

2

Movement of Substances

Structured Questions ▶

Level 2

1. Figure 2.1 shows a plant cell placed in a solution containing 10% sugar concentration. Meanwhile, the concentration of the cell sap inside the plant cell is 5% sugar. After 30 minutes, the appearance of the cell changed.

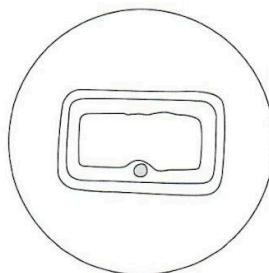


Figure 2.1

(a) Draw the appearance of plant cell after 30 minutes have passed. [3]

(b) Describe **two** differences between osmosis and diffusion. [2]

2. An experimental set-up was made to investigate the movement of substances. Two identical potato cubes were placed into beakers A and B, each containing different solutions. The cubes were cut to create cavities and had solutions poured into the cavities. Figure 2.2 shows the initial state of the potato cubes. After a few hours, the level of solutions in the cavities had changed.

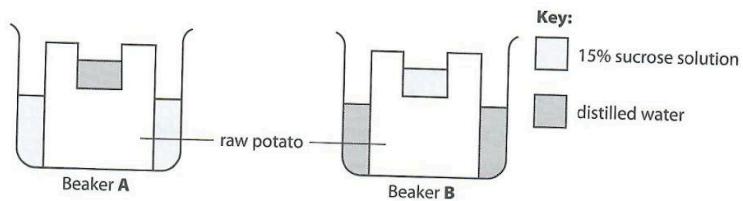


Figure 2.2

(a) State what happened to the solution level in the potato cavity from beaker A. [1]

(b) Explain your answer in (a). [2]

(c) State what happened to the solution level in the potato cavity from beaker B. [1]

(d) Explain your answer in (c). [2]

3. Figure 2.3 shows two blocks of agar with different dimensions each.

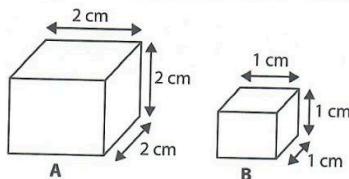


Figure 2.3

(a) Calculate the surface area-to-volume ratio of agar blocks A and B. Show your workings clearly. [4]

(b) Both blocks are submerged in the same solution containing a blue dye. Explain which block will completely change its colour to blue in a shorter amount of time. [2]

Level 3

4. Several potato strips were each submerged in sucrose solutions of different concentrations for 15 minutes. Figure 2.4 shows a graph of the $\frac{\text{Final weight}}{\text{Initial weight}}$ of the potato strip against the concentration of the sucrose solution used.

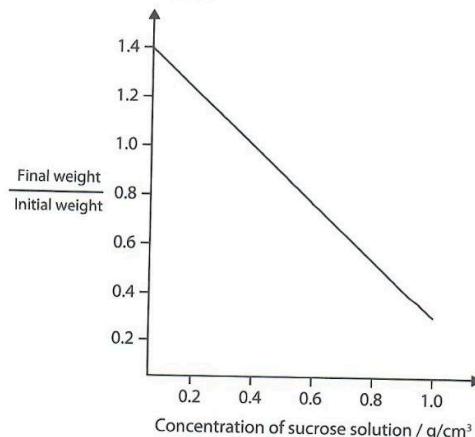


Figure 2.4

(a) Using the information given, state the concentration of the potato cell sap. [1]

(b) Explain how you had obtained your answer in (a). [3]

5. Figure 2.5 shows an experiment set-up. The apparatus was left undisturbed for three hours.

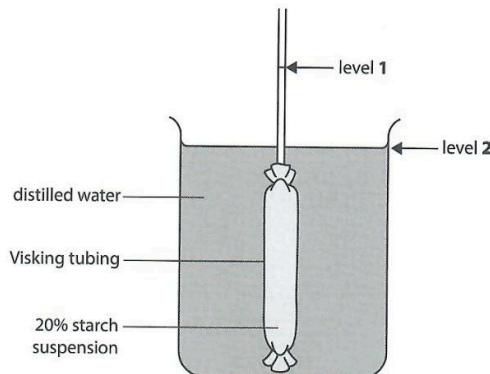


Figure 2.5

(a) After three hours, both levels 1 and 2 changed.

- State the changes that occurred to levels 1 and 2. [2]
- Explain your answer in (i). [3]

(b) State the reason why no diffusion occurred in the beaker. [1]

Free-response Questions►

Level 2

6. The following experiment is an investigation on osmosis.

The lower epidermis of the leaves of a plant was extracted. Ten similar strips were placed in different concentrations of salt solution. After 15 minutes, the strips were stained and studied under the microscope to derive the percentage of plasmolysed cells.

Table 2.1 shows the results.

- Describe the appearance of a plasmolysed cell. [1]
- Explain the change in the percentage of plasmolysed cells when the salt concentration changed from $0.50 \text{ mol}/\text{dm}^3$ to $0.60 \text{ mol}/\text{dm}^3$. [4]
- Explain the shape of a plant cell placed in distilled water. [3]

Table 2.1

Salt Concentration / mol/dm^3	Percentage of Plasmolysed Cells / %
0.35	0
0.40	0
0.45	0
0.50	0
0.55	10
0.60	25
0.65	87
0.70	96
0.75	100
0.80	100

Level 3

7. Figure 2.6 shows the structure of a cell from bean sprouts.

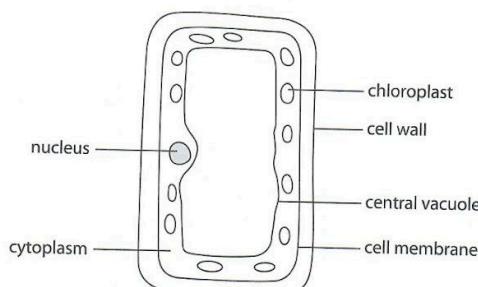


Figure 2.6

(a) Describe the shape of the cell when the bean sprout is placed in distilled water. [1]
(b) Explain your answer in (a). [3]
(c) Choose the correct structure from Figure 2.6 to complete Table 2.2. [2]

Table 2.2

Function	Structure
Controls the movement of substances	
Prevents the cell from bursting	

(d) To investigate movement of substances, a student weighed 10 g of bean sprouts and put them in a Petri dish as shown in Figure 2.7. He added 10% sucrose solution to the petri dish. After 30 minutes, he dried and weighed the bean sprouts again.

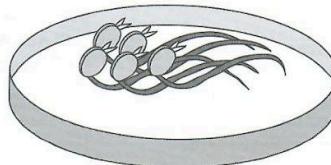


Figure 2.7

(i) Predict what happens to the weight of the bean sprouts after 30 minutes. [1]
(ii) Explain your answer in (d)(i). [2]

8. In an experiment investigating the effect of the concentration of salt solution on potato tissues, 15 potato strips were cut into same dimensions. Three potato strips were placed in five Petri dishes each, with different concentrations of sodium chloride solution. The initial length of each potato strip is 50.0 mm.

After half an hour, they were all removed and dried. Their lengths were then measured again. The results were recorded in Table 2.3.

Table 2.3

Concentration of Salt Solution / mol/dm ³	Average Change in the Length of Potato Strips / mm	Average Percentage Change in the Length of Potato Strips / %
0.2	+2.6	+5.2
0.4	+2.0	+4.0
0.6	-1.0	-2.0
0.8	-2.5	-5.0
1.0	-3.0	-6.0

(a) Plot a graph of the average percentage change in length of the potato strips against the concentration of sodium chloride solution. [4]

(b) With reference to the graph drawn in (a), state the concentration of the cell sap in the potato strips. [1]

(c) Explain how you derived your answer in (b). [3]

9. In an experiment, red blood cells were placed in solutions of different sucrose concentrations. The results of the experiment are shown in Table 2.4.

Table 2.4

Concentration of Sucrose Solution / %	1.0	2.0	3.0
Appearance of Red Blood Cells in Solution			

(a) Explain the shape of the red blood cells placed in the 3.0% sucrose solution. [3]

(b) Explain the shape of the red blood cell placed in 1.0% sucrose solution. [3]

10. Figure 2.8 shows an amoeba, a microscopic freshwater unicellular organism. It has a contractile vacuole which removes extra water from its body at regular intervals. Figure 2.9 shows the frequency of contraction in this organism when placed in medium A.

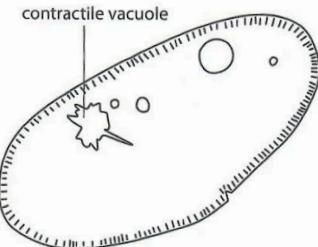


Figure 2.8

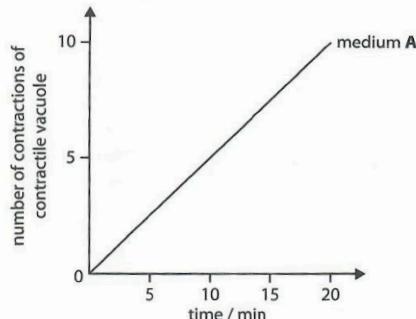


Figure 2.9

- (a) Name the process by which water moves into the vacuole. [1]
- (b) Explain what would happen to the amoeba if it were placed in medium A and it failed to form contractile vacuoles. [4]
- (c) The amoeba was later placed in another medium B which is of a lower concentration than medium A. On Figure 2.9, sketch a line to depict the frequency of contraction of the contractile vacuole when in medium B. [2]

11. In Figures 2.10 and 2.11, two of the same plant cells are placed in two different solutions.

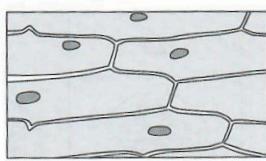


Figure 2.10

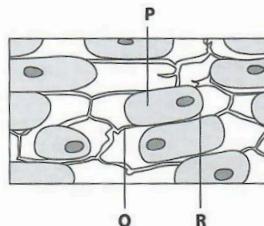


Figure 2.11

- (a) State the appearance of the plant cells in Figures 2.10 and 2.11. [2]
- (b) Name the structures P, Q and R in Figure 2.11. [3]
- (c) State whether the cell in Figure 2.11 is placed in a solution of higher or lower water potential. Explain your answer. [3]