

Movement into and out of cells practice questions

12 questions • 34 marks • mark scheme at the back

For Cambridge IGCSE Combined Science 0653. **Supplement** is Extended content, only examined on Papers 2 and 4.

Name

Total / 34

Diffusion **Spec B3.1**

1 Which statement describes diffusion? [1 mark]

- A. ☐ The movement of particles from a low concentration to a high concentration using energy from respiration
- B. ☐ The net movement of water through a partially permeable membrane
- C. ☐ The net movement of particles down a concentration gradient as a result of their random movement
- D. ☐ The movement of particles using protein carriers in the cell membrane

2 Describe the importance of diffusion of gases and solutes in living organisms. [3 marks]

3 Supplement

[3 marks]

A student investigates diffusion into cubes of agar containing alkali and an indicator. The cubes are placed in dilute acid and the student times how long each takes to turn colourless. (a) Calculate the surface area to volume ratio of each cube. [2] (b) Use your answers to explain why the 1 cm cube turned colourless in less time. [1]

Agar cubes	
Length of side / cm	Time to turn colourless / s
1	95
2	310

Answer =

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4 Supplement

[3 marks]

A flatworm is a small, thin and flat animal with no blood system. Explain how its shape allows oxygen to reach all of its cells.

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Osmosis Spec B3.2

- 5** Cylinders of potato were placed in sugar solutions of different concentrations. The percentage change in mass was measured after 60 minutes. (a) Use the data to estimate the concentration of sugar solution that has no effect on the mass of the potato. [1] (b) Explain why the potato cylinder in 0.0 mol/dm^3 increased in mass. [2] (c) State one variable that must be kept constant in this investigation. [1] [4 marks]

Change in mass of potato	
Concentration / mol/dm^3	Change in mass / %
0.0	+18
0.2	+7
0.4	-4
0.6	-13
0.8	-20

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- 6** Supplement [1 mark]
- Two solutions are separated by a partially permeable membrane. Solution X is dilute. Solution Y is concentrated. What is the net movement of water?
- A. ☐ From X to Y, because X has a lower water potential
- B. ☐ From X to Y, because X has a higher water potential
- C. ☐ From Y to X, because Y has a higher water potential
- D. ☐ There is no net movement because the membrane is partially permeable

7 **Supplement** **[5 marks]**

A piece of onion epidermis is placed in a concentrated sugar solution. When viewed under a microscope the cell membranes have pulled away from the cell walls. Use the terms plasmolysis, flaccid and water potential to explain what has happened.

8 **Supplement** **[4 marks]**

A red blood cell and a plant cell are each placed in distilled water. The red blood cell bursts but the plant cell does not. Explain these results.

Active transport Spec B3.3 Supplement

9 **Supplement** **[1 mark]**

Which statement describes active transport?

- A. ☐ Direction: down a concentration gradient; energy from respiration: needed
- B. ☐ Direction: against a concentration gradient; energy from respiration: needed
- C. ☐ Direction: against a concentration gradient; energy from respiration: not needed
- D. ☐ Direction: down a concentration gradient; energy from respiration: not needed

10 **Supplement** **[2 marks]**

Describe two differences between diffusion and active transport.

Supplement

The concentration of nitrate ions is lower in the soil than inside a root hair cell. Explain how the root hair cell takes in nitrate ions and why it has many mitochondria.

[illegible]

Supplement

Barley roots were placed in solutions with and without oxygen. The uptake of nitrate ions was measured. (a) Describe the effect of removing oxygen on nitrate uptake. [1] (b) Explain this effect. [3]

Nitrate uptake by roots	
Condition	Nitrate uptake / arbitrary units
Oxygen present	45
Oxygen absent	6

[illegible]

Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1]

C C (1)

2. [3]

- oxygen diffuses into cells for respiration (1)
- carbon dioxide diffuses out of cells / carbon dioxide diffuses into leaf cells for photosynthesis (1)
- digested food / glucose / amino acids (solutes) diffuse from the gut into the blood (1)
- urea (waste solute) diffuses out of cells into the blood (1)
- Max 3

3. [3] **Supplement**

- 1 cm cube: $6 \text{ cm}^2 \div 1 \text{ cm}^3 = 6$ (1)
- 2 cm cube: $24 \text{ cm}^2 \div 8 \text{ cm}^3 = 3$ (1)
- it has the larger surface area to volume ratio / the acid has a shorter distance to diffuse to the centre (1)

4. [3] **Supplement**

- short distance for oxygen to diffuse (1)
- large surface area compared with its volume (1)
- oxygen diffuses down a concentration gradient fast enough to supply all the cells (1)

5. [4]

- between 0.30 and 0.35 mol/dm³ (1) allow 0.3 mol/dm³
- water entered the potato cells (1)
- by osmosis through the (partially permeable) cell membrane (1)
- any one from: temperature / volume of solution / time in solution / size (surface area) or mass of cylinder / same type of potato (1) ignore 'amount of potato'

6. [1] **Supplement**

B B (1)

7. [5] **Supplement**

- the sugar solution has a lower water potential than the cell contents (1)
- water leaves the cell by osmosis (1)
- through the partially permeable cell membrane (1)
- the cell loses turgor pressure and becomes flaccid (1)
- the cytoplasm shrinks and the cell membrane pulls away from the cell wall: this is plasmolysis (1)

8. [4] **Supplement**

- distilled water has a higher water potential than the cells / cell contents (1)
- water enters both cells by osmosis (1)
- the red blood cell has no cell wall, so it swells and bursts (1)
- the plant cell wall resists the expansion, so the cell becomes turgid (1) allow 'turgor pressure stops more water entering'

9. [1] **Supplement**

B B (1)

10. [2] Supplement

- diffusion is down a concentration gradient but active transport is against a concentration gradient (1)
- active transport needs energy from respiration but diffusion does not (1)

11. [3] Supplement

- by active transport (1)
- movement is against the concentration gradient (1)
- mitochondria release energy (from respiration) needed for active transport (1)

12. [4] Supplement

- uptake is much lower / falls from 45 to 6 without oxygen (1)
- no oxygen so less aerobic respiration (1)
- less energy released (1)
- less active transport of nitrate ions (against the concentration gradient) (1)