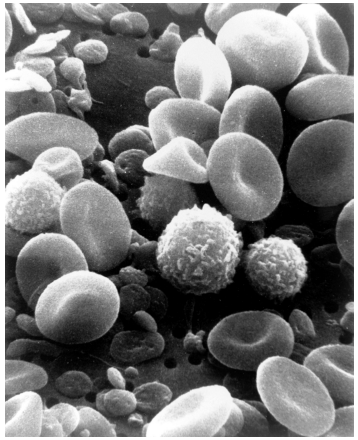
Exercise walk-through

4.1
Fluid mosaic membranes

A-Level Biology

What we will cover

1. The fluid mosaic model
2. Cell signalling
3. Diffusion & osmosis
4. Active & bulk transport
5. Surface area : volume
6. Cells in solutions



each cell has a membrane

What is in the membrane, and what each part does

phospholipids	the two layers – they form the basic barrier
cholesterol	between the tails – regulates fluidity and adds **stability**
channel proteins	a water-filled pore for facilitated diffusion of ions
carrier proteins	change shape to move a specific molecule – facilitated diffusion or active transport
glycoproteins and glycolipids	carbohydrate chains on the outside – cell recognition, **antigens** , and receptors
together	they give the membrane its stability, its fluidity, and its **permeability**

> "Fluid mosaic": fluid because the phospholipids move past one another, mosaic because the proteins are scattered through them.

Topic 4 – key takeaways

1 Fluid mosaic

a fluid bilayer dotted with proteins

2 Passive vs active

diffusion down gradient; active needs ATP

3 Osmosis

water moves to lower water potential

4 Water balance

turgid/plasmolysed; burst/shrink

Exercises 2.1·2.2

2.1 State the role of each membrane component. [3]

component	role
cholesterol	
carrier protein	
glycoprotein	

2.2 Explain why the phospholipids form a bilayer in water. [2]

Exercises 2.1·2.2

2.1 State the role of each membrane component. [3]

component	role
cholesterol	
carrier protein	
glycoprotein	

2.1

- cholesterol – controls fluidity / adds strength; carrier protein – carries specific molecules across; glycoprotein – cell recognition / receptor / antigen

2.2 Explain why the phospholipids form a bilayer in water. [2]

2.2

- the hydrophilic heads are attracted to water on both sides while the hydrophobic tails are repelled by water; so the tails face inward and heads outward, forming two layers

Exercises 3.1·3.2

3.1 Which part of the membrane is responsible for cell recognition? [1]

- [ ] **A** cholesterol
- [ ] **B** glycoproteins
- [ ] **C** the hydrophobic tails
- [ ] **D** channel proteins

3.2 Why does only the target cell respond to a particular hormone? [1]

- [ ] **A** only the target cell is near the gland
- [ ] **B** only the target cell has a receptor with a complementary shape
- [ ] **C** the hormone is only made near the target cell
- [ ] **D** the hormone is hydrophobic

Exercises 3.1·3.2

3.1 Which part of the membrane is responsible for cell recognition? [1]

- **A** cholesterol
- **B** glycoproteins
- **C** the hydrophobic tails
- **D** channel proteins

3.1 B

- Glycoproteins (carbohydrate chains) are used for cell recognition

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3.2 Why does only the target cell respond to a particular hormone? [1]

- **A** only the target cell is near the gland
- **B** only the target cell has a receptor with a complementary shape
- **C** the hormone is only made near the target cell
- **D** the hormone is hydrophobic

3.2 B

- The receptor's shape is complementary to that ligand only

Exercise 3.3 (a)

3.3 An electron micrograph shows a cell surface membrane that is 7.0 mm thick at a magnification of $\times 1\,000\,000$.

(a) Calculate the actual thickness of the membrane, in nm. [2]

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(a)

- $\dfrac{7.0 \text{ mm}}{1\,000\,000} = 7.0 \times 10^{-6} \text{ mm} = 7.0 \text{ nm}$

Exercise 3.3 (b)

3.3 An electron micrograph shows a cell surface membrane that is 7.0 mm thick at a magnification of $\times 1\,000\,000$.

(b) Explain why a phospholipid bilayer forms a good barrier to ions and large polar molecules. [2]

Exercise 3.3 (b)

3.3 An electron micrograph shows a cell surface membrane that is 7.0 mm thick at a magnification of $\times 1\,000\,000$.

(b) Explain why a phospholipid bilayer forms a good barrier to ions and large polar molecules. [2]

(b)

- the hydrophobic tail region repels charged/polar molecules, so ions and large polar molecules cannot pass straight through

Exercise 3.4

3.4 Describe the main stages of cell signalling that lead to a response in a target cell. [3]

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3.4

- a cell secretes a ligand; it is carried to and binds a complementary receptor on the target cell's membrane; binding triggers a specific response inside the target cell