

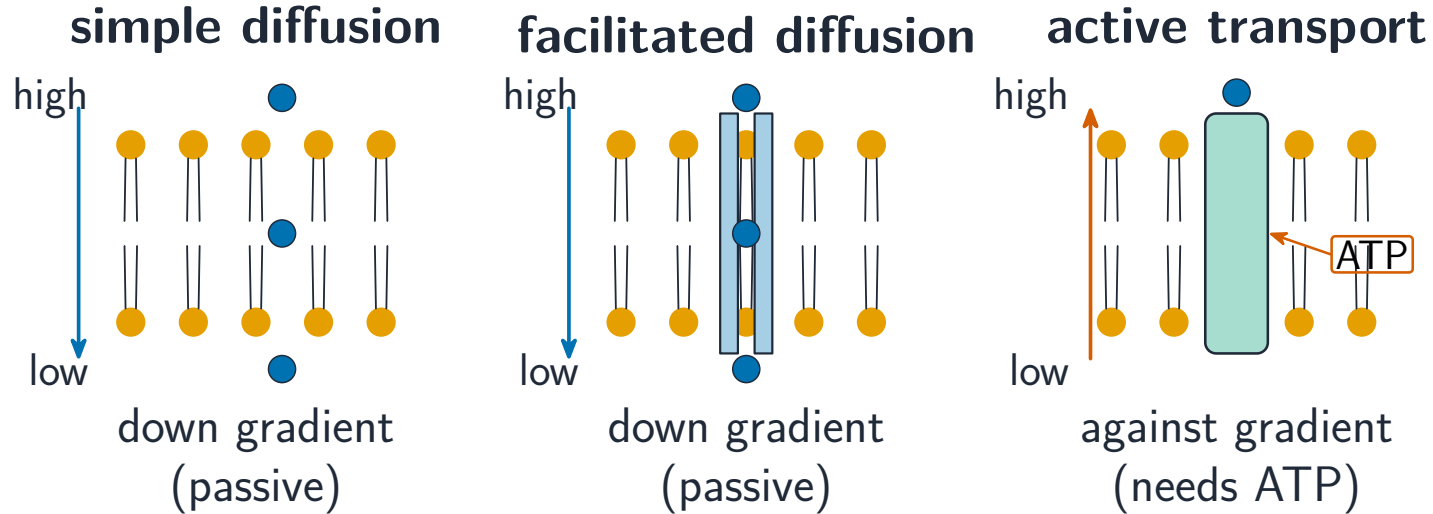
Exercise walk-through

2.6

Facilitated Diffusion

AP Biology

Three ways substances cross the membrane



Three ways substances cross the membrane

What crosses, and how

The hydrophobic core decides what crosses directly:

- cross easily – small **nonpolar** (O_2 , CO_2), and water
- blocked – large or charged (**glucose**, Na^+)

Facilitated diffusion :
channel / **carrier** proteins –
 passive, but **saturates**.

Passive: down the gradient,
no ATP

Active: against the gradient,
 uses *ATP*

Osmosis = diffusion of water.
 Endo/exocytosis move bulk cargo.

Exam tips

- Use the two AP-formula skills: **surface-area-to-volume ratio** (why cells stay small) and **water potential** $\Psi = \Psi_p + \Psi_s$ ($\Psi_s = -iCRT$).
- Water moves toward the **lower (more negative) water potential**; predict swelling or shrinking from tonicity (hypo/hyper/isotonic).
- **Passive transport and osmosis need no energy** (down the gradient); **active transport** needs ATP (against the gradient).
- Distinguish diffusion, facilitated diffusion (a channel/carrier protein), and active transport.
- Explain membrane selectivity from the **phospholipid bilayer** – small non-polar molecules cross, large/charged ones need help.

Exercises 2.1-2.3

2.1 Is facilitated diffusion active or passive?

[1]

2.2 Name the two types of transport protein used.

[2]

2.3 Why does glucose need a protein to enter by facilitated diffusion?

[1]

Exercises 2.1-2.3

2.1 Is facilitated diffusion active or passive? [1]

2.1

- Passive
-

2.2 Name the two types of transport protein used. [2]

2.2

- Channel proteins and carrier proteins
-

2.3 Why does glucose need a protein to enter by facilitated diffusion? [1]

2.3

- Glucose is large and polar, so it cannot cross the hydrophobic bilayer without a protein

Exercise 3.1

3.1 Facilitated diffusion requires

[1]

☐

A ATP and a protein

B a protein but no ATP

C neither a protein nor ATP

D ATP but no protein

Exercise 3.1

3.1 Facilitated diffusion requires

[1]

☐

A ATP and a protein

B a protein but no ATP

C neither a protein nor ATP

D ATP but no protein

3.1 B

- a protein but no ATP

Exercise 3.2 (a)

3.2 A carrier protein moves glucose into a cell where glucose is less concentrated.

(a) State whether ATP is used, with a reason.

[2]

Exercise 3.2 (a)

3.2 A carrier protein moves glucose into a cell where glucose is less concentrated.

(a) State whether ATP is used, with a reason.

[2]

(a)

- No ATP – glucose moves down its gradient, which is spontaneous

Exercise 3.2 (b)

3.2 A carrier protein moves glucose into a cell where glucose is less concentrated.

(b) Explain how a carrier protein differs from a channel protein.

[2]

Exercise 3.2 (b)

3.2 A carrier protein moves glucose into a cell where glucose is less concentrated.

(b) Explain how a carrier protein differs from a channel protein. [2]

(b)

- A channel forms a pore for the molecule to pass through; a carrier binds the molecule and changes shape to move it

Exercise 3.3

3.3 Explain why facilitated diffusion is passive even though it uses a protein.

[2]

Exercise 3.3

3.3 Explain why facilitated diffusion is passive even though it uses a protein. [2]

3.3

- The molecule still moves **down** its concentration gradient, so no energy is spent; the protein only provides a passageway across the membrane