SCIENCE FOUNDATIONS

Cell membrane structure

Difficulty level: Intermediate

Science Foundations

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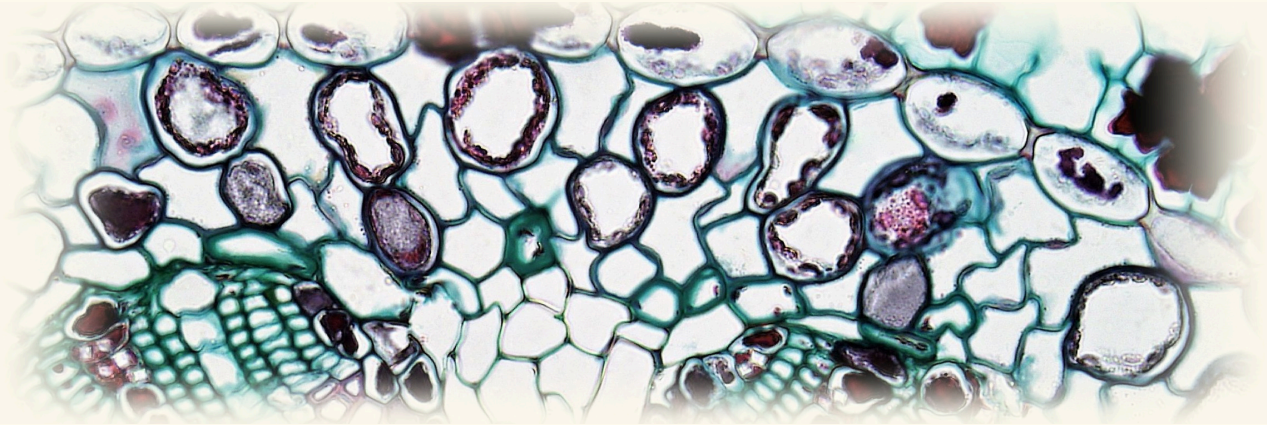
Overview of the concept

This is how you explain the gate that controls what gets into and out of every cell in your body, like a border crossing that lets nutrients in and keeps harmful things out. A cell membrane lets water and nutrients pass, blocks harmful substances, and opens for signals the cell needs to hear. Without that gate, a cell could not keep what it needs inside or keep danger outside. Every cell in your body depends on this thin gate to stay alive and do its job.



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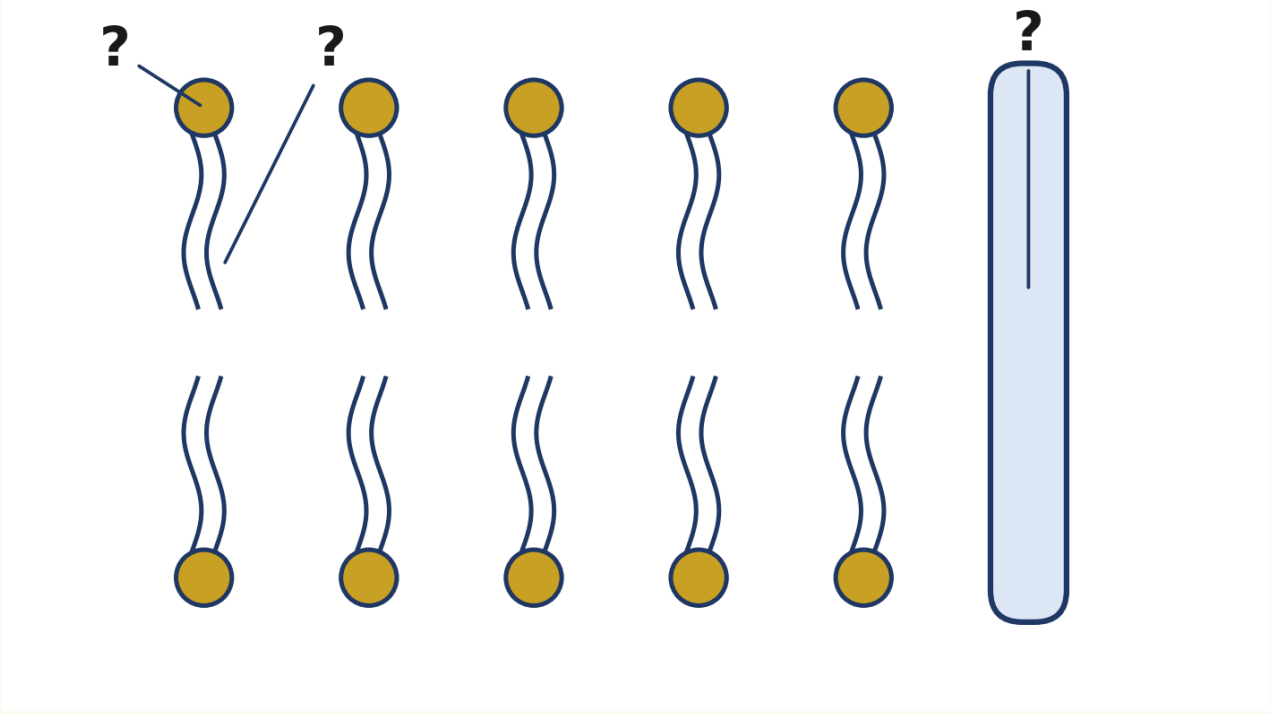
Worked examples

EXAMPLE 1

Q Draw and label a cell membrane section.



SOLUTION

Draw two rows of phospholipids: heads facing out, tails facing in.

Place protein channels spanning the bilayer.

Label heads hydrophilic, tails hydrophobic, proteins as channels.

The result is bilayer with heads out, tails in, proteins spanning it.

Scientists call this arrangement the fluid mosaic model: fluid because its parts move around, and mosaic because it is made of many different parts fitted together.

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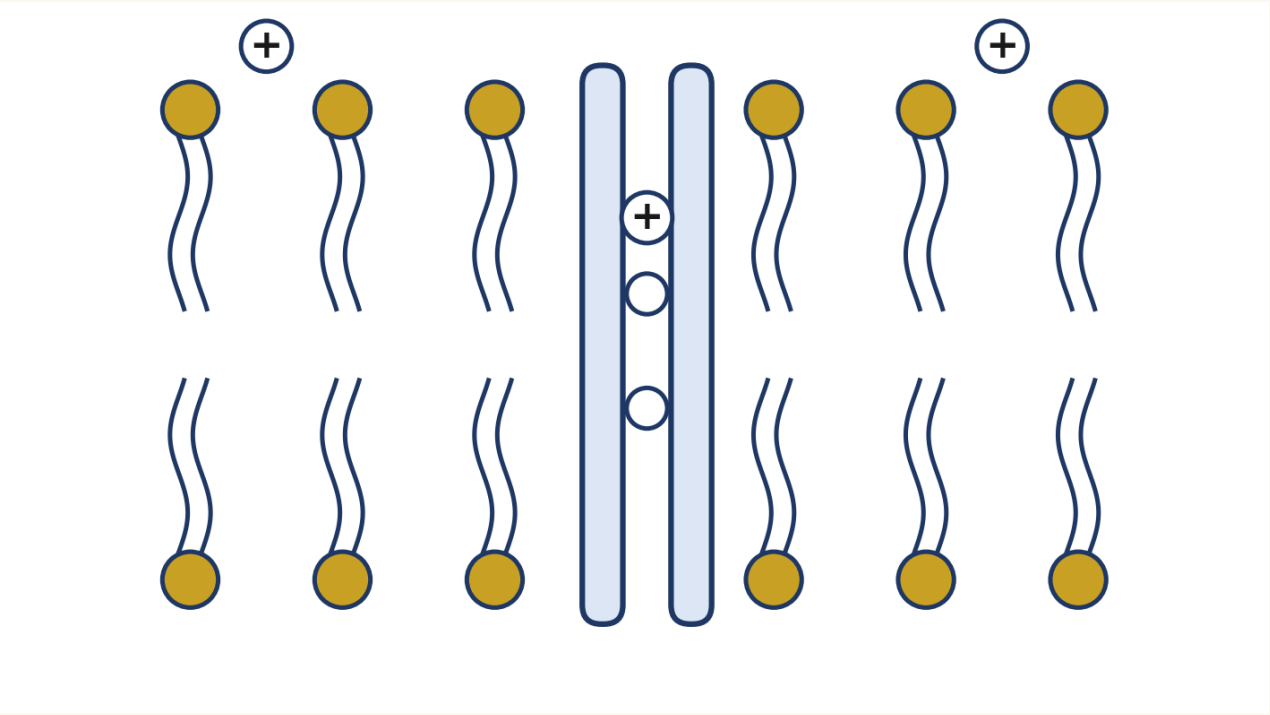
EXAMPLE 2

Q Why can small non-polar molecules cross easily but ions cannot?



SOLUTION

Check the barrier: the hydrophobic tails repel charged ions.

Small non-polar molecules dissolve through the tails.

Conclude: ions need channels, non-polar molecules do not.

The result is ions need protein channels; non-polar molecules pass.

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Practice questions

1 What sits in the middle of the membrane, facing away from the water on both sides?

- **A** The hydrophobic tails
- **B** The hydrophilic heads
- **C** The protein channels
- **D** The water outside

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2 What part of a phospholipid is attracted to water?

- **A** The head
- **B** The tail
- **C** The protein
- **D** The bilayer

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3

Which molecule crosses the membrane most easily?

A Oxygen

B Glucose

C Sodium ion

D Amino acid

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4

A charged ion is outside a cell. Why can it not cross the membrane on its own, and how does it get in?

A The hydrophobic tails repel it, so it needs a protein channel

B The hydrophilic heads attract it, so it passes straight through

C The bilayer dissolves it, so it passes straight through

D The tails attract it, so it passes straight through

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5 Membrane made of what?

- A A phospholipid bilayer
- B A single layer of protein
- C A wall of cellulose
- D A layer of cholesterol only

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6 Heads are hydrophilic or hydrophobic?

- A Hydrophilic
- B Hydrophobic

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7 Tails are hydrophilic or hydrophobic?

A Hydrophobic

B Hydrophilic

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8 What is the model of the membrane called?

A Fluid mosaic model

B Lock and key model

C Cell wall model

D Double helix model

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9 What do proteins do in the membrane?

A Channels and carriers

B Store energy for the cell

C Make the membrane rigid

D Break down waste in the cell

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10 Why is the membrane called fluid?

A Its parts move

B Its parts are fixed in place

C It is made of solid protein

D It never lets anything through

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ANSWER KEY

1. The hydrophobic tails

2. The head

3. Oxygen

4. The hydrophobic tails repel it, so it needs a protein channel

5. A phospholipid bilayer

6. Hydrophilic

7. Hydrophobic

8. Fluid mosaic model

9. Channels and carriers

10. Its parts move

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