

Exercise walk-through

Lipids ■ 1.5

eXercise

You must be able to

- describe lipids as **nonpolar** and **hydrophobic** 疏水
- describe a **phospholipid** 磷脂 (polar head, nonpolar tails)
- link phospholipid structure to the cell membrane

Method — Lipids are hydrophobic

Lipids are mostly nonpolar, so they do **not** mix with water (**hydrophobic**). They include fats (energy storage), phospholipids (membranes), and steroids.

Method — Fats store energy

Fats (triglycerides) pack a lot of energy per gram — more than carbohydrates — making them efficient long-term energy stores.

Method — Phospholipids build membranes

A **phospholipid** has a **polar (hydrophilic) head** and two **nonpolar (hydrophobic) tails**. This dual nature is the key to the membrane.

Method — The bilayer

In water, phospholipids arrange into a **bilayer**: heads face the water on both sides, tails hide inside, away from water. This forms the basic structure of the cell membrane.

Practice 2.1 ■ 1 mark

Do lipids mix with water? Give the term.

Solution 2.1

Method: Lipids are hydrophobic

Worked steps

No — they are hydrophobic **B1**.

Practice 2.2 ■ 2 marks

Describe the two parts of a phospholipid.

Solution 2.2

Worked steps

A polar (hydrophilic) head and two nonpolar (hydrophobic) tails **B1** **B1**.

Practice 2.3 ■ 1 mark

Which lipid stores energy efficiently?

Solution 2.3

Method: Fats store energy

Worked steps

Fats (triglycerides) **B1**.

Exam-style 3.1 ■ 1 mark

A phospholipid has a polar head and

- A** a polar tail
- B** two nonpolar tails
- C** no tail
- D** a charged tail

Solution 3.1

Method: Phospholipids build membranes

- A a polar tail
- B two nonpolar tails
- C no tail
- D a charged tail



Worked steps

B — two nonpolar tails.

Exam-style 3.2 ■ 2 marks

Phospholipids form a bilayer in water.

- (a) Describe how the heads and tails are arranged in the bilayer.
- (b) Explain why this arrangement forms spontaneously in water.

Solution 3.2

Method: The bilayer

Worked steps

(a) The polar heads face the water on both surfaces; the nonpolar tails point inward, away from water **M1 A1**. (b) The hydrophobic tails are excluded from water and cluster together, while the hydrophilic heads interact with water, so the bilayer self-assembles **M1 A1**.

Exam-style 3.3 ■ 2 marks

Explain why fats are better than carbohydrates for long-term energy storage.

Solution 3.3

Method: Fats store energy

Worked steps

Fats store more energy per gram than carbohydrates and are hydrophobic (stored without water), making them a compact, efficient long-term store **M1** **A1**.