

4 Cell membranes – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
partially permeable	半透	_____	_____	_____
diffusion	扩散	_____	_____	_____
osmosis	渗透	_____	_____	_____
simple diffusion	简单扩散	_____	_____	_____
oxygen	氧气	_____	_____	_____
concentration gradient	浓度梯度	_____	_____	_____
facilitated diffusion	易化扩散	_____	_____	_____
ions	离子	_____	_____	_____
glucose	葡萄糖	_____	_____	_____
water potential	水势	_____	_____	_____
Active transport	主动运输	_____	_____	_____
endocytosis	胞吞	_____	_____	_____
exocytosis	胞吐	_____	_____	_____
volume	体积	_____	_____	_____
surface area	表面积	_____	_____	_____

English	中文	Write it 3 times (English)
turgid	膨胀	_____
plasmolysis	质壁分离	_____

Recall

From Part 1 you know the membrane is **partially permeable** 半透. Here we look at the ways substances cross it, and why cell size matters.

- At IGCSE you met **diffusion** 扩散 and **osmosis** 渗透.
- Now we add *facilitated diffusion*, *active transport*, and the surface area : volume idea.

New ideas

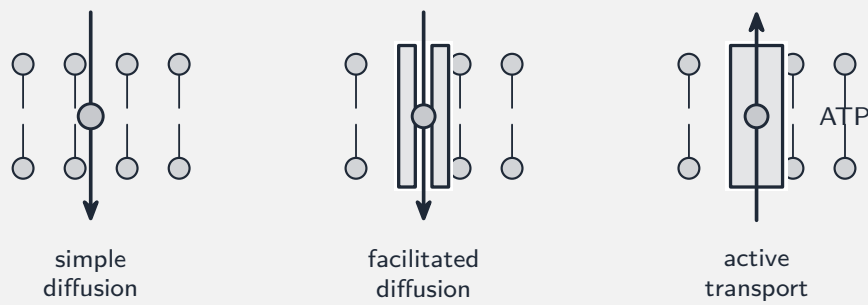
Read these first, then do the Practice.

■ 1 Passive transport (no energy)

- **simple diffusion** 简单扩散—small or non-polar molecules (like **oxygen** 氧气) pass straight through the bilayer, **down** the **concentration gradient** 浓度梯度.
- **facilitated diffusion** 易化扩散—**ions** 离子 and large polar molecules (like **glucose** 葡萄糖) cross through channel or carrier proteins, still down the gradient.
- **osmosis** 渗透—water moves across a partially permeable membrane from higher to lower **water potential** 水势.

■ 2 Active transport (uses ATP)

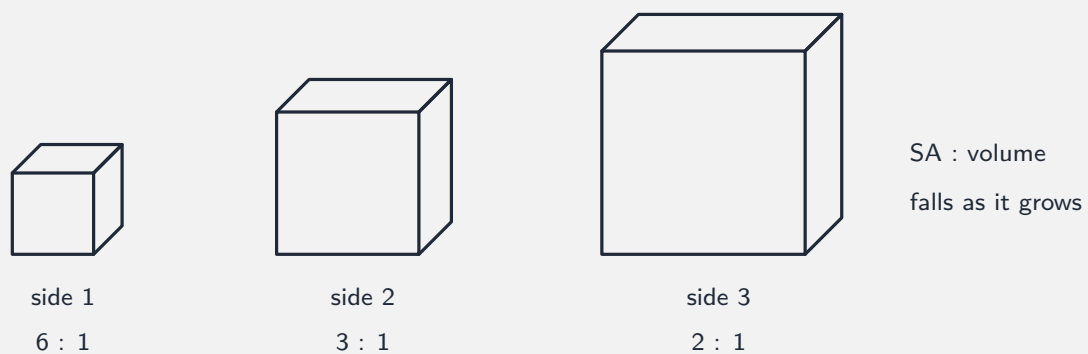
Active transport 主动运输 moves a substance **against** its concentration gradient (low → high). It needs a carrier protein **and** energy from **ATP**.



Larger amounts move in bulk by **endocytosis** 胞吞 (folding material in) and **exocytosis** 胞吐 (releasing material out), both using ATP.

■ 3 Surface area to volume ratio

A cell exchanges substances across its surface. As it grows, **volume** 体积 grows faster than **surface area** 表面积, so the surface area : volume ratio gets **smaller**.



This is why small or thin, flat cells exchange materials fast, while large cells cannot rely on diffusion alone.

■ 4 Cells in solutions

- a plant cell in pure water becomes **turgid** 膨胀 (the wall stops it bursting); in a strong solution it loses water and undergoes **plasmolysis** 质壁分离.
- an animal cell has no wall: in pure water it may **burst**; in a strong solution it **shrinks**.

Watch out: passive transport (diffusion, facilitated diffusion, osmosis) goes *down* the gradient with *no* energy; active transport goes *against* the gradient and needs ATP and a carrier protein. As a cell grows, its surface-area-to-volume ratio *falls*.

Practice

Try these in order.

4.1 Name the process that moves a substance **against** its concentration gradient. [1]

4.2 State one difference between simple diffusion and facilitated diffusion. [1]

4.3 Active transport and facilitated diffusion both use proteins. State one way they differ. [1]

4.4 A cube-shaped cell of side 2 has a surface area : volume ratio of 3 : 1. Explain what happens to this ratio as the cell grows larger. [2]

4.5 Explain why a small cell can exchange substances faster than a large cell. [2]

4.6 An animal cell and a plant cell are both placed in pure water. Describe what happens to each. [2]

4.7 Challenge. Cells lining the gut are covered in tiny folds called microvilli. Explain how this helps absorption, using the idea of surface area. [2]
