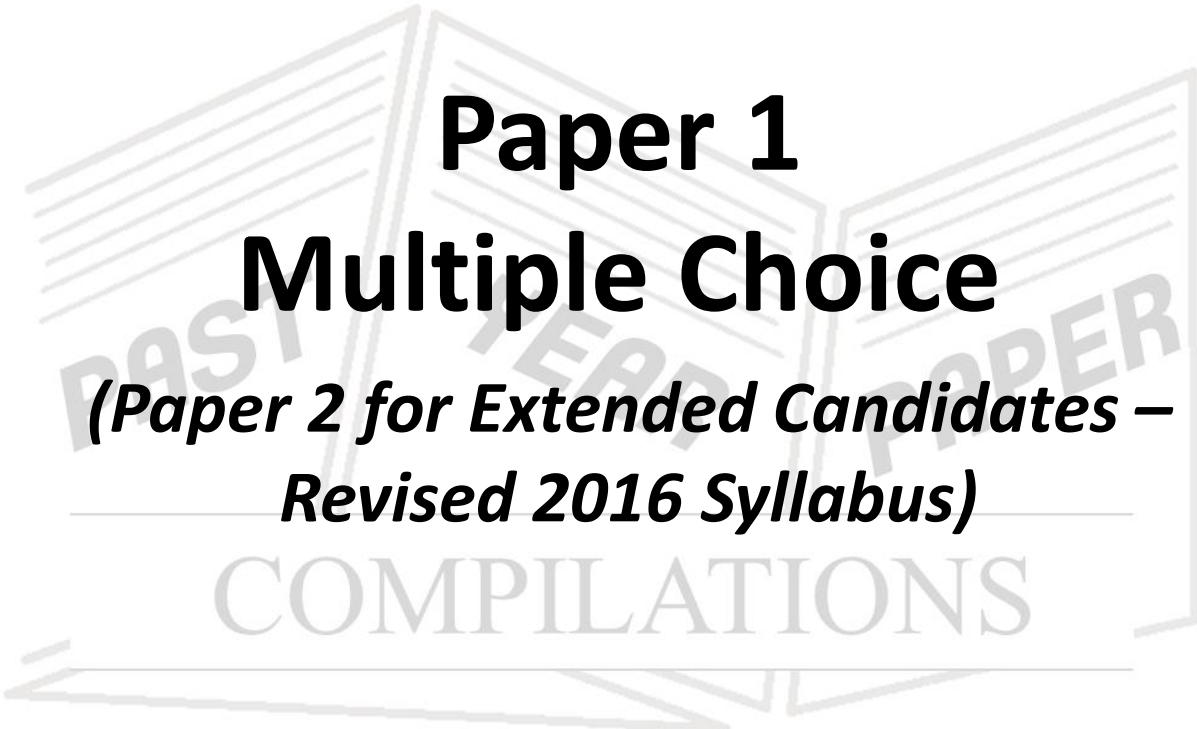




Past Paper Compilation – Movement in and out of cells

- [Paper 1](#)
- [Paper 3](#)
- [Paper 6](#)



Paper 1

Multiple Choice

*(Paper 2 for Extended Candidates –
Revised 2016 Syllabus)*

COMPILATIONS

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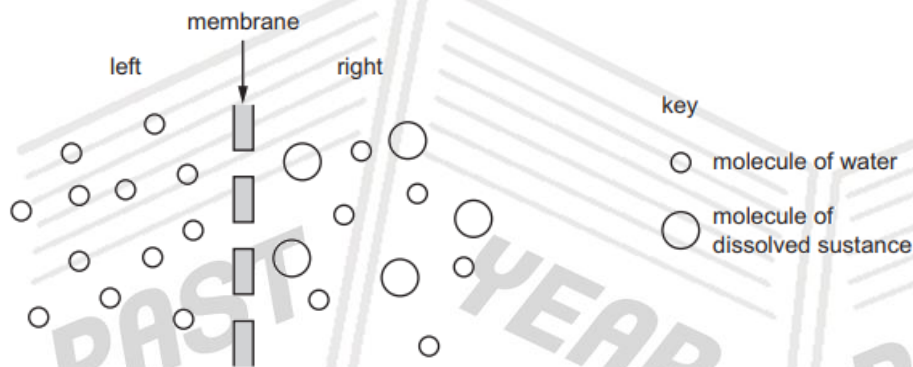
1 How do carbon dioxide and oxygen move in and out of a mesophyll cell?

- A active transport
- B diffusion
- C respiration
- D transpiration

2 During osmosis, which molecules move and through which type of membrane?

	molecules moving	type of membrane
A	oxygen	partially permeable
B	oxygen	permeable
C	water	partially permeable
D	water	permeable

3 The diagram represents two liquids, separated by a membrane through which osmosis can occur.



Which statement describes how the molecules will move?

- A Molecules of dissolved substance move from left to right.
- B Molecules of dissolved substance move from right to left.
- C Overall, water molecules move from left to right.
- D Overall, water molecules move from right to left.

4 The data show the results of an investigation on osmosis using sticks of potato.

concentration of sugar solution / mol per dm ³	length of potato stick at start / mm	length of potato stick after 24 hours / mm
0.6	60	54

Which statements explain this change in length?

	movement of water	cause of the movement
A	into the potato cells	The sugar solution has a higher water potential than the potato cells.
B	into the potato cells	The sugar solution has a lower water potential than the potato cells.
C	out of the potato cells	The sugar solution has a higher water potential than the potato cells.
D	out of the potato cells	The sugar solution has a lower water potential than the potato cells.

5 What causes the diffusion of oxygen into a plant cell?

- A active transport
- B movement of molecules
- C osmosis
- D photosynthesis

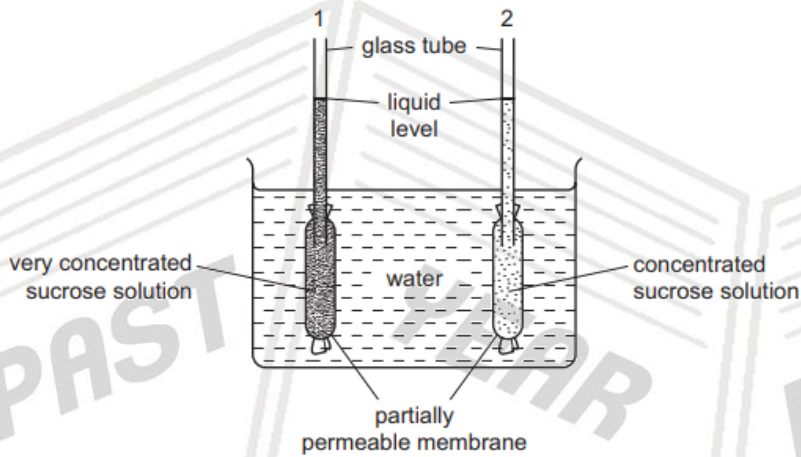
SOLUTIONS

- 6 What is **not** an example of active transport?
- A absorption of water by root hairs
 - B reabsorption of glucose by kidney tubules
 - C uptake of glucose by villi
 - D uptake of ions by root hairs

7 Which cell helps to move dust particles out of an organism?

- A ciliated cell
- B guard cell
- C muscle cell
- D red blood cell

8 The diagram shows apparatus which can be used to demonstrate osmosis.



After one hour, what would happen to the liquid levels in the glass tubes?

	level in tube 1	level in tube 2
A	falls	falls
B	falls	rises
C	rises	falls
D	rises	rises

9 Which characteristics are correct for **both** osmosis and diffusion?

	require a partially permeable membrane	require a concentration gradient	are energy consuming processes
A	✓	✓	x
B	✓	x	✓
C	x	✓	x
D	x	x	✓

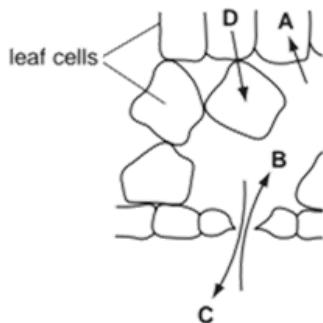
10 Osmosis is defined as the diffusion of water molecules

- A down their concentration gradient through a partially permeable membrane.
- B down their concentration gradient through a permeable membrane.
- C up their concentration gradient through a partially permeable membrane.
- D up their concentration gradient through a permeable membrane.

SOLUTIONS

11 The diagram shows part of a section through a leaf.

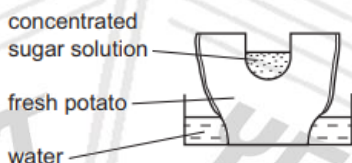
Which arrow shows the direction of movement of water by osmosis in a leaf?



12 On a dry, sunny day, how does water vapour move through the stomata of a leaf?

- A into the leaf by diffusion
- B into the leaf by osmosis
- C out of the leaf by diffusion
- D out of the leaf by osmosis

13 The diagram shows an experiment using a potato.



Which shows the result of the experiment after 24 hours?



14 Boiling potatoes destroys their cell membranes. A peeled, boiled potato strip is placed in a concentrated solution of salts.



What takes place?

	osmosis	solute diffusion
A	✓	✓
B	✓	x
C	x	✓
D	x	x

key:
 ✓ = takes place
 x = does not take place

15 A red blood cell is placed in a concentrated sugar solution.

What happens and why?

- A The cell bursts as sugar molecules diffuse into it.
- B The cell bursts because the concentrated sugar solution enters it.
- C The cell shrinks because sugar molecules leave it.
- D The cell shrinks because water leaves it.

SOLUTIONS

16 Why do some root cells have root hairs?

- A for the maintenance of the temperature of the cell sap
- B to increase the surface area of the cells
- C to increase the volume of the cell sap
- D to provide a place for cell nuclei

17 Which structures **must** be present in a cell for osmosis to take place?

- A cell (sap) vacuole and cell wall
- B cell wall and cell membrane
- C chloroplast and cytoplasm
- D cytoplasm and cell membrane

18 A frog's skin is permeable to oxygen and carbon dioxide.

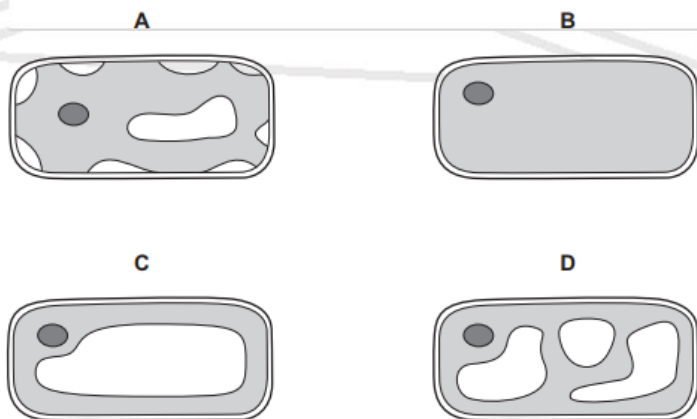
When a frog is swimming in pond water, in which directions will oxygen and carbon dioxide diffuse?

	from the frog's skin into the water	from the water into the frog's skin
A	carbon dioxide	oxygen
B	carbon dioxide and oxygen	–
C	oxygen	carbon dioxide
D	–	carbon dioxide and oxygen

19 Which process depends on energy from respiration?

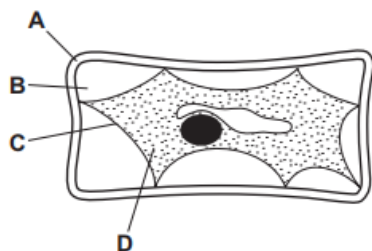
- A diffusion
- B osmosis
- C peristalsis
- D photosynthesis

20 Which diagram shows the appearance of a plant cell several minutes after it has been placed in a concentrated solution of sugar?



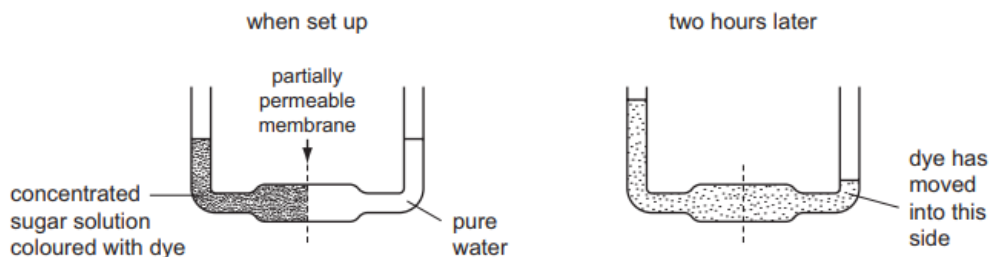
21 The diagram shows a plant cell which has lost water to its surroundings by osmosis.

Which part is the partially permeable membrane?



SOLUTIONS

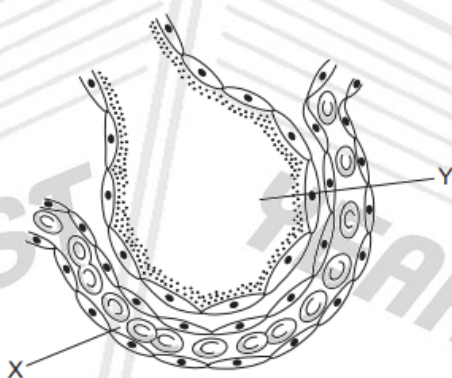
- 22 The diagrams show an experiment when set up and the same experiment two hours later.



What explains the movement of water and dye?

	movement of water	movement of dye
A	diffusion	osmosis
B	osmosis	diffusion
C	osmosis	translocation
D	translocation	diffusion

- 23 The diagram shows a section through an alveolus and a capillary.



Why does carbon dioxide move from X to Y?

- A** Air has a lower concentration of carbon dioxide than blood.
- B** Carbon dioxide moves more freely in air than in blood.
- C** Carbon dioxide must replace oxygen.
- D** Diffusion of carbon dioxide can only be out of the blood.

- 24 The cholera bacterium produces toxins that cause chloride ions to be secreted into the small intestine.

How does this affect the water potential of blood in the intestinal capillaries and the intestinal contents?

	water potential	
	blood in capillaries	contents of small intestine
A	lowered	lowered
B	lowered	raised
C	raised	lowered
D	raised	raised

25 The diagram shows a fish in a pond.



Why does oxygen diffuse from the air into the water before reaching the fish?

- A Oxygen is more concentrated in the air than in the water.
- B Oxygen is more concentrated in the water than in the air.
- C Oxygen is needed by the fish for aerobic respiration.
- D Oxygen is needed by the fish for anaerobic respiration.

26 Which processes are used by root hairs to take up ions and water?

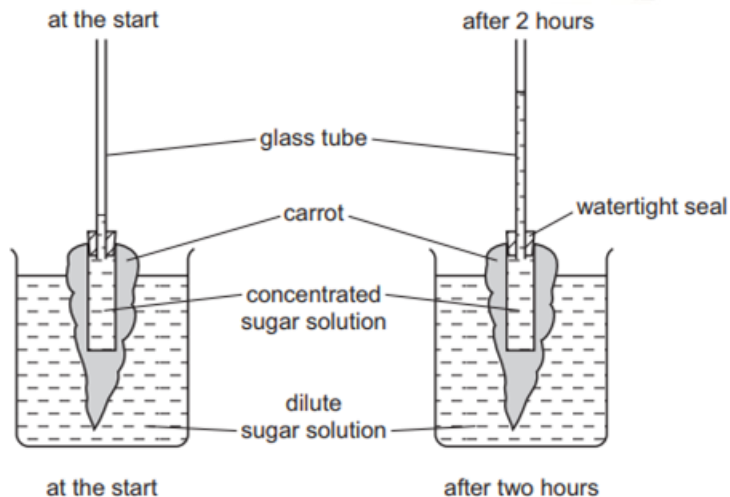
	ion uptake	water uptake
A	active transport	osmosis
B	diffusion	active transport
C	osmosis	diffusion
D	osmosis	osmosis

27 For the stomata of a leaf to open, the guard cells accumulate more potassium ions than the surrounding cells.

Which row describes what happens?

	movement of potassium ions	movement of water in relation to guard cells	final state of the guard cells
A	active transport	in	turgid
B	active transport	out	flaccid
C	diffusion	in	plasmolysed
D	diffusion	out	no change

28 The diagram shows the movement of a concentrated sugar solution up a glass tube. The glass tube is connected firmly to a hollowed-out carrot.



Why does the sugar solution in the glass tube rise?

- A Sugar molecules move across the carrot tissue into the glass tube.
- B Sugar molecules move across the carrot tissue into the beaker.
- C Water molecules move across the carrot tissue into the glass tube.
- D Water molecules move across the carrot tissue into the beaker.

SOLUTIONS

29 A plant absorbs water and oxygen into its roots.

How are these substances absorbed?

	water	oxygen
A	diffusion	transpiration
B	osmosis	diffusion
C	transpiration	osmosis
D	transpiration	transpiration

30 Two identical cylinders, 40mm long, are cut from a potato. One (W) is placed in water and the other (X) is placed in a concentrated sugar solution.

What are the lengths of the cylinders after two hours?

	length of cylinder / mm	
	W	X
A	38	40
B	38	42
C	40	42
D	42	38

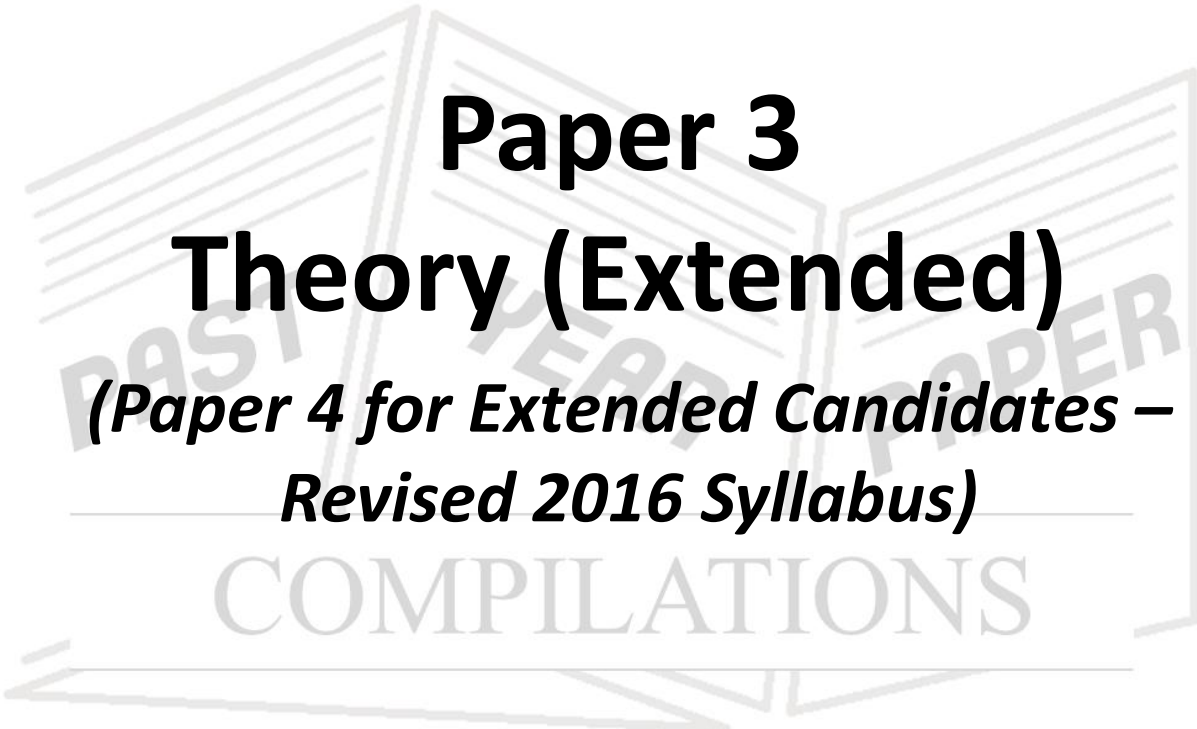
PAST

YEAR

PAPER

COMPILATIONS

SOLUTIONS



Paper 3

Theory (Extended)

*(Paper 4 for Extended Candidates –
Revised 2016 Syllabus)*

COMPILATIONS

[Index](#)

1 (a) Explain how water is absorbed by plant roots.

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..... [3]

(b) Young plants were grown in pots of sand for four weeks.

Some plants were watered with distilled water at pH 7.0 (no salts).
Most pots were watered with solutions containing different concentrations of salt (sodium chloride) at pH 7.0.
The plants were kept at 20°C.
The growth of the plants was measured after four weeks.

The growth of the plants is shown in Fig. 4.1 as percentages of the growth of the plants watered with distilled water.

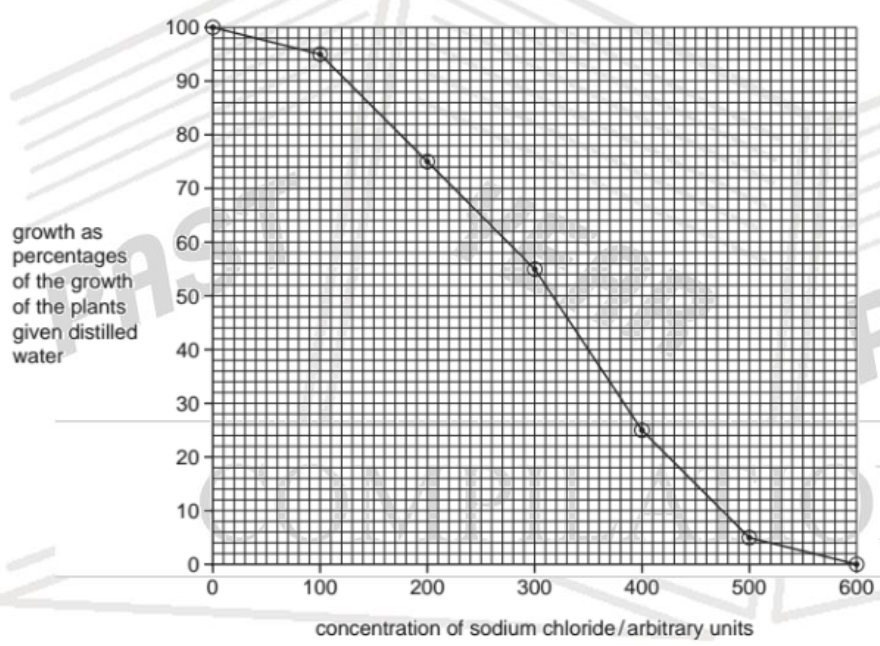


Fig. 4.1

(i) Describe the results shown in Fig. 4.1.

You will gain credit for using the figures in the graph to support your answer.

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..... [3]

(ii) Explain the difference in growth between the plants watered with low concentrations and those watered with high concentrations of salt solution.

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..... [4]

2 Fig. 1.1 shows an animal cell and a plant cell as seen with a light microscope.

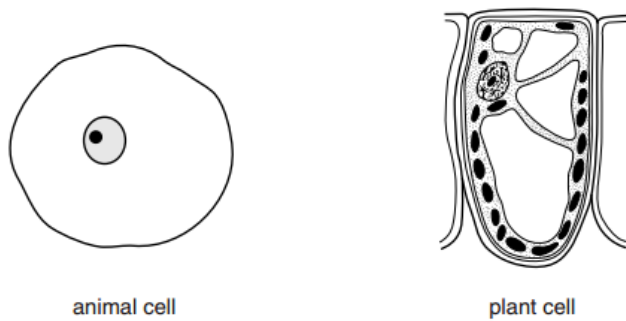


Fig. 1.1

(b) The cells were kept in a dilute salt solution. They were then transferred to distilled water.

Explain what will happen to each of these two cells when they are placed into distilled water.

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[4]

3 Describe how water moves from the soil into the roots of crop plants.

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[3]

4 Stomata allow the movement of gases into and out of the leaf. During the daytime oxygen passes out and carbon dioxide passes in.

(i) Explain why oxygen passes out of the leaf during the daytime.

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[3]

- 5 A student conducted an experiment to investigate the percentage change in mass of potato tuber tissue when placed in different concentrations of sucrose solution. The potato tuber tissue was cut into cubes of the same size.

Fig. 5.2 shows a graph of the results.

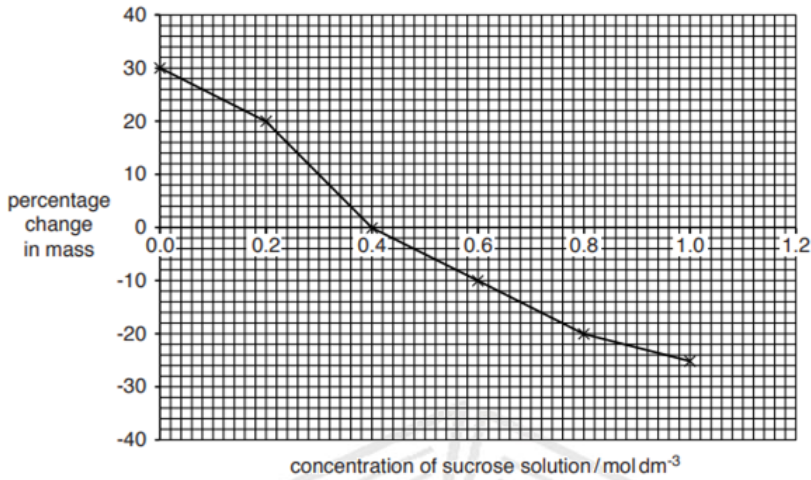


Fig. 5.2

- (i) Use Fig. 5.2 to predict the percentage change in mass of a cube of potato tuber tissue placed in 1.2 mol dm^{-3} sucrose solution.

..... [2]

- (ii) Explain the results shown in Fig. 5.2 in terms of water potential:

- between sucrose concentrations of $0.0 - 0.4 \text{ mol dm}^{-3}$
- at sucrose concentration 0.4 mol dm^{-3}
- between sucrose concentrations of $0.4 - 1.0 \text{ mol dm}^{-3}$.

between $0.0 - 0.4 \text{ mol dm}^{-3}$

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at 0.4 mol dm^{-3}

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between $0.4 - 1.0 \text{ mol dm}^{-3}$

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..... [5]

6 Fig. 2.1 is a diagram of a protein used to move ions across membranes in root hair cells.

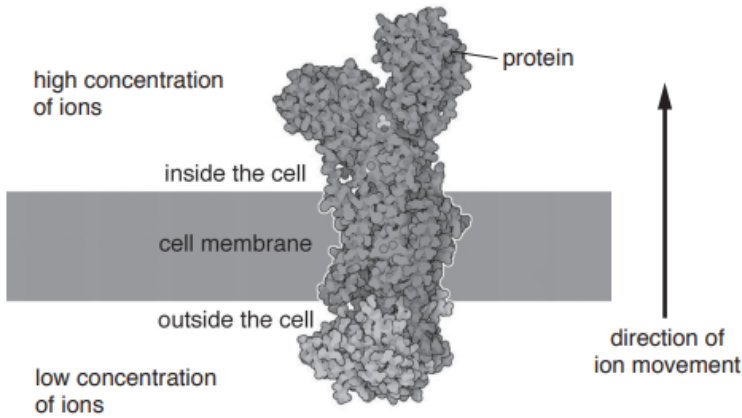


Fig. 2.1

(i) State the name of the process that moves mineral ions into root hair cells through cell membrane proteins.

.....[1]

(ii) Explain how protein molecules move ions across a membrane during this process.

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7 Explain how ions, such as phosphate ions, are absorbed by plant roots.

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.....[3]

8 When plants are grown in a solution that includes a poison that prevents respiration, the roots continue to absorb water, but do **not** absorb many ions.

Explain this result.

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.....[3]

9 Substances move into and out of cells in kidney tubules.

Fig. 3.2 shows four processes, H, J, K and L, that occur in cells lining the kidney tubule.

The net movement of substance is shown by an arrow, in each case.

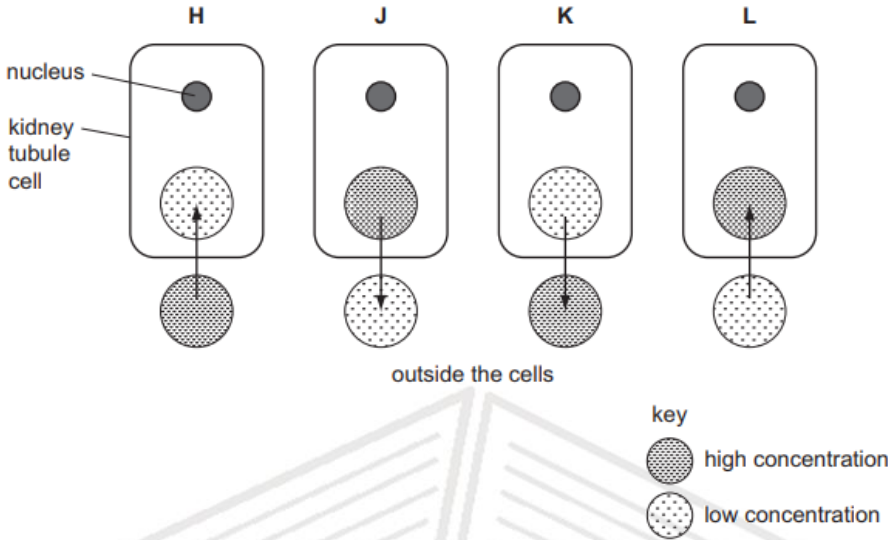


Fig. 3.2

- (i) Complete Table 3.1 by stating the letter, H, J, K or L, which identifies each of the processes. Give a reason for each answer.

Table 3.1

process	letter	reason
diffusion of oxygen		
active uptake of sodium ions		

[4]

10 Root hair cells provide a large surface area for the absorption of water from the soil.

Explain, using the term **water potential**, how water is absorbed from the soil into root hair cells.

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[3]

SOLUTIONS



Paper 6 (Alternative to Practical)

COMPILATIONS

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1 An investigation was carried out to find the effect of salt (sodium chloride) solution, on potato tissue.

A large potato was cut into long thin strips, called chips. Each chip measured 60 mm in length.

One chip was placed in a concentrated salt solution and another chip was placed in distilled water.

After three hours these chips were removed from the liquids.

The chips are shown in Fig. 2.1.



Fig. 2.1

- (a) (i) Measure the length of the chips in Fig. 2.1. Calculate any change in length. Record your measurements in Table 2.1.

Table 2.1

	chip in salt solution	chip in distilled water
length / mm		
change / mm		

[2]

- (ii) Explain the changes that you have recorded for these two chips.

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[4]

- (b) A similar investigation was carried out by a group of students. They measured the mass of five chips before putting each chip in a different concentration of **sucrose** solution. The chips were left in the solution for two hours. After two hours each chip was removed from the sucrose solution and its mass measured.

Their results are shown in Table 2.2.

Table 2.2

concentration of sucrose solution / g dm ⁻³	mass at start / g	mass after 2 hours / g	difference in mass / g	percentage change
0.0	1.36	1.49	+0.13	+9.56
35.0	1.41	1.48	+0.07	+4.96
70.0	1.46	1.47	+0.01	+0.68
175.0	1.47	1.38	-0.09	-6.12
345.0	1.45	1.31	-0.14

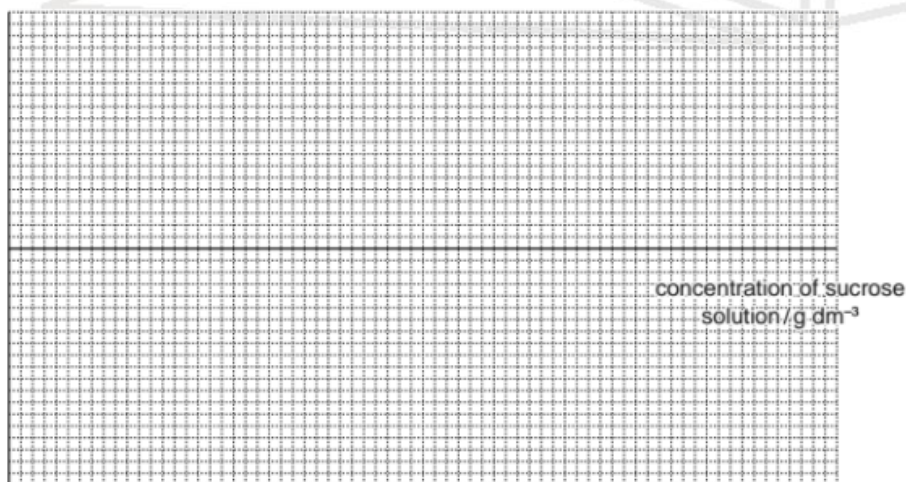
- (i) Complete Table 2.2 by calculating the percentage change in mass for the most concentrated solution. Show your working.

[1]

- (ii) Suggest why it is necessary to calculate the percentage change in mass when comparing the chips.

[1]

- (iii) Plot a graph to show the percentage change in mass against the concentration of the sucrose solution. Use the grid and axes provided.



[4]

- (c) (i) Use your graph to find the concentration of sucrose solution in which the mass of chip would stay the same.

..... g dm⁻³ [1]

SOLUTIONS

(ii) Explain why the mass of a chip in this solution would stay the same.

[1]

[Total: 14]

SOLUTIONS (Q1)

- 2 (a) A student investigated the effect of different concentrations of sucrose solution on the movement of water into and out of potato cells by osmosis.

Water enters cells if the solution outside the cells is less concentrated than the solution inside the cells.

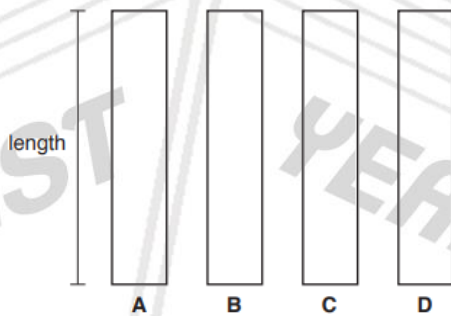
Water exits cells if the solution outside the cells is more concentrated than the solution inside the cells.

Prepare a table to record your results in (a)(i).

The student was given four different concentrations of sucrose solution labelled **A**, **B**, **C** and **D**.

The student was also given four potato sticks which were cut to the same length and diameter.

Step 1 The student measured the length of four potato sticks. The potato sticks for this step are shown in Fig. 1.1.



Step 2 The student labelled a large test-tube **A** and used a syringe to put 25 cm³ of sucrose solution **A** into the large test-tube.

Step 3 The student repeated step 2 using solutions **B**, **C** and **D** and three more large test-tubes. The student reused the syringe from step 2.

Step 4 The student placed one potato stick into each of the four large test-tubes, **A**, **B**, **C** and **D**. This step is shown in Fig. 1.2.

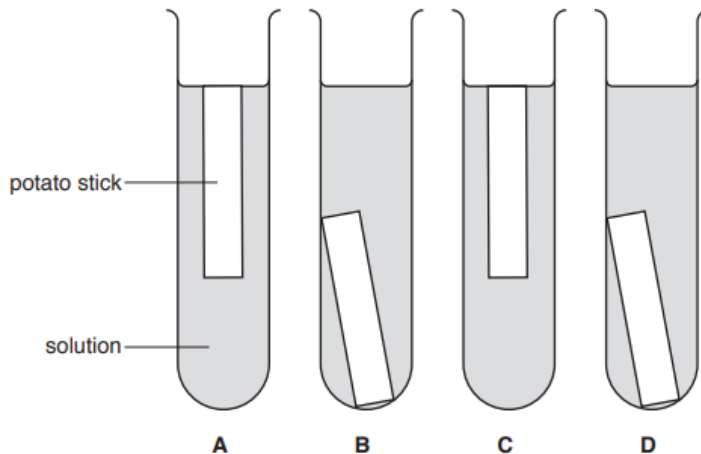


Fig. 1.2

Step 5 The potato sticks were left in the solutions for 30 minutes.

SOLUTIONS

Step 6 After 30 minutes the student removed the potato sticks from the solutions and measured the length of each potato stick. The potato sticks for this step are shown in Fig. 1.3.

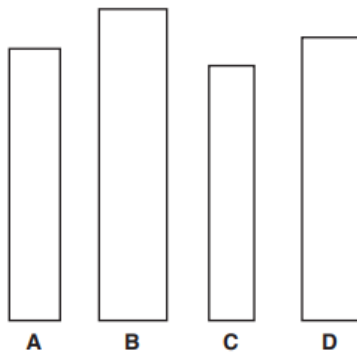


Fig. 1.3

(ii) Suggest why it is important to compare the change in length rather than the final lengths of the potato sticks in this type of investigation.

.....

 [1]

(b) The student examined each potato stick after the 30 minutes soaking time. Their observations are recorded in Fig. 1.4.

potato stick A - slightly soft, bends a little
 potato stick B - very hard and easy to snap in half
 potato stick C - very soft and bends easily
 potato stick D - does not bend but difficult to snap in half

Fig. 1.4

(i) Use the information in your table of results and in Fig. 1.2 and Fig. 1.4 to identify solutions A, B, C and D.

Write your answers in Table 1.1.

Table 1.1

relative concentration of sucrose solution	solution letter
least concentrated	
↓	
most concentrated	

[2]

(ii) Explain how the results support your answer to part (b)(i).

.....

SOLUTIONS

(iii) Identify **one** source of error with the method and suggest an improvement.

error

.....

improvement

.....

[2]

(iv) State **one** of the controlled variables for this investigation.

.....

.....[1]

(c) Another investigation was carried out into the effect of different concentrations of sucrose solution on potato sticks.

In this investigation students decided to measure the change in mass rather than the change in length.

The students followed a similar method to the one in your investigation but they left the potato sticks to soak for three hours instead of 30 minutes.

(i) Suggest why the students left the potato sticks in the solutions for three hours instead of 30 minutes.

.....

.....

.....[1]

(ii) The students dried the potato sticks on paper towels before measuring the mass of each potato stick.

Suggest why this step was **not** important in the investigation described in 1(a), where length was measured.

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.....[1]

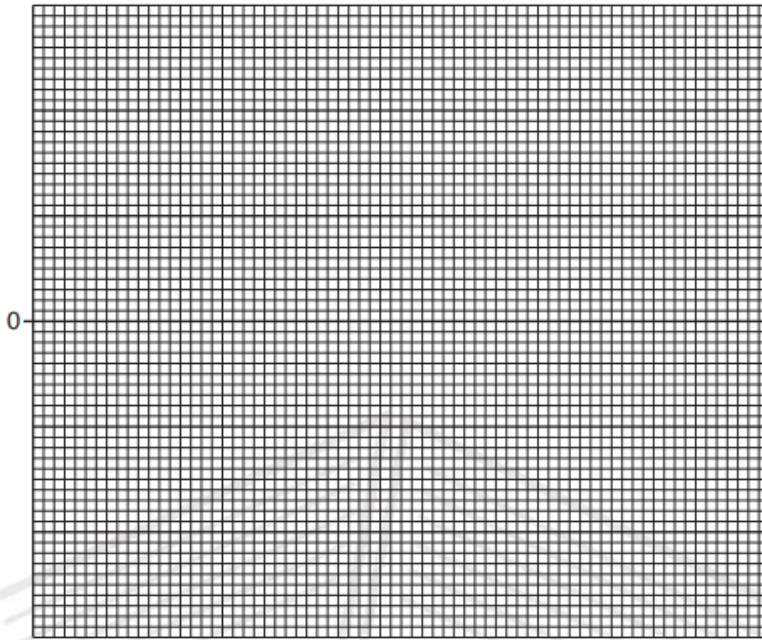
Table 1.2 shows their results.

Table 1.2

concentration of sucrose solution /g per dm ³	percentage change in mass
0	29.5
70	12.0
140	-3.0
210	-15.0
280	-26.0
350	-29.5

- (iii) Using Table 1.2, plot a graph on the grid to show the effect of the concentration of sucrose solution on the percentage change in mass.

The y-axis has been started for you.



[4]

- (iv) Use your graph to find the concentration of sucrose solution that would cause **no change** in mass of the potato stick.
Mark this point on your graph with a + and record the concentration.
Include the unit.

.....
[2]

- (v) Students tested other potatoes and found different values for the concentration of sucrose solution that would cause no change in mass.

Suggest **one** reason for this.

.....
.....
.....[1]

SOLUTIONS – PAPER 1

1. B
2. C
3. C
4. D
5. B
6. A
7. A
8. D
9. C
10. A
11. D
12. C
13. C
14. C
15. D
16. B
17. D
18. A
19. C
20. A
21. C
22. B
23. A
24. C
25. A
26. A
27. A
28. C
29. B
30. D



[BACK](#)

SOLUTIONS – PAPER 3

Question		Expected Answers	Marks	Additional Guidance
1	(a)	root hairs ; large surface area ; water moves, from high water potential to low water potential / down water potential gradient ; by osmosis ; through partially permeable membrane ; protein pores ;	[max 3]	A water concentration
	(b) (i)	decrease in growth ; description of curve ; e.g. sigmoid no growth at 600 units ; any other figure from the graph ;	[3]	MP2 linked with MP1 i.e. growth
	(ii)	1 salt lowers the water potential ; 2 plants absorb less water ; 3 loss of turgidity / AW ; 4 no water for new cells ; 5 no, elongation / AW, of cells ; 6 no / less, water for chemical reactions ; 7 no / less, water for photosynthesis ; 8 no / less, water for transport ; 9 stomata close ;	[max 4]	A hypertonic A water moves out
2	water moves (in) by <u>osmosis</u> ; down a water <u>potential</u> gradient / from high water <u>potential</u> to low water <u>potential</u> ; through partially permeable membrane; (both cells / vacuole) enlarge / swell / increase in volume; <u>animal</u> cell bursts; <u>plant</u> cell becomes turgid / AW;		max 4	I water concentration A semi / selectively A cell wall prevents bursting
3	by osmosis ; the soil has a higher <u>water potential</u> than the root cells ; water moves from an area of higher water potential to lower water potential ; across a partially permeable membrane ; ref to root hair cell ;		3	A down a water potential gradient
4	(i) oxygen is a (waste / by) product of photosynthesis ; more oxygen is produced than used in respiration ; concentration inside the leaf is greater than outside ; ref to air spaces inside the leaf ; oxygen moves down its concentration gradient ; by <u>diffusion</u> ; idea that the rate of photosynthesis is greater than the rate of respiration ;		max [3]	A word equation / symbol equation

BACK

SOLUTIONS – PAPER 3

5	<p>(i) – (negative); 25 – 40 ;</p>	[2]	1 mark for a number in range from 25 – 40 inclusive.
(ii)	<p><i>Accept the following 3 marking points written anywhere in response:</i></p> <p>1 correct reference to <u>osmosis</u> ; 2 cell membrane is, <u>partially/semi/selectively permeable</u> ; 3 reference to movement of water down a water potential gradient ;</p> <p><i>between 0.0 mol dm⁻³–0.4 mol dm⁻³</i></p> <p>4 water moves into the potato ; 5 potato has a lower water potential than surroundings / ora ; 6 increasing the potato's mass ;</p> <p><i>at 0.4 mol dm⁻³</i></p> <p>7 potato has the same water potential as the surroundings ; 8 there is no net movement of water ;</p> <p><i>between 0.4 mol dm⁻³ – 1.0 mol dm⁻³</i></p> <p>9 potato has a higher water potential than the surroundings ora; 10 water moves out of the potato ; 11 decreasing the potato's mass ;</p>	[max 5]	<p>marking points 1, 2 and 3 need to be in correct context</p> <p>A there is no water potential gradient at 0.4 mol dm⁻³</p>
6	<p>(i)(i) active transport ;</p>	1	
(ii)	<p>1 protein uses, energy / ATP (from respiration) ; 2 <i>idea of</i> protein interaction with ions ; 3 (to) change shape of protein ; 4 ions move through the protein ; 5 against concentration gradient / lower concentration to high concentration (across a membrane) ; 6 AVP ;</p>	3	e.g. ref to selective / specific shape
7)	<p>1 root hairs / root hair cells ; 2 active transport ; 3 against, concentration / diffusion, gradient A from low to high concentration ; 4 using, energy / ATP ; R energy produced / production of energy 5 from respiration ; 6 ref to, proteins / carrier molecules (in membranes) ;</p>	[max 3]	<p>ignore diffusion / movement down a concentration gradient / osmosis</p> <p>ignore gradient in 'from low concentration gradient to high concentration gradient'</p>
8)	<p>1 active uptake/active transport, of ions against the concentration gradient (into the root) ; 2 energy is needed for, active uptake/active transport ; 3 comes from respiration ; 4 water is absorbed, by osmosis/down water potential gradient ; 5 (osmosis/diffusion is a) passive process/does not need energy ; 6 diffusion of ions will occur until equilibrium ;</p>	[max 3]	R energy 'produced'

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SOLUTIONS – PAPER 3

9 (i)

process	letter	reason
diffusion of oxygen	H ;	<i>idea that</i> (oxygen) diffuses, from high concentration/to low concentration/down concentration gradient (into the cell) ;
active uptake of sodium ions	L ;	<i>idea that</i> (sodium ions) are moved against their concentration gradient/from low to high concentration ;

[4]

- 10 water moves from high(er) water potential to low(er) water potential ;
by osmosis ;
through partially permeable membrane ;
ref to protein pores ;

[max 3]



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SOLUTIONS – PAPER 6

1 (a) (i)	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 20%;"></th> <th style="width: 30%;">chip in salt solution</th> <th style="width: 30%;">chip in water</th> </tr> </thead> <tbody> <tr> <td>length / mm</td> <td>55</td> <td>63;</td> </tr> <tr> <td>change / mm</td> <td>-5</td> <td>(+3);</td> </tr> </tbody> </table>		chip in salt solution	chip in water	length / mm	55	63;	change / mm	-5	(+3);		<p>Mark per row for measurements. ± 1 mm for measurements.</p> <p>Change must take into consideration the measurements – so allow ecf.</p> <p>Numerical answer required and –ive sign only is required or qualification in words e.g. gain 3 mm v loss 5 mm , smaller by 5 mm v larger 3 mm, AW.</p>			
	chip in salt solution	chip in water													
length / mm	55	63;													
change / mm	-5	(+3);													
(ii)	<p><u>Osmosis</u>; Reference to partially or semi-permeable membrane;</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 20%;">feature</th> <th style="width: 30%;">in salt solution</th> <th style="width: 30%;">in water</th> </tr> </thead> <tbody> <tr> <td>direction of water</td> <td>out of chip;</td> <td>into chip;</td> </tr> <tr> <td>gradient</td> <td>tissue has higher Ψ, less concentrated in salts or solution is lower Ψ or more concentrated, hypertonic</td> <td>tissue has lower Ψ, more concentrated in salts or solution is higher Ψ or less concentrated, hypotonic;</td> </tr> <tr> <td>state of tissue or chip</td> <td>flaccid or plasmolysed;</td> <td>turgid;</td> </tr> </tbody> </table>	feature	in salt solution	in water	direction of water	out of chip;	into chip;	gradient	tissue has higher Ψ , less concentrated in salts or solution is lower Ψ or more concentrated, hypertonic	tissue has lower Ψ , more concentrated in salts or solution is higher Ψ or less concentrated, hypotonic;	state of tissue or chip	flaccid or plasmolysed;	turgid;	<p>[1]</p> <p>[1]</p> <p>[2]</p> <p>[1]</p> <p>[1]</p> <p>Max[4]</p>	<p>Comparison required for mark.</p> <p>Comparison required for mark.</p>
feature	in salt solution	in water													
direction of water	out of chip;	into chip;													
gradient	tissue has higher Ψ , less concentrated in salts or solution is lower Ψ or more concentrated, hypertonic	tissue has lower Ψ , more concentrated in salts or solution is higher Ψ or less concentrated, hypotonic;													
state of tissue or chip	flaccid or plasmolysed;	turgid;													
(b) (i)	(-) 9.66 or 9.65 %;	[1]													
(ii)	Difference in starting mass / the mass did not start the same / AW;	[1]	Ignore for fair test, more accurate.												
(iii)	<p>A - label the numbers on both axes and –ive sign in front of numbers on the 'y' axis;</p> <p>S – scale;</p> <p>P – plot;</p> <p>L – smooth curve to join plots;</p>	[4]	<p>Bar chart – A and S. max 2.</p> <p>Even scale spaced across the grid so the curve fills half more than half for both 'x' and 'y' axes. A. scale on lower edge of grid for 'x' axis.</p> <p>Accurate to one small square on grid. A. ecf. 2 (b) (i).</p> <p>R. large points that cover more than one small square.</p> <p>If scale is inverted – negative values above and positive below, allow S, P and L to max 3.</p>												
(c) (i)	point where line crosses the 'x' axis – to fit graph in 2 (b) (iii) ;	[1]													
(ii)	No net change / water entering = water leaving / Ψ inside and outside the same / concentration is equal / isotonic / state of equilibrium;	[1]	Ignore 'no water movement', no osmosis, no diffusion, no water uptake or loss [not the idea of equal].												
		[Total:14]													

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SOLUTIONS – PAPER 6

2 (a)(ii)	possible that different initial lengths ; <i>ref to percentage change (in length) ;</i>	1	
(b)(i)	B D A C ; ;	2	
(b)(ii)	1 B gained, water ; 2 (because B) was, hard / larger / AW ; 3 C / A , lost, water ; 4 (because C) was most, floppy / soft / small / AW ; 5 D / A , were between B and C in terms of, length / texture ; 6 A , bent more / smaller than, D ; ora 7 no (net) movement of water in D ; AW	3	
b)(iii)	1 reuse of syringe ; 2 use clean / new, syringes each time ; 3 water loss from tubes ; 4 cover tubes (prevent evaporation) ; 5 potatoes may not be same, type / age / AW ; 6 use same potato / type of potato etc. ; 7 softness / bending, was not quantified ; 8 described method to quantify, bending / softness ; 9 AVP ;	2	
b)(iv)	initial, length / diameter / size / surface area, of potato / type / age / AW, of potato / volume / 25 cm ³ , of (sucrose) solution / soaking time ;	1	I amount I time unqualified
(c)(i)	<i>idea that</i> (mass) change, would be greater / takes a longer time (so easier to measure) ; allows more time to reach equilibrium ;	1	
(c)(ii)	surface water would not affect measurement of length ;	1	
(c)(iii)	Axes – correct axes with axes labels and units ; Scale – even scale and points fill more than half of printed grid ; Plotting - plots all accurate \pm half a small square ; Line ;	4	A x: concentration / g per dm ³ OR concentration / g dm ⁻³ y : percent(age) change in mass OR change in mass / % R extrapolation / feathered line
(c)(iv)	1 any indication on graph where their expected line intercepts x-axis ; 2 value from graph in g per dm ³ ;	2	
(c)(v)	(potatoes) of different, age / variety / part / AW ; to calculate an average / identify anomalies ;	1	I mass / size, of potato

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