood in arbitrary units	Conclusion
<5.6	No diabetes
5.6 to 7.0	Mild diabetes
>7.0	Severe diabetes

Which person has severe diabetes?

[1 mark]

Tick (✓) **one** box.

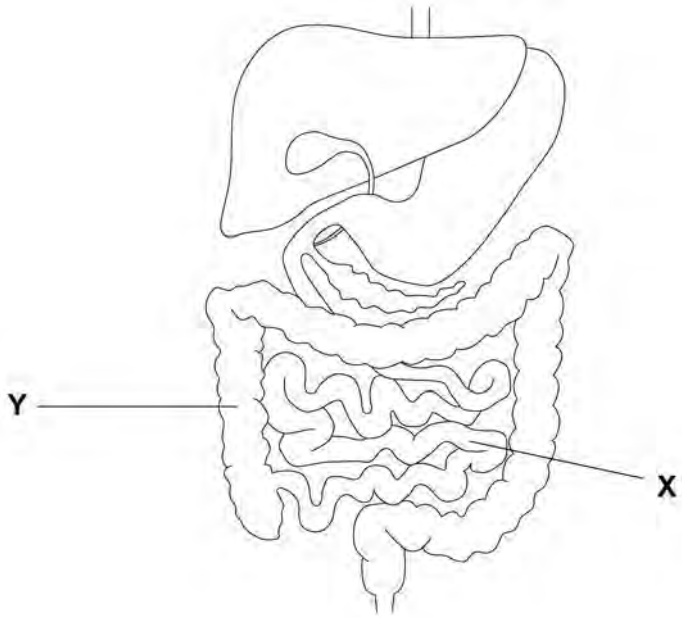
A ☐ **B** ☐ **C** ☐ **D** ☐

4.1.3.2 Osmosis

Question 11 · continued

Figure 2 shows part of the human digestive system.

Figure 2



0 1 . 8 Glucose is absorbed into the bloodstream in part **X**.

Name part **X**.

[1 mark]

_____

0 1 . 9 Complete the sentences.

[2 marks]

Choose answers from the box.

active transport	**digestion**	**excretion**
osmosis	**respiration**	

Some glucose is absorbed into the bloodstream against the concentration gradient by the process of _____.

Water moves out of part **Y** and into the bloodstream by the process of _____.

10

4.1.3.2 Osmosis

Question 12

June 2019 | 8461/2F | Original Q6

0 6 Two of the substances the body excretes are urea and carbon dioxide.

0 6 . 1 Complete the sentence.

[1 mark]

Choose the answer from the box.

carbohydrate	**lipid**	**protein**	**salt**

A person makes a lot of urea if the person's diet contains

a lot of _____.

0 6 . 2 Why must urea be excreted from the body?

[1 mark]

_____

_____

0 6 . 3 A person produces more carbon dioxide during exercise than when resting.

Complete the sentences.

[2 marks]

Choose answers from the box.

breathing	**digestion**	**egestion**
osmosis	**respiration**	

The process that makes carbon dioxide is _____.

During exercise, extra carbon dioxide can be removed from the body by increasing the rate of _____.

4.1.3.2 Osmosis

Question 12 · continued

0 6 . 4 Excess water must also be removed from the body.

If a person sweats a lot, less water will be excreted in the urine.

A healthy person did the same amount of exercise on each of 3 days.

Table 2 shows information for the 3 days.

Table 2

Day	Air temperature in °C	Volume of water consumed in cm^3	Relative amount of urine produced by the kidneys
1	30	1500	
2	20	1500	
3	15	2000	

Complete **Table 2**.

[2 marks]

Choose answers from the box.

least	medium	most

Question 6 continues on the next page

Question 12 · continued

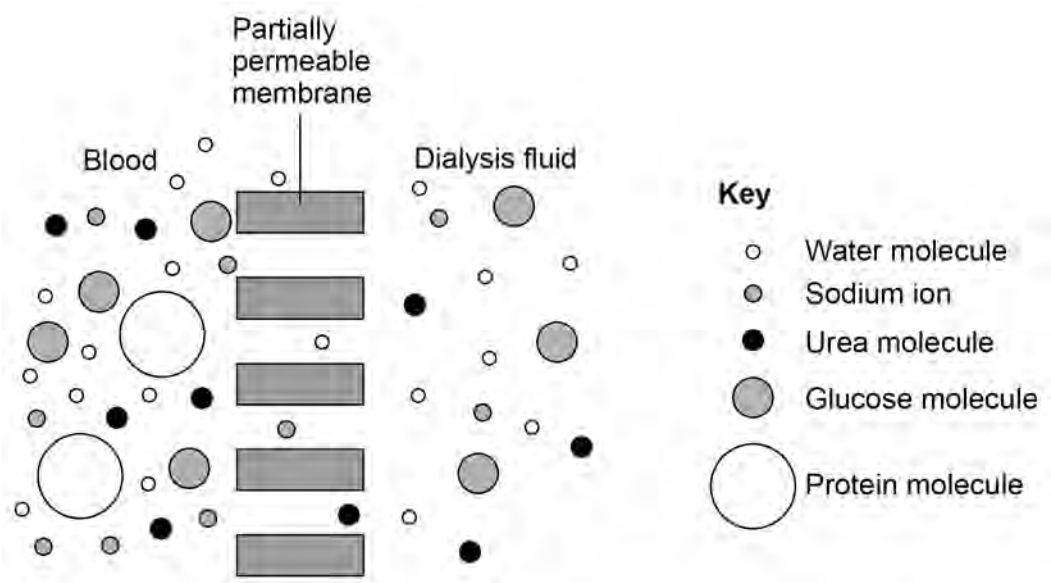
Some people have kidney disease.

Kidney disease may be treated by dialysis or by having a kidney transplant operation.

- During dialysis, a person is connected to a machine that filters the blood.
- Each dialysis session lasts about 6 hours.
- The person has several dialysis sessions each week.

Figure 12 shows how dialysis works.

Figure 12



0 6 . 5 How does urea move out of the blood during dialysis?

[1 mark]

Tick (✓) **one** box.

- Diffusion ☐
- Digestion ☐
- Osmosis ☐
- Respiration ☐

4.1.3.2 Osmosis

Question 12 · continued

0 6 . 6 Which substance in **Figure 12** does **not** pass from the blood into the dialysis fluid?

Give the reason for your answer.

[2 marks]

Substance _____

Reason _____

_____

Question 6 continues on the next page

Question 12 · continued

Two people have kidney disease.

- Person **A** is treated by dialysis.
- Person **B** has had a kidney transplant.

Figure 13 shows changes in the urea concentration in the blood of each person over 2 weeks.

Figure 13



0 6 . 7 How many dialysis sessions did person **A** have **each week**?

[1 mark]

_____

0 6 . 8 What happens to the concentration of urea in the blood between dialysis sessions?

[1 mark]

_____

0 6 . 9 Give **two** reasons why a kidney transplant is a better method for treating kidney disease than dialysis.

[2 marks]

1 _____

_____

2 _____

_____

13

4.1.3.2 Osmosis

Question 13

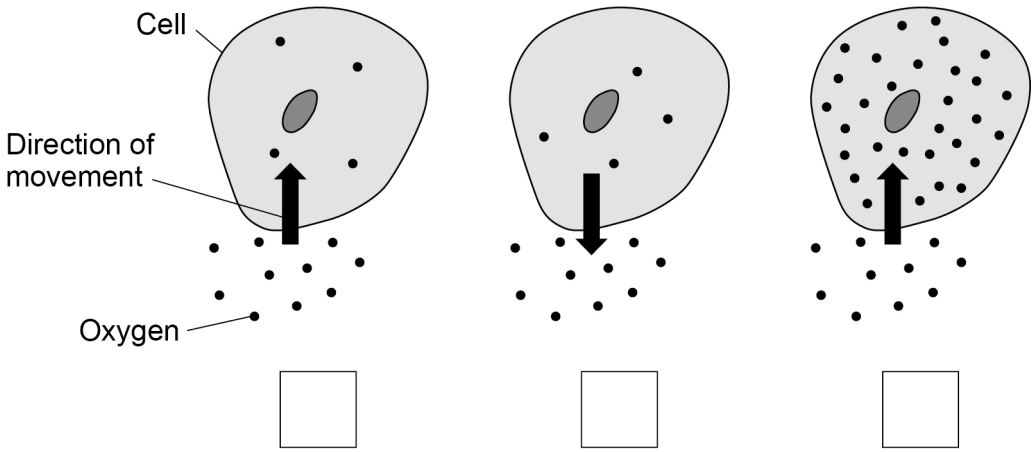
November 2021 | 8461/1F | Original Q1

0 1 This question is about cells.

0 1 . 1 Which diagram shows oxygen moving by diffusion?

[1 mark]

Tick (✓) **one** box.



0 1 . 2 Complete the sentences.

[3 marks]

Choose answers from the box.

carbon dioxide	**chlorophyll**	**energy**
light	**mineral ions**	**water**

Plant cells absorb substances from the soil.

Plant cells use osmosis to absorb _____.

Plant cells use active transport to absorb _____.

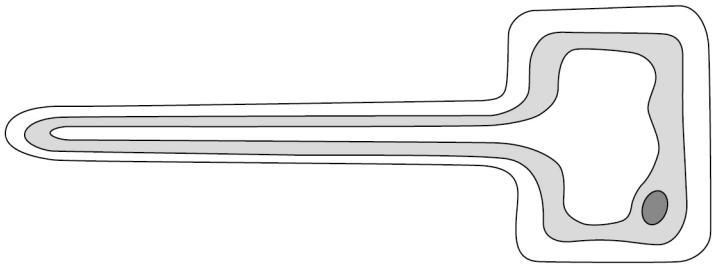
Active transport moves substances against the concentration gradient and needs _____.

4.1.3.2 Osmosis

Question 13 · continued

Figure 1 shows a specialised cell that absorbs substances from the soil.

Figure 1



0 1 . 3 Name the type of specialised cell in **Figure 1**.

[1 mark]

0 1 . 4 Describe how the cell in **Figure 1** is adapted to increase the absorption of substances from the soil.

[1 mark]

Question 1 continues on the next page

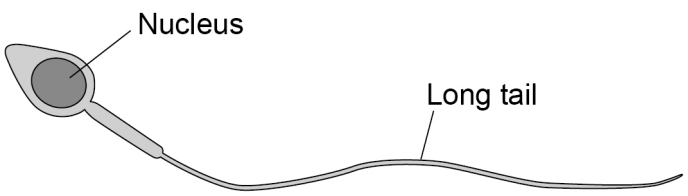
4.1.3.2 Osmosis

Question 13 · continued

A sperm cell is another specialised cell.

Figure 2 shows a sperm cell.

Figure 2



0 1 . 5 Draw **one** line from each feature to how the feature helps the sperm cell carry out its function.

[2 marks]

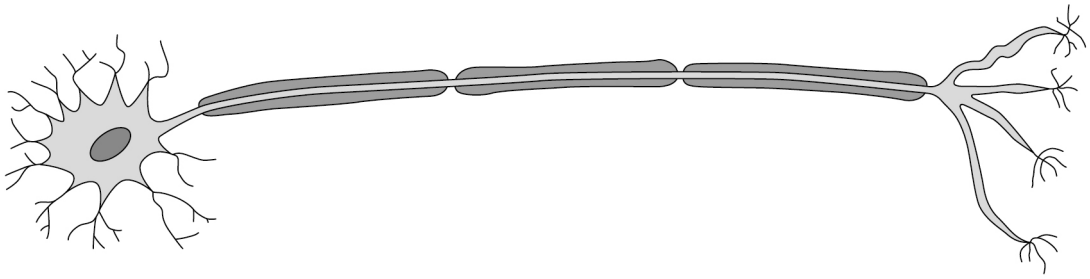
Feature of sperm cell	How the feature helps
Contains a nucleus	To break the outer layer of the egg
	To help the cell to swim to the egg
Has a long tail	To provide the chromosomes for fertilisation
	To release energy

4.1.3.2 Osmosis

Question 13 · continued

Figure 3 shows another specialised cell.

Figure 3



0 1 . 6 Name the type of cell in **Figure 3**.

Describe **one** feature of the cell that helps it to carry out its function.

[2 marks]

Name of the cell _____

Feature of the cell _____

_____

10

4.1.3.2 Osmosis

Question 14

June 2022 | 8461/1F | Original Q7

0 7 This question is about cells and transport.

0 7 . 1 Complete **Table 5**.

[3 marks]

Table 5

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 7 . 2 What is the function of chloroplasts?

[1 mark]

0 7 . 3 Name **one** type of cell in a potato plant that does **not** contain chloroplasts.

[1 mark]

Question 7 continues on the next page

4.1.3.2 Osmosis

Question 14 · continued

June 2022 | 8461/1F | Original Q7

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 7 . 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 7 . 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 14 · continued

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

0 7 . 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 7 continues on the next page

4.1.3.2 Osmosis

Question 14 · continued

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

Table 6 shows the results.

Table 6

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 7 . 7 Complete **Figure 9**.

You should:

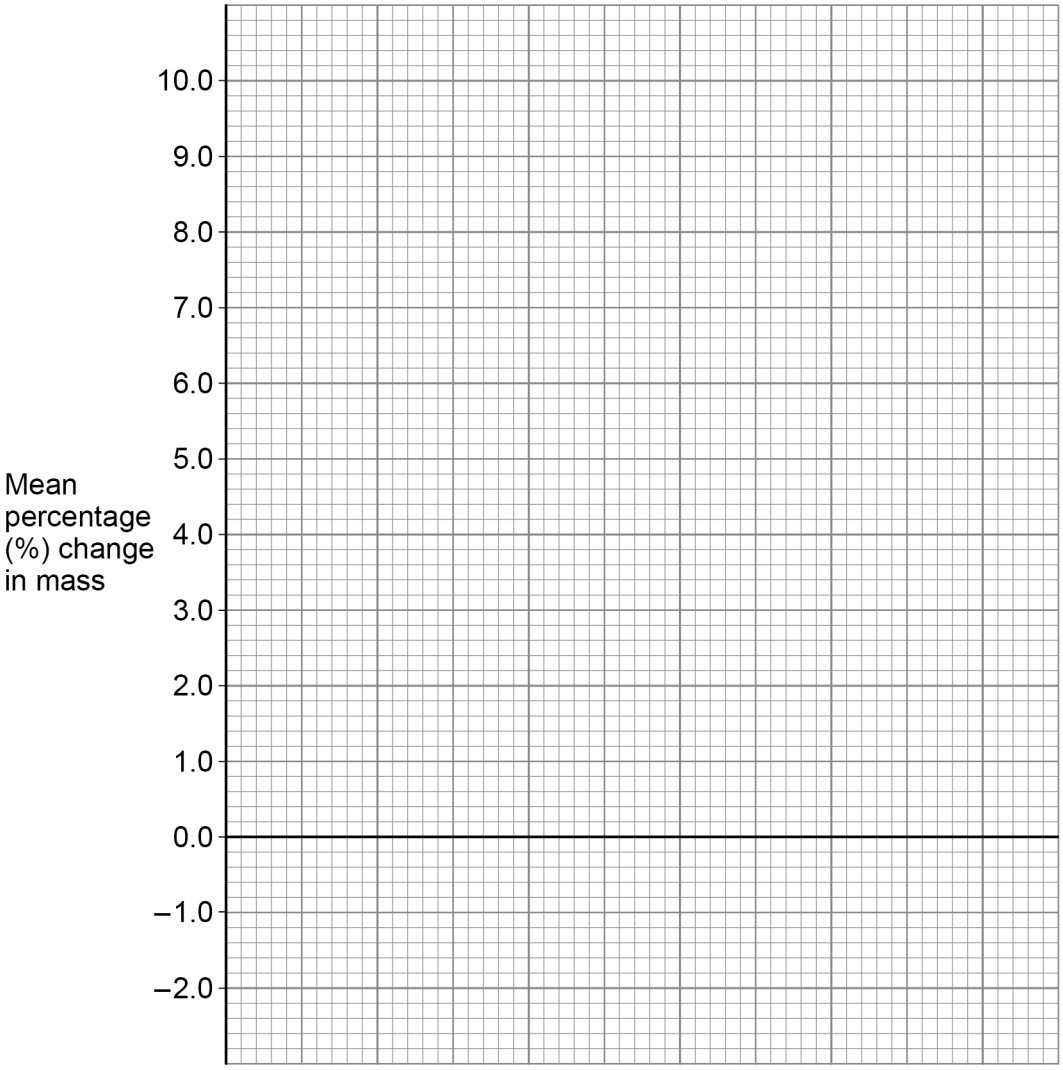
- label the x-axis
- use a suitable scale for the x-axis
- plot the data from **Table 6**
- draw a line of best fit.

[4 marks]

4.1.3.2 Osmosis

Question 14 · continued

Figure 9



0 7 . 8 What concentration of salt solution was equal to the concentration of the solution inside the potato pieces?

Use **Figure 9**.

[1 mark]

Concentration = _____ mol/dm^3

Question 7 continues on the next page

4.1.3.2 Osmosis

Question 14 · continued

0 7 . 9 Explain why the potato pieces in the 0.4 mol/dm^3 salt solution decreased in mass.

[3 marks]

17

4.1.3.2 Osmosis

Question 15

June 2023 | 8461/1F | Original Q1

0 1 Plants are made of cells, tissues and organs.

0 1 . 1 Which part of a plant is the largest?

[1 mark]

Tick (✓) **one** box.

A guard cell ☐

A leaf ☐

A root hair ☐

Students investigated the effect of concentration of salt solution on the mass of pieces of potato.

This is the method used.

1. Cut two pieces of potato to the same size.
2. Record the mass of each piece of potato.
3. Place one piece of potato into a beaker containing a dilute salt solution.
4. Place the other piece of potato into a beaker containing a concentrated salt solution.
5. After 20 minutes, remove each piece of potato from its solution.
6. Record the change in mass of each piece of potato.
7. Repeat steps 1 to 6 two more times.

Table 1 shows the results.

Table 1

Solution	Change in mass of piece of potato in grams			
	Test 1	Test 2	Test 3	Mean
Dilute salt solution	1.1	1.1	1.4	**X**
Concentrated salt solution	–7.2	–6.8	–32.4	–7.0

4.1.3.2 Osmosis

Question 15 · continued

0 1 . 2 Calculate mean value **X** in **Table 1**.

[2 marks]

X = _____ grams

There is an anomalous result for the concentrated salt solution in **Table 1**.

0 1 . 3 Draw a ring around the anomalous result in **Table 1**.

[1 mark]

0 1 . 4 What did the students do with the anomalous result when calculating the mean in **Table 1**?

[1 mark]

0 1 . 5 What name is given to a variable that is kept the same during an investigation?

[1 mark]

Tick (✓) **one** box.

- Control variable ☐
- Dependent variable ☐
- Independent variable ☐

Question 1 continues on the next page

4.1.3.2 Osmosis

Question 15 · continued

0 1 . 6 One variable the students kept the same during the investigation was the size of the pieces of potato.

Which other variable did the students keep the same?

[1 mark]

Tick (✓) **one** box.

Change in mass of pieces of potato ☐

Concentration of salt solution ☐

Time in the salt solution ☐

0 1 . 7 The pieces of potato in the concentrated salt solution decreased in mass.

Complete the sentence.

Choose the answer from the box.

[1 mark]

excretion	**osmosis**	**respiration**

Water moved out of the potato by the process of _____.

4.1.3.2 Osmosis

Question 15 · continued

0 1 . 8 The potato cells have a partially permeable membrane.

Which particles can pass through a partially permeable membrane?

[1 mark]

Tick (✓) **one** box.

No particles ☐

Some particles ☐

All particles ☐

0 1 . 9 How could the students improve their investigation?

[1 mark]

Tick (✓) **one** box.

Boil the pieces of potato at the start. ☐

Leave the skin on some pieces of potato. ☐

Use more concentrations of salt solution. ☐

10

4.1.3.2 Osmosis

Question 16

June 2024 | 8461/1F | Original Q6

0 6 A student investigated the effect of different concentrations of salt solution on the mass of uncooked pieces of potato.

This is the method used.

1. Cut four pieces of a potato to the same size.
2. Record the mass of each piece of potato.
3. Put one of the pieces of potato into a beaker containing 100 cm^3 of 0.1 mol/dm^3 salt solution.
4. Repeat step 3 using the other pieces of potato, each in a different concentration of salt solution.
5. After 20 minutes, remove the pieces of potato from the solutions.
6. Record the mass of each piece of potato.

0 6 . 1 Give **two** control variables the student used in the investigation.

[2 marks]

1 _____

_____

2 _____

_____

4.1.3.2 Osmosis

Question 16 · continued

0 6 . 2 The student needed to be sure the measurements were as accurate as possible.

What should be done to each piece of potato after removing from the solution and before measuring the mass?

[1 mark]

0 6 . 3 Name the piece of apparatus the student could use to measure the mass of the pieces of potato.

[1 mark]

Question 6 continues on the next page

Table 4 shows the results.

Table 4

Piece of potato	Concentration of salt solution in mol/dm^3	Mass of piece of potato in grams			Percentage (%) change in mass of piece of potato
		At start	After 20 minutes	Change	
A	0.1	6.2	6.5	+ 0.3	+ 4.8
B	0.3	6.8	6.5	− 0.3	− 4.4
C	0.5	6.5	5.8	− 0.7	− 10.8
D	0.7	6.0	4.9	− 1.1	**X**

0 6 . 4 What was the resolution of the apparatus used for measuring mass?

Use **Table 4**.

[1 mark]

Tick (✓) **one** box.

0.01 g ☐ 0.1 g ☐ 1.0 g ☐ 1.1 g ☐

0 6 . 5 Which piece of potato had the greatest change in mass in the investigation?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

4.1.3.2 Osmosis

Question 16 · continued

0 6 . 6 Calculate value **X** in **Table 4**.

Use the equation:

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

Give your answer to 1 decimal place.

[3 marks]

X (1 decimal place) = _____ %

0 6 . 7 What is the best way to present the data in **Table 4**?

[1 mark]

Tick (✓) **one** box.

Bar chart ☐

Line graph ☐

Pie chart ☐

Question 6 continues on the next page

Question 16 · continued

0 6 . 8 Complete the sentences.

[3 marks]

Some of the pieces of potato decreased in mass because the potato cells lost _____.

The decrease in mass was due to a process called _____.

The structure surrounding each cell in a piece of potato is partially _____.

0 6 . 9 **Table 4** is repeated below.

Table 4

Piece of potato	Concentration of salt solution in mol/dm^3	Mass of piece of potato in grams			Percentage (%) change in mass of piece of potato
		At start	After 20 minutes	Change	
A	0.1	6.2	6.5	+ 0.3	+ 4.8
B	0.3	6.8	6.5	− 0.3	− 4.4
C	0.5	6.5	5.8	− 0.7	− 10.8
D	0.7	6.0	4.9	− 1.1	**X**

Estimate the concentration of salt solution that would **not** cause a change in mass of these pieces of potato.

[1 mark]

Concentration = _____ mol/dm^3

14

4.1.3.2 Osmosis

Question 17

June 2025 | 8461/1F | Original Q8

0 8 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 8 . 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 17 · continued

0 8 . 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 8 . 3 Active transport is another process used by potato cells.

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

[1 mark]

_____

_____

8