

# 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

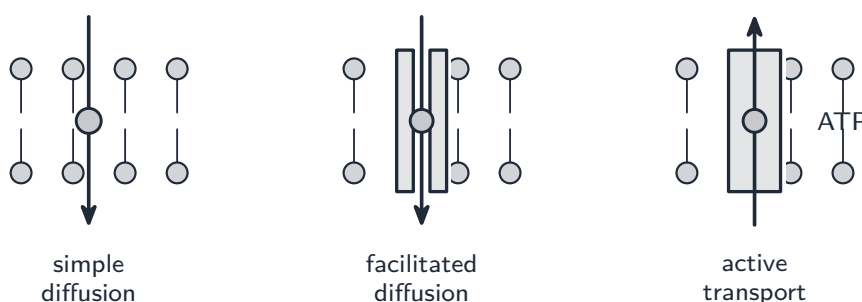
Read these first, then do the Practice.

### ■ 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)

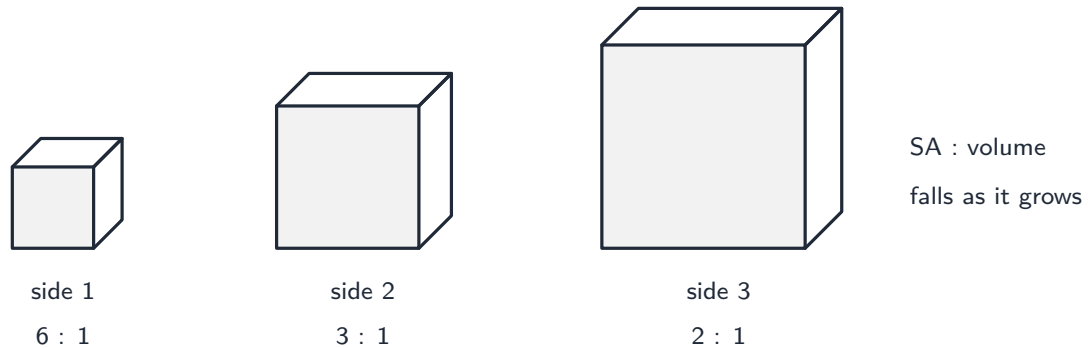
**Active transport** 主动运输 moves a substance **against** its concentration gradient (low → high). It needs a carrier protein **and** energy from **ATP**.



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

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Try these in order.

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

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

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

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**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]

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