Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Osmosis experiments

Time allowed: 30 minutes

Subject code **0610**

Biology

Questions from Paper 1, Paper 2 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.

Total marks

/ 26

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.

Information

- This paper has 10 questions worth 26 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 What is the best piece of laboratory equipment to use to represent the cell membrane in an osmosis investigation?

A dialysis tubing

B filter paper

C measuring cylinder

D test-tube

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Answer A

2 Red blood cells were placed in pure water.

Movement of water across the cell membrane caused a change in their appearance.

What caused this change in appearance?

	direction of water movement	from higher to lower water potential	from lower to higher water potential
A	into cells	yes	no
B	into cells	no	yes
C	out of cells	yes	no
D	out of cells	no	yes

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Answer A

3 Uncooked potato cylinders of identical size were placed in four different liquids for two hours.

The different liquids are listed.

1 pure water

2 a sugar solution that was less concentrated than the contents of the potato cells

3 a sugar solution that was more concentrated than the contents of the potato cells

4 a sugar solution that was the same concentration as the contents of the potato cells

In which liquids will the potato cylinders increase in length?

A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

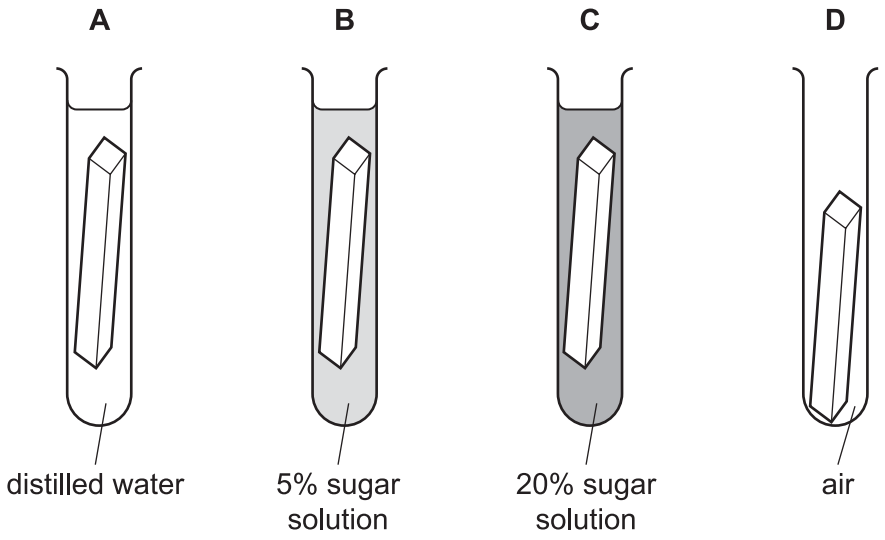
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Answer A

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4 The diagram shows four identical pieces of potato plant tissue in test-tubes. The pieces of potato were kept in the test-tubes for six hours.

Which piece of potato would have the greatest increase in mass after six hours?



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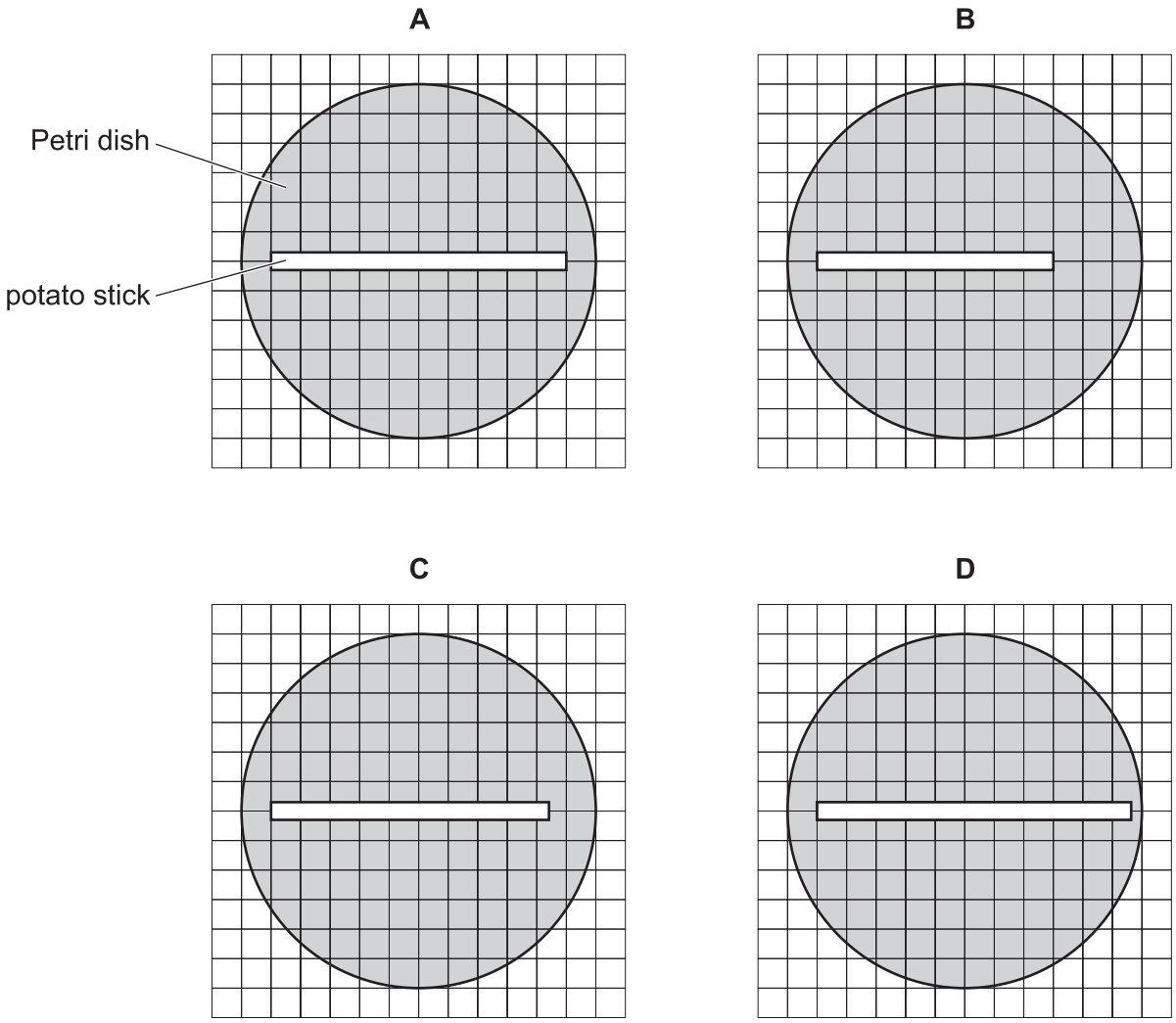
Answer A

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5 A potato was used as a source of plant tissue. Four potato sticks of identical size were cut from the same potato. At the start of the investigation, each potato stick was 10 squares long. The potato sticks were put into four separate Petri dishes. Each Petri dish contained a different concentration of sugar solution.

The diagram shows the four Petri dishes after 24 hours.

Which dish contains a sugar solution that has a higher water potential than the potato tissue?

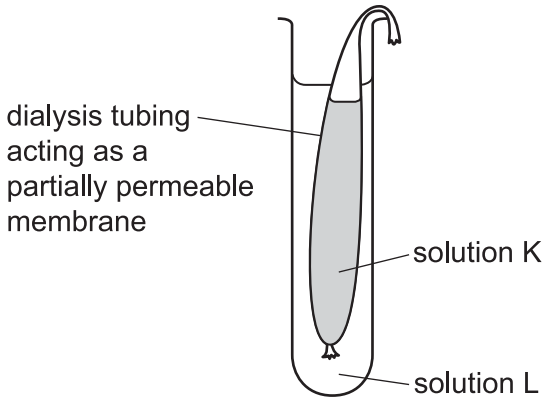


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Answer D

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6 The apparatus shown is used to demonstrate osmosis.



The mass of the dialysis tubing and contents was 11.2 g at the start of the demonstration and 9.4 g at the end.

Which solutions would cause this change in mass?

	solution K	solution L
A	10% salt solution	5% salt solution
B	5% salt solution	10% salt solution
C	5% salt solution	water
D	10% salt solution	water

Osmosis Click for more variations

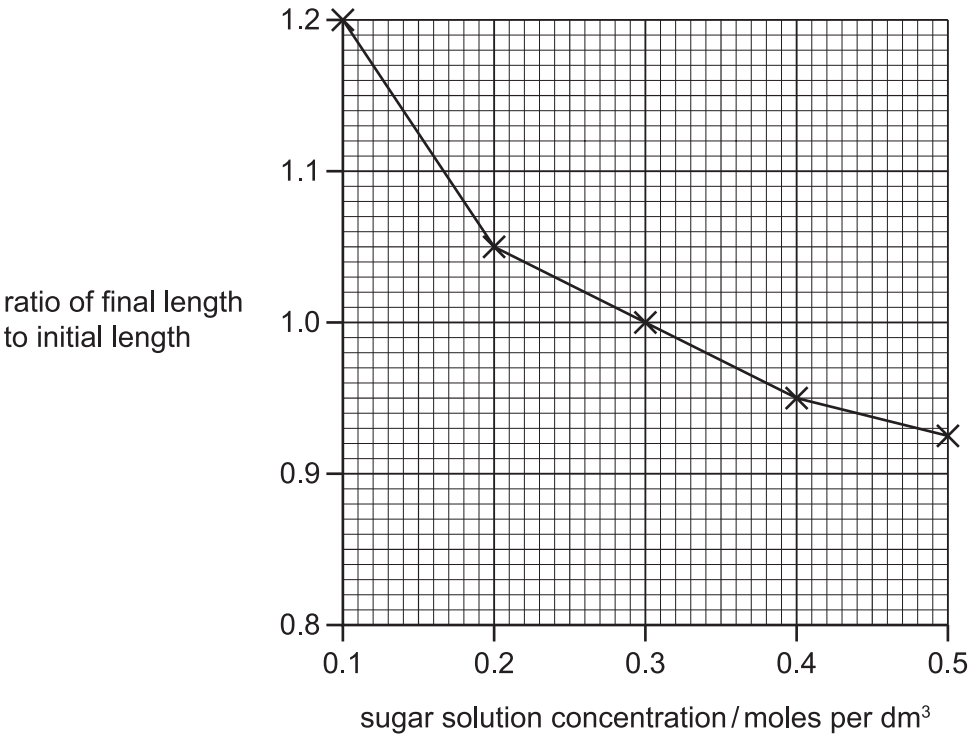
Answer B

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7 Cylinders of potato tissue were placed in sugar solutions of different concentrations and left overnight.

The lengths of the potato cylinders were measured before and after they were placed in the sugar solutions.

The graph shows the results of the investigation.



In which sugar solution concentrations did the potato cells gain water?

A 0.1 moles per dm^3 and 0.2 moles per dm^3

B 0.1 moles per dm^3 only

C 0.2 moles per dm^3 and 0.3 moles per dm^3

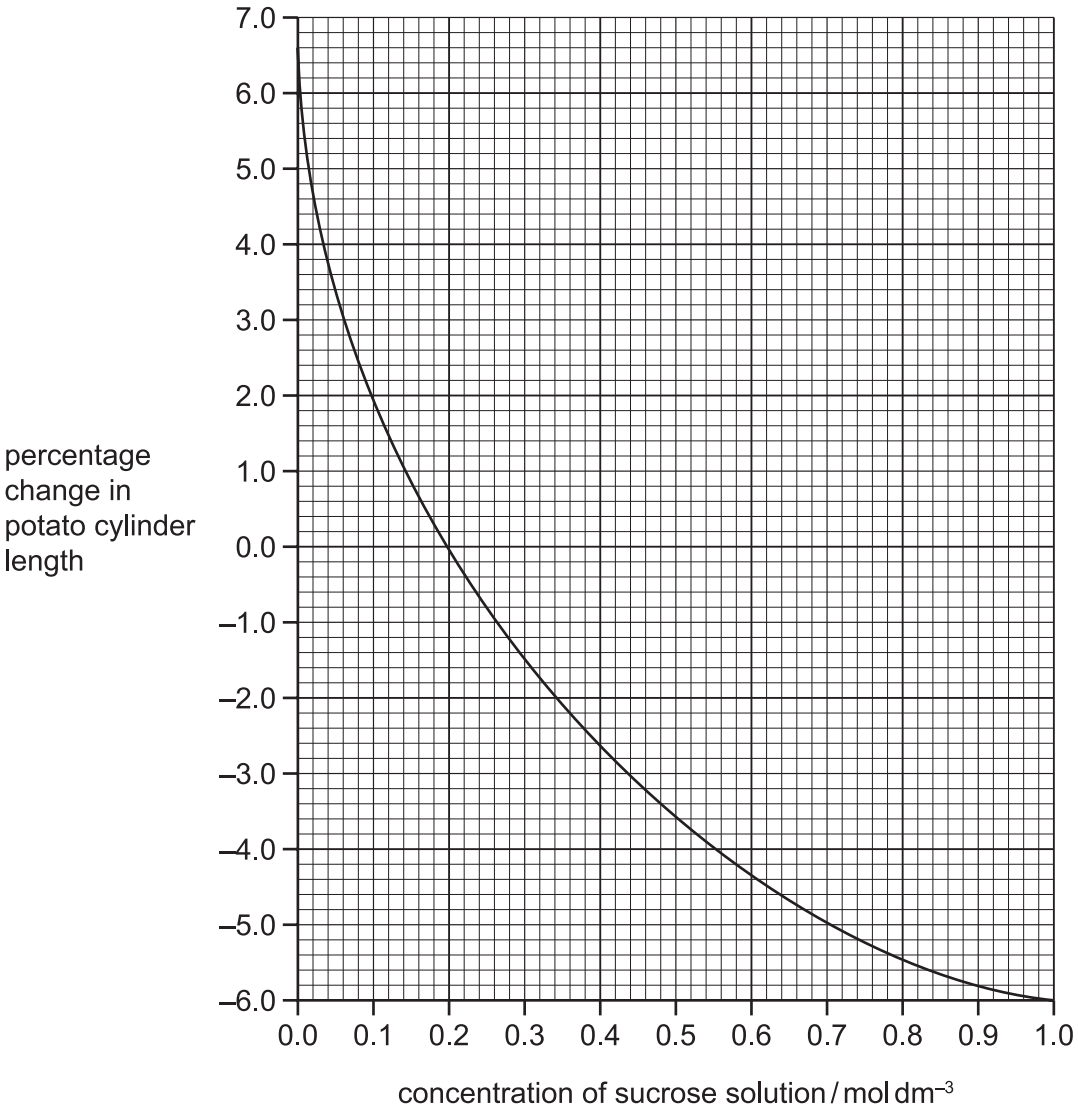
D 0.4 moles per dm^3 and 0.5 moles per dm^3

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Answer A

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8 Cylinders of potato tissue were left in different concentrations of sucrose solution for one hour. The graph shows the percentage change in the length of the potato cylinders after one hour.



What can be concluded about the cells of the potato cylinders that were left in 0.2 mol dm^{-3} sucrose solution?

A The cells in the potato cylinders became flaccid.

B The cells in the potato cylinders became plasmolysed.

C The net movement of water into the potato cells was equal to the net movement of water out of the potato cells.

D The water potential of the potato cells was zero.

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Answer C

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9 Water is an essential molecule for life.

(a) Complete the statements.

Water moves into and out of cells by ..... .

Water is known as a ..... because it can dissolve solutes.

[2]

(b) A leaf cell was put into a solution. The water potential of the solution was lower than the water potential of the contents of the cell.

Fig. 1.1 is a sketch of the cell after three hours in the solution.

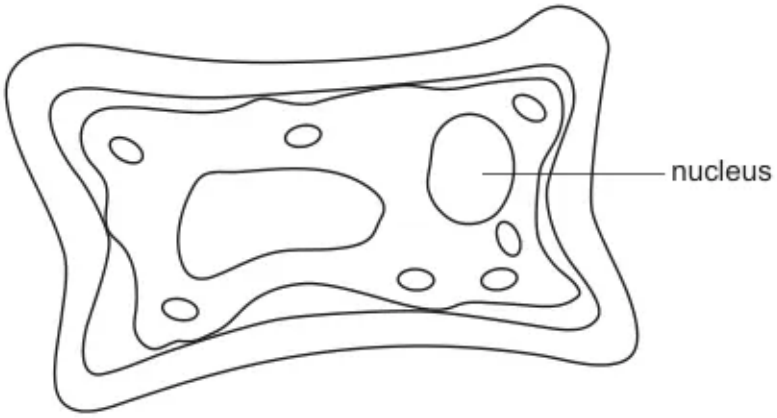


Fig. 1.1

The leaf cell was transferred into pure water.

Sketch the expected appearance of the cell after it had been in the pure water for three hours.

Draw **one** arrow on your sketch to show the direction of water movement.

[3]

(c) A plant was **not** watered for one week.

Fig. 1.2 shows a series of photographs of the plant during the week.



day 0 day 3 day 7

Fig. 1.2

Explain how the lack of water has affected the support of the leaves of the plant shown in Fig. 1.2.

Use the term *turgor pressure* in your answer.

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.....

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..... [3]

[Total: 8]

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9(a)	osmosis ; solvent ;	**2**	
9(b)	*drawing with:* arrow showing water movement into cell ; *max. two from:* no space between cell membrane and cell wall ; cell wall, slightly bent outwards / straight ; vacuole larger in proportion than in Fig 1.1 ;	**3**	
9(c)	wilting ; lack of turgor pressure (at the end of the week) ; **ora** no longer a push against cell wall / AW ; **ora** (mesophyll) cells not providing support / cell collapses / AW ; (lack of water means cells become) flaccid / plasmolyse ;	**3**	

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10 Some students investigated osmosis in raw potato sticks.

(a) Define the term *osmosis*.

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..... [3]

(b) The students measured the mass of four of the potato sticks using an electronic balance.

Fig. 4.1 shows an electronic balance.



Fig. 4.1

The students left each potato stick in one of four different liquids for 5 hours:

- distilled water
- 0.1 mol per dm^3 sodium chloride solution
- 0.5 mol per dm^3 sodium chloride solution
- 1.0 mol per dm^3 sodium chloride solution.

After 5 hours they measured the mass again and calculated the change in mass.

(i) Predict which of the liquids would cause the largest decrease in mass of a potato stick.

..... [1]

(ii) The students dried the potato sticks with paper towels before putting them on the electronic balance.

Suggest why.

.....

.....

..... [1]

(c) After the experiment the students noticed that the potato stick with the lowest mass was soft and floppy.

Explain why the potato stick had become soft and floppy.

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..... [3]

(d) The students followed the same experimental procedure with boiled potato sticks and found no overall change in mass in any of the solutions.

Suggest why the mass of the boiled potato sticks remained the same.

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..... [2]

[Total: 10]

Osmosis Click for more variations

10 **(a)**	movement / diffusion, of water (molecules) ; from high water potential to low water potential / down water potential gradient ; across a partially permeable membrane ;	[3]	
(b) (i)	1.0 (mol dm^{-3} sodium chloride solution) ;	[1]	
(ii)	(to remove) excess / surface / AW, water / AW, on potato sticks ; to measure the mass of the potato (stick) only ;	[max 1]	**I** inaccurate unqualified **R** dry mass
(c)	cells / potato sticks, have lost water (by osmosis) ; from high water potential to low water potential / down water potential gradient ; (cells / tissue / potato) were, plasmolysed / flaccid ; loss of turgor (pressure) ; not enough pressure of water pushing on cell walls ;	[max 3]	**I** water concentration **I** incipient (plasmolysis) **A** reduced turgidity / description
(d)	protein denatured (when cooked) ; cell membrane, damaged / destroyed (when cooked) ; no osmosis will occur ;	[max 2]	**R** killed proteins **I** killed / denatured, cells **I** damaged cell wall
		[Total: 10]	

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