AP BIOLOGY • EXERCISE SHEET

2.4 What Can Cross the Membrane

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

Objective

Build the skills to answer exam questions on **what can cross the membrane** —selective permeability.

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

1 Worked examples

Study these first. Each one shows the method for a question type used later —follow the steps and you can do the Practice and Exam-style questions yourself.

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.

Easy crossers

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

Blocked without help

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

A worked prediction

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

2 Practice

Now apply the methods above.

2.1 What kind of molecule crosses the bilayer most easily? [1]

2.2 Why can't ions cross the bilayer directly? [1]

2.3 State one gas that diffuses freely across the membrane. [1]

3 Exam-style questions

3.1 Which molecule crosses the phospholipid bilayer most easily? [1]

- **A** a sodium ion
- **B** glucose
- **C** oxygen gas
- **D** a protein

3.2 A cell must take in oxygen and glucose.

(a) State which can cross the bilayer directly, and why. [2]

(b) State what the other needs to cross. [1]

3.3 Explain why the membrane is described as **selectively** permeable. [2]

4 Go further

You are now ready for the real exam questions on this subtopic:

- work through the **2.4 What Can Cross the Membrane** lesson on the **Learn** page;
- read the **What Can Cross the Membrane** section of the AP Biology handout on the **Know** page.

Solutions

2.1 A small, nonpolar molecule.

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

2.3 Oxygen (or carbon dioxide).

3.1 C —oxygen gas (small and nonpolar).

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

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