

# Edexcel (A) Biology A-level

## 2.1 to 2.4 - Exchange of Substances

### Flashcards

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How does surface area to volume ratio affect transport of molecules?



How does surface area to volume ratio affect transport of molecules?

The lower the surface area to volume ratio, the further distance molecules need to travel to reach all parts of the organism. Diffusion alone is not sufficient, so specialised gas exchange surfaces are required.



Name three features of an efficient gas exchange surface.



Name three features of an efficient gas exchange surface.

1. Large surface area, e.g. folded membranes in mitochondria.
2. Thin/short distance, e.g. wall of capillaries.
3. Steep concentration gradient, maintained by blood supply or ventilation, e.g. alveoli.



What is Fick's law? Give the corresponding equation.



What is Fick's law? Give the corresponding equation.

States that the larger the surface area, the larger the difference in concentration, and the shorter the diffusion distance, the quicker the rate of diffusion.

$$\text{rate of diffusion} \propto \frac{\text{surface area} \times \text{concentration difference}}{\text{diffusion distance}}$$



How is the mammalian lung adapted for gas exchange?





## How is the mammalian lung adapted for gas exchange?

- Alveoli provide a large surface area.
- Good blood supply maintains a steep concentration gradient.
- Only one cell thick, providing a short diffusion distance.



What is the structure and properties of a cell membrane?



What are the structure and properties of a cell membrane?

- Phospholipid bilayer
- Membranous proteins e.g. transporters, receptors, enzymes.
- Controls movement of substances in and out of the cell.



What is meant by the fluid mosaic model?



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Cell membranes are fluid, and have a mosaic-like arrangement of proteins.



What evidence led to development of the fluid-mosaic model?



## What evidence led to development of the fluid-mosaic model?

- Phospholipids naturally form bilayers in water.
- Microscope images show proteins on membrane surface.
- Lipid-soluble substances pass more easily in and out of cells than water-soluble.



Define osmosis.





Define osmosis.

The movement of free water molecules from an area of high concentration to an area of low concentration, across a partially permeable membrane.



Define passive transport and give examples of this.



Define passive transport and give examples of this.

The movement of particles down a concentration gradient (high to low), meaning no energy is required. Diffusion, facilitated diffusion, and osmosis are all passive.



Define diffusion.



Define diffusion.

The movement of small non-polar, lipid-soluble molecules from an area of high concentration to an area of low concentration.



Define facilitated diffusion.



Define facilitated diffusion.

The movement of polar, charged, water-soluble molecules particles from high to low concentration through a carrier protein or channel protein.



Define active transport.





Define active transport.

The movement of molecules against a concentration gradient (low to high), meaning energy in the form of ATP is required. Also uses carrier proteins.



How are large molecules moved across  
a cell membrane?



How are large molecules moved across a cell membrane?

Requires vesicles. Endocytosis = cell membrane forms a vesicle and engulfs the material, which enters the cytoplasm.

Exocytosis = vesicle fuses with cell membrane to release contents from cell.

