

Solutions

Each answer shows the steps, then the **result**.

2.1

- simple diffusion — passive; active transport — active; osmosis — passive; exocytosis — active

2.2

- surface area = $6 \times 2^2 = 24 \text{ cm}^2$; volume = $2^3 = 8 \text{ cm}^3$; ratio = $24 : 8 = 3 : 1$

3.1 B

- Through a protein and down the gradient with no ATP = facilitated diffusion

3.2 B

- Distilled water has a higher water potential, so water enters by osmosis and the cell, having no wall, bursts (haemolysis)

3.3

(a)

- the smallest block has the largest surface area to volume ratio; so dye diffuses across a relatively larger surface for the volume inside; and the diffusion distance to the centre is shorter

(b)

- large organisms have a small surface area to volume ratio, so diffusion across the surface is too slow to supply all the inner cells — they need a transport system

3.4

(a)

- find the solution that gives no change in mass; its water potential equals that of the potato tissue

(b)

- water leaves the cell by osmosis; the contents shrink and the membrane pulls away from the cell wall; this is plasmolysis

3.5

(a)

- $SA : V = 3 : 1, 1.5 : 1$ and $0.75 : 1$. As $SA : V$ falls, the time rises; halving the ratio roughly quadruples the time, so the relationship is not simply proportional

(b)

- The acid enters by **diffusion** down its concentration gradient; the rate of entry depends on surface area, while the amount that must be supplied depends on volume; in the large cube each unit of volume is served by less surface **and** the distance to the centre is greater, so it takes far longer

(c)

- A large animal has a small SA : V, so its body surface cannot supply enough oxygen for its volume of respiring tissue; the distance from surface to inner cells is also far too great for diffusion alone; a specialised exchange surface supplies the area, and a transport system covers the distance quickly

(d)

- The agar is not alive — there is no cell surface membrane, so nothing is selectively permeable and there is no active transport; it does not consume the acid as a respiring cell consumes oxygen, so no steep internal gradient is maintained