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B1 L9

B1 L9 Osmosis: Exam questions worksheet

Mark scheme · Total 20 marks

/ means alternative answers. ( ) words in brackets are not needed for the mark. **allow** = accept this answer. **ignore** = this does not lose or gain a mark. **do not accept** = this answer cannot score the mark. If a tick-box question has more than one box ticked, give 0 marks.

Question	Answers	Extra information	Mark	AO / Spec. ref.
01.1	1 **cell wall** (1) 2 **cell membrane** (1) 3 **permanent vacuole** (1)	1 mark for each correct label. If more than one word from the box is written on one line, do not give that mark. **allow** "vacuole" for line 3.	3	AO1 4.1.1.2 4.1.3.2
01.2	It has lost water by osmosis. (1)	If more than one box is ticked, 0 marks.	1	AO2 4.1.3.2
		Question 01 total	**4**	
02.1	(1.56 − 1.50) ÷ 1.50 × 100 (1) = **(+)4(.0)** (%) (1)	**allow** 4 or +4. Correct answer with no working = 2 marks. **do not accept** −4 for the answer mark.	2	AO2 4.1.3.2 RP (maths)
02.2	the cylinders had different starting masses / so the results can be compared fairly (1)	**do not accept** "to make it accurate". **ignore** "to make it fair" on its own.	1	AO3 4.1.3.2 RP
02.3	any **one** from: volume of (sugar) solution / size (length, diameter, surface area) of the cylinders / time in the solution / temperature / type of potato / how the cylinders are blotted (1)	**do not accept** "the concentration" (it is the independent variable). **ignore** "the amount" with no detail.	1	AO3 4.1.3.2 RP
02.4	**0.3** (mol/dm^3) (1)	**allow** any value from 0.25 to 0.35.	1	AO3 4.1.3.2 RP (maths)
02.5	to remove (sugar) solution / water from the surface, so only the mass of the potato is measured / so the mass is not too high (1)	**allow** "to remove excess water". **ignore** "to dry it" on its own.	1	AO3 4.1.3.2 RP
		Question 02 total	**6**	
03	the water in the soil is more dilute than the inside of the root hair cell / the cell has a lower concentration of water (1) water moves into the cell by osmosis (across the partially permeable cell membrane) (1)	**do not accept** "from a high concentration to a low concentration" without "of water" for the first mark. **do not accept** "by active transport" for the second mark.	2	AO1 4.1.3.2
		Question 03 total	**2**	
04	(net movement of water) from **A** to **B** (1) because A is more dilute / has a higher concentration of water / B is more concentrated / has a lower concentration of water (1)	The second mark depends on the first. **allow** "into B" for the first mark. **do not accept** "sugar moves from B to A". **do not accept** "from high concentration to low concentration" without "of water".	2	AO2 4.1.3.2
		Question 04 total	**2**	

Question	Answers	Extra information	Mark	AO / Spec. ref.
05	Level of response: see the level descriptors and indicative content below.		6	AO1, AO3 4.1.3.2 RP
		Question 05 total	**6**	
		TOTAL	**20**	

05 Level descriptors

Level	Marks	Descriptor
3	**5–6**	A detailed and coherent method in a logical order that would give valid results. It includes a range of concentrations, finding the mass before and after, at least two control variables, and how the results are used to find the concentration with no change in mass (a percentage change and a graph crossing 0 %, or the concentration between a gain and a loss).
2	**3–4**	A method with the main steps in a mostly sensible order. Some detail is missing, for example the control variables or how the concentration with no change is found. At least one control variable is given.
1	**1–2**	Simple statements about the method, for example “put potato in sugar solution” or “weigh it”. The order may be unclear, with little about making it fair.
0	**0**	No relevant content.

05 Indicative content

- cut potato cylinders with a cork borer, all the same diameter
- trim them to the same length with a scalpel (on a tile); remove the skin
- make up a range of sugar solutions, for example 0.0, 0.2, 0.4, 0.6, 0.8 and 1.0 mol/dm³
- put the same volume of each solution (for example 10 cm³) into labelled boiling tubes
- blot each cylinder and find its starting mass on a balance
- put one cylinder in each tube and leave them for the same time (for example overnight) at the same temperature
- remove, blot in the same way and find the final mass
- calculate the percentage change in mass
- repeat (for example three cylinders at each concentration) and calculate the mean
- plot percentage change in mass against concentration and draw a line of best fit
- where the line crosses 0 % there is no change in mass / no net movement of water: read off that concentration
- control variables: the same potato, the same size of cylinder, the same volume, the same time, the same temperature
- safety: cut away from the fingers, onto a tile

An answer that never finds the mass both before and after cannot reach Level 2.

Model answers

01.1 1 cell wall; 2 cell membrane; 3 permanent vacuole. **01.2** It has lost water by osmosis. **02.1** (1.56 − 1.50) ÷ 1.50 × 100 = +4.0 %. **02.2** The cylinders had different starting masses, so a percentage lets them be compared fairly. **02.3** The volume of sugar solution. **02.4** About 0.3 mol/dm³. **02.5** To remove solution from the surface, so only the mass of the potato is measured.

03 The water in the soil is more dilute than the inside of the root hair cell, so water moves into the cell by osmosis.

04 There is a net movement of water from A to B, because A is the more dilute solution (it has the higher concentration of water).

05 (Level 3) Use a cork borer to cut potato cylinders of the same diameter, and trim them all to 3 cm with a scalpel on a tile. Put 10 cm³ of sugar solution into each of six labelled boiling tubes: 0.0, 0.2, 0.4, 0.6, 0.8 and 1.0 mol/dm³. Blot each cylinder and find its starting mass on a balance. Put one cylinder in each tube and leave them all overnight at the same temperature. Take them out, blot them in the same way and find the final masses. Use the same potato for every cylinder. Calculate the percentage change in mass for each one. Do three cylinders at each concentration and find the mean. Plot the mean percentage change against the concentration and draw a line of best fit. The concentration where the line crosses 0 % is where there is no change in mass.

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