

Exercise walk-through

Membrane Permeability ■ 2.4

eXercise

You must be able to

- predict which molecules cross the bilayer easily
- explain why size and polarity matter
- link the hydrophobic core to selective permeability

Method — The hydrophobic barrier

The membrane's inner core is **hydrophobic** (the nonpolar tails). Molecules that are **small and nonpolar** slip through easily; large or charged molecules do not.

Method — Easy crossers

- **Small nonpolar** (O_2 , CO_2) — cross freely.
- **Small polar** (water, in small amounts) — cross slowly.

Method — Blocked without help

- **Large polar** (glucose) and **ions** (Na^+ , Cl^-) — cannot cross the core; they need **transport proteins**.

Method — A worked prediction

Oxygen (small, nonpolar) diffuses straight through; a sodium ion (charged) is blocked and must use a channel or pump.

Practice 2.1 ■ 1 mark

What kind of molecule crosses the bilayer most easily?

Solution 2.1

Worked steps

A small, nonpolar molecule **B1**.

Practice 2.2 ■ 1 mark

Why can't ions cross the bilayer directly?

Solution 2.2

Method: Blocked without help

Worked steps

They are charged, so they cannot pass through the hydrophobic core **B1**.

Practice 2.3 ■ 1 mark

State one gas that diffuses freely across the membrane.

Solution 2.3

Worked steps

Oxygen (or carbon dioxide) **B1**.

Exam-style 3.1 ■ 1 mark

Which molecule crosses the phospholipid bilayer most easily?

A a sodium ion

B glucose

C oxygen gas

D a protein

Solution 3.1

A a sodium ion

B glucose

C oxygen gas



D a protein

Worked steps

C — oxygen gas (small and nonpolar).

Exam-style 3.2 ■ 2 marks

A cell must take in oxygen and glucose.

- (a) State which can cross the bilayer directly, and why.
- (b) State what the other needs to cross.

Solution 3.2

Worked steps

(a) Oxygen — it is small and nonpolar, so it crosses the hydrophobic core directly **M1 A1**. (b) Glucose needs a transport protein **B1**.

Exam-style 3.3 ■ 2 marks

Explain why the membrane is described as **selectively** permeable.

Solution 3.3

Worked steps

The membrane lets some molecules (small, nonpolar) cross freely but controls or blocks others (large, polar, charged), so it selects what enters and leaves **M1** **A1**.