

Solutions

2.1 The spreading out of particles of a substance in solution or a gas, with a net movement from an area of higher concentration to lower concentration.

2.2

$$\% \text{ change} = \frac{-0.45}{3.0} \times 100 = -\mathbf{15\%}$$

(method 1, answer with sign 1)

2.3 The soil solution is more dilute than the root hair cell contents; active transport moves ions against the gradient using energy from respiration – diffusion could not do this.

3.1 (a) Any three: volume of solution; temperature; time in solution; surface area / dimensions of pieces; same potato / starting concentration of tissue; blotting method. (b) The solution outside is more dilute than the potato cells; water enters by osmosis through the partially permeable membrane, increasing the mass. (c) Water left the cells by osmosis; so the cell contents are more concentrated than 0.8 mol/dm^3 – the external solution is hypertonic to the cells.

3.2 A single-celled organism is small, so its surface area to volume ratio is large; enough molecules cross the cell surface by diffusion to meet its needs. A human is large, so SA:V is small; diffusion alone would be too slow over the distances inside – exchange surfaces and a transport system (blood circulation) deliver molecules to all cells.

3.3 (a) Numerous alveoli give a large surface area; thin walls give a short diffusion path; capillaries maintain the concentration gradient by carrying blood away and bringing fresh supply. (b) The working surface area for gas exchange halves; less oxygen diffuses into the blood per second; so the rate of supply cannot meet the demand – breathing rate rises to try to ventilate the remaining alveoli more.