

Exercise walk-through

1.3

Transport in cells – diffusion, osmosis, active transport (4.1.3, RP2)

AQA · GCSE · Biology

Exercises 2.1·2.3

2.1 Define diffusion.

[2]

2.2 A 3.0 g potato piece loses 0.45 g in a concentrated sugar solution. Calculate the percentage change.

[2]

2.3 Explain why root hair cells use active transport rather than diffusion to absorb mineral ions.

[2]

Exercises 2.1·2.3

2.1 Define diffusion.

[2]

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 A 3.0 g potato piece loses 0.45 g in a concentrated sugar solution. Calculate the percentage change. [2]

2.2

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

(method 1, answer with sign 1)

2.3 Explain why root hair cells use active transport rather than diffusion to absorb mineral ions. [2]

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.

Exercises 3.1·3.2

3.1 A student places potato pieces in salt solutions of $0.2\text{--}1.0\text{ mol/dm}^3$ (RP3).

(a) State three control variables. [3]

(b) In 0.2 mol/dm^3 the pieces gained mass. Explain why. [2]

(c) In 0.8 mol/dm^3 the percentage change was -12% . Suggest what this shows about the cell contents. [2]

3.2 Explain why a single-celled organism does not need a transport system, but a human does. Use surface area to volume ratio in your answer. [4]

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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 Explain why a single-celled organism does not need a transport system, but a human does. Use surface area to volume ratio in your answer. [4]

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.

Exercise 3.3

3.3 The alveoli in lungs are thin-walled, numerous, and surrounded by capillaries.

- (a) Explain how each feature speeds gas exchange. [3]
- (b) A disease halves the number of working alveoli. Explain why the patient becomes breathless. [3]

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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.