AP BIOLOGY • EXERCISE SHEET

1.5 Lipids

Name: _____ Class: _____ Date: _____ **Total: 11 marks**

Objective

Build the skills to answer exam questions on **lipids**.

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

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.

Lipids are hydrophobic

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

Fats store energy

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

Phospholipids build membranes

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

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.

2 Practice

Now apply the methods above.

2.1 Do lipids mix with water? Give the term. [1]

2.2 Describe the two parts of a phospholipid. [2]

2.3 Which lipid stores energy efficiently? [1]

3 Exam-style questions

3.1 A phospholipid has a polar head and [1]

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

3.2 Phospholipids form a bilayer in water.

(a) Describe how the heads and tails are arranged in the bilayer. [2]

(b) Explain why this arrangement forms spontaneously in water. [2]

3.3 Explain why fats are better than carbohydrates for long-term energy storage. [2]

4 Go further

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

- work through the **1.5 Lipids** lesson on the **Learn** page;
- read the **Lipids** section of the AP Biology handout on the **Know** page.

Solutions

2.1 No —they are hydrophobic.

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

2.3 Fats (triglycerides).

3.1 B —two nonpolar tails.

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

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