

Diffusion: how particles spread out

Cambridge IGCSE Biology 0610 | Grade 10 | Week 8 | Topic 3.1 Diffusion

By the end of this sheet you should be able to describe diffusion using the term concentration gradient, state where its energy comes from, explain why it matters to living things, and use data to show how surface area, temperature, concentration gradient and distance change its rate.

A What is diffusion? *Pick the correct word for each gap (1 to 5).*

Diffusion is the net movement of particles from a region of (1) _____ concentration to a region of (2) _____ concentration. So the particles move (3) _____ a concentration gradient. This happens because particles are always in (4) _____ movement. The energy for this comes from the (5) _____ energy of the particles themselves, which means the cell does not have to supply energy from respiration.

Word bank	higher	lower	down	up	random	steady	kinetic	chemical
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B Gases moving in and out of a cell *Look at Figure 1, then answer B1 to B5.*

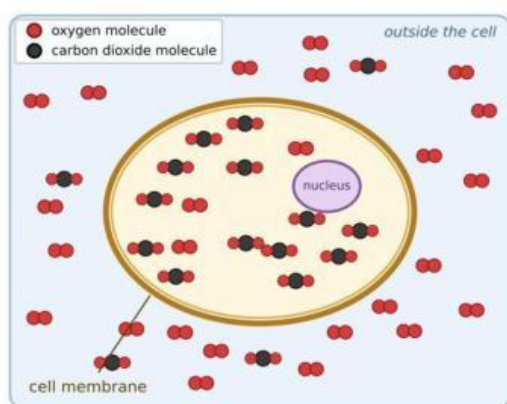


Figure 1 An animal cell surrounded by tissue fluid.

- B1** Oxygen diffuses _____ the cell
- B2** Carbon dioxide diffuses _____ the cell
- B3** Name the structure the gases pass through to enter or leave the cell.

- B4** Use Figure 1 to explain why oxygen moves in the direction you chose in B1.
- B5** Inside the cell, mitochondria keep using oxygen for respiration. What does this do to the oxygen concentration gradient?

C Why diffusion matters *Join each place to the substance that diffuses there.*

Alveoli in the lungs	•	glucose and amino acids into the blood
Spongy layer of a leaf in daylight	•	oxygen from water into the blood
Villi in the small intestine	•	oxygen from air into the blood
Gills of a fish	•	carbon dioxide from air into leaf cells

C2 An *Amoeba* is a single cell. It gets all the oxygen it needs by diffusion through its surface. A cow cannot do this, so it needs lungs and blood. Suggest why.

D Investigation: agar cubes in acid *Practical skills (AO3)*

A student made cubes of agar jelly containing an alkaline indicator, which turns the jelly pink. Each cube was put into the same volume of dilute hydrochloric acid at 25 °C. As the acid diffused into a cube, the pink colour disappeared. The student timed how long each cube took to lose all of its colour.

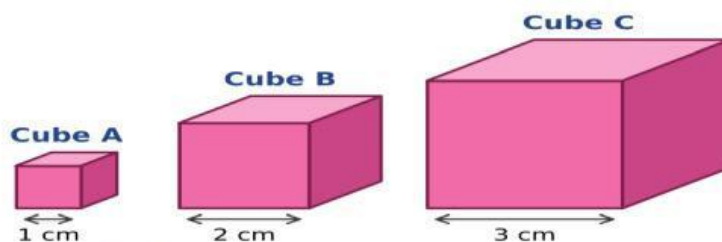


Figure 2 The three agar cubes before they were placed in the acid.

Cube	Length of side / cm	Surface area / cm ²	Volume / cm ³	Surface area : volume ratio	Time to lose colour / min
A	1	6	1	6 : 1	5
B	2				19
C	3				42

D1 Complete the table for cubes B and C. Write each ratio in the form **x : 1**.

D2 Independent variable:

D3 Dependent variable:

D4 State one variable the student kept the same. _____

D5 Cube A lost its colour fastest. Explain why, using the words **surface area : volume ratio** and **distance**.

E Temperature and other factors *Use Figure 3 for E1 and E2.*

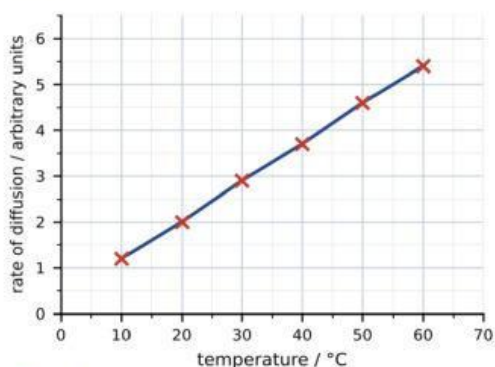


Figure 3 Rate of diffusion of a dye in water at different temperatures.

E1 Read the rate of diffusion at 25 °C. _____ arbitrary units

E2 Describe the trend in Figure 3, then explain it in terms of the particles.

E3 Tick True or False for each statement.

- | | | |
|--|-------------------------------|--------------------------------|
| a) A steeper concentration gradient gives a faster rate of diffusion. | ☐ True | ☐ False |
| b) Diffusion is faster when particles have a longer distance to travel. | ☐ True | ☐ False |
| c) Cells with folds or microvilli gain substances faster because of their larger surface area. | ☐ True | ☐ False |
| d) Once the concentrations on both sides are equal, the particles stop moving. | ☐ True | ☐ False |