

Exercise walk-through

Plasma Membrane ■ 2.3

eXercise

You must be able to

- describe the **phospholipid bilayer** 磷脂双层 with embedded proteins
- explain why it is “fluid” and a “mosaic”
- state the roles of membrane proteins and cholesterol

Method — The fluid mosaic model

The membrane is a **phospholipid bilayer** with **proteins** embedded in and on it. It is:

- **fluid** — phospholipids and proteins drift sideways;
- a **mosaic** — many different molecules dotted throughout.

Method — Membrane proteins

Proteins act as **channels/transporters** (move substances), **receptors** (receive signals), and markers (cell recognition). They give the membrane most of its specific functions.

Method — Cholesterol

Cholesterol sits among the phospholipids and stabilizes fluidity — keeping the membrane from becoming too fluid when warm or too stiff when cold.

Method — Selective permeability

The hydrophobic core lets small nonpolar molecules pass but blocks most ions and large polar molecules, which need proteins — making the membrane **selectively permeable**.

Practice 2.1 ■ 2 marks

What are the two main components of the membrane?

Solution 2.1

Worked steps

A phospholipid bilayer and embedded proteins **B1** **B1**.

Practice 2.2 ■ 1 mark

Why is the model called “fluid”?

Solution 2.2

Method: The fluid mosaic model

Worked steps

The phospholipids and proteins can move sideways within the layer **B1**.

Practice 2.3 ■ 1 mark

State one function of membrane proteins.

Solution 2.3

Worked steps

Any one: transport (channel/carrier), receptor for signals, cell recognition **B1**.

Exam-style 3.1 ■ 1 mark

In the fluid mosaic model, the membrane is described as a mosaic because it

- A** is completely rigid
- B** contains many different molecules scattered throughout
- C** has only phospholipids
- D** never moves

Solution 3.1

Method: The fluid mosaic model

- A is completely rigid
- B contains many different molecules scattered throughout** 
- C has only phospholipids
- D never moves

Worked steps

B — many different molecules scattered throughout.

Exam-style 3.2 ■ 1 mark

A membrane must transport glucose into a cell.

- (a) Explain why glucose cannot cross the bilayer directly.
- (b) State what allows glucose to cross.

Solution 3.2

Worked steps

- (a) Glucose is large and polar, so it cannot pass through the hydrophobic core **B1**.
- (b) A transport (carrier/channel) protein allows glucose across **M1** **A1**.

Exam-style 3.3 ■ 2 marks

Explain the role of cholesterol in maintaining membrane fluidity across temperatures.

Solution 3.3

Method: Cholesterol

Worked steps

Cholesterol keeps the membrane from becoming too fluid at high temperatures and too rigid at low temperatures, stabilizing fluidity **M1** **A1**.