

Gas exchange, membranes and transport

State three properties of a gas exchange surface.

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State Fick's law of diffusion.

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Why do large organisms need specialised gas exchange surfaces?

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Name the path of air to the gas exchange surface in a mammal.

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How does ventilation help gas exchange?

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How is an alveolus adapted for rapid diffusion?

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Describe the arrangement of phospholipids in a membrane.

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What is the role of cholesterol in a membrane?

Rate of diffusion $\propto$ (surface area $\times$ difference in concentration) $\div$ thickness of the exchange surface.

Large surface area to volume ratio, thin (short diffusion distance), large difference in concentration (steep gradient).

Trachea, bronchi, bronchioles, alveoli.

They have a small surface area to volume ratio, so diffusion across the body surface is too slow to supply all cells.

Walls one cell thick; very many alveoli; capillary network around each; elastic fibres.

Brings in fresh air and removes carbon dioxide, so the concentration gradients are maintained.

Lies between phospholipid tails; regulates fluidity and stabilises the membrane.

A bilayer: hydrophilic heads face the water on both sides, hydrophobic tails face inwards.

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What are glycoproteins and glycolipids used for in membranes?

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Why is the fluid mosaic model called a model?

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What did the cell fusion experiment (mouse and human cells) show?

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Why does beetroot pigment leak at high temperature?

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How is the colour of the liquid measured in core practical 3?

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How does ethanol affect membrane permeability?

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Define osmosis.

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What is the water potential of pure water?

It is an explanation built from, and revised in the light of, experimental data.

Cell recognition (antigens) and receptors for hormones and other signals.

Membrane proteins denature and the bilayer becomes more fluid, so permeability increases.

Fluorescently labelled surface proteins mixed over time, so proteins can move within the membrane: it is fluid.

It dissolves lipids and disrupts the phospholipid bilayer, so the membrane becomes more permeable.

With a colorimeter (blue-green filter), zeroed on distilled water, or by comparing with colour standards.

Zero kPa, the highest value. Solutions have negative water potentials.

The net movement of free water molecules through a partially permeable membrane, down a water potential gradient.

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What happens to a plant cell in a solution of lower water potential?

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Percentage change in mass: formula?

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Define facilitated diffusion.

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Channel protein or carrier protein: which changes shape during transport?

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Define active transport.

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What happens to ATP in active transport?

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Difference between endocytosis and exocytosis?

$$\frac{(\text{final mass} - \text{initial mass})}{\text{initial mass}} \times 100.$$

Water leaves by osmosis; the cytoplasm shrinks away from the cell wall (plasmolysis).

Carrier protein. Channel proteins form a pore (often gated).

Passive movement of ions or polar molecules down a concentration gradient through channel or carrier proteins.

It is hydrolysed to ADP + P_i, releasing energy to change the shape of the carrier protein.

Movement of molecules or ions across a membrane against a concentration gradient, using ATP and carrier proteins.

Endocytosis takes material into the cell in a vesicle from the membrane; exocytosis releases material by vesicle fusion with the membrane.