

Chapter 1 Biological molecules

1.4 Lipids (脂质)

- Sources: olive, nuts, seeds, and etc
- Elements: C, H, O
- Functions:
 - For energy storage
 - Provides structural support
 - Phospholipids: components of plasma membrane
 - Cholesterol: maintain fluidity of cell membranes
 - To synthesise steroid hormones
 - To protect internal organs
 - As a heat insulator
- Types:
 - Fat
 - Lipoid
 - Steroid
- Characteristics:
 - Hydrophobic
 - Insoluble in water
 - Dissolve in organic solvents (acetone, ether, chloroform, and benzene)

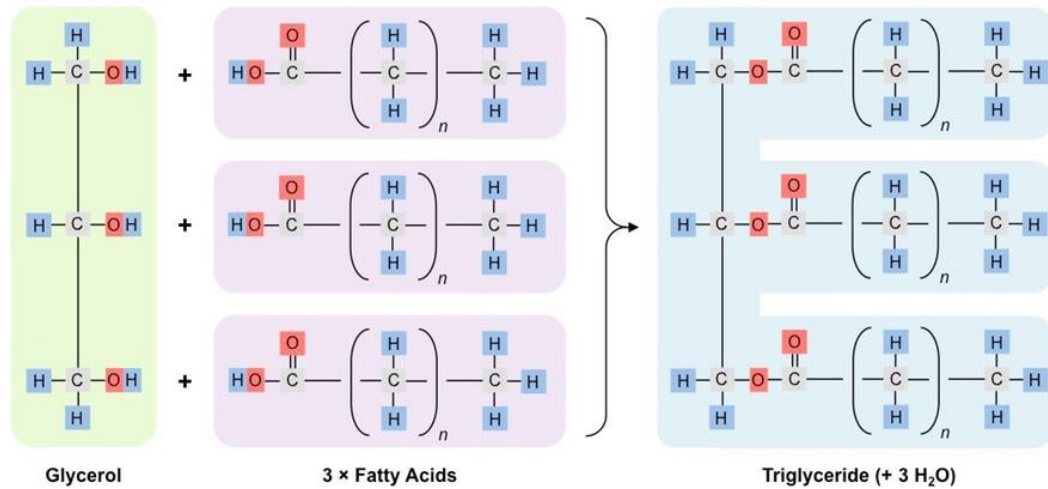
Fats

- Fats and oils are placed in category called triglyceride (甘油三酯)
- A triglyceride is made up of one molecule of glycerol (甘油) and three molecules of fatty acid (脂肪酸)

Characteristics	Saturated fats (饱和脂肪)	Unsaturated fats (不饱和脂肪)
Type of chemical bond	Single bond C-C (Saturated fatty acids 饱和脂肪酸)	Double bond C=C (Unsaturated fatty acids 不饱和脂肪酸)
Chains	Fatty acids form straight chains	The fatty acids will bend at the double bonds
Melting point (熔点)	Higher	Lower
At room temperature	Solid	Liquid
Stability	More stable	Less stable
Example	Animal fat: lard (猪油)	Vegetable oil: peanut oil
Similarities	<ul style="list-style-type: none">• Both are triglycerides (1 glycerol + 3 fatty acids)• Both are insoluble in water	

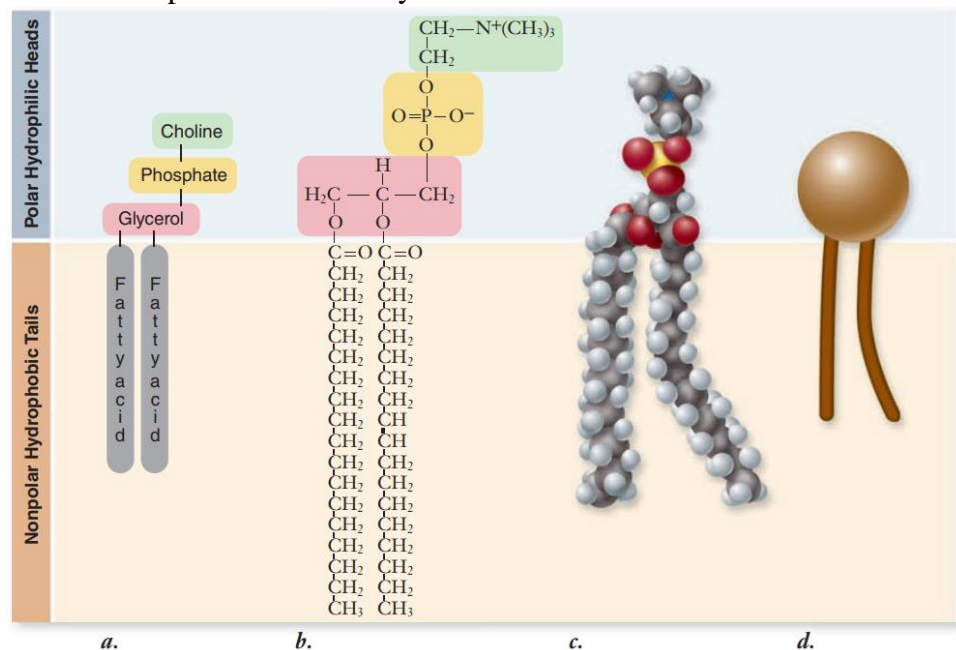
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- The formation of a triglyceride by condensation reaction



Lipoid (类脂)

- A fat like substance, e.g., phospholipids, glycolipids and etc
- Phospholipid
 - Composed of two fatty acids, a glycerol, and a phosphate group
 - The major component of plasma membrane
 - A molecule with both polar (hydrophilic 亲水性) and non-polar (hydrophobic 疏水性) properties
 - Polar head: phosphate (a charged ion)
 - Non-polar tail: two fatty acids



- In aqueous medium, the phospholipids spontaneously arrange themselves to form a double layer (bilayer) with the hydrophobic tails facing the inside and their hydrophilic heads facing the outside

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Steroids (固醇类)

- A steroid is a complex organic compound with four rings of carbon atoms interconnected to form the main skeleton and side chains of variable length

Steroids	Functions
Cholesterol (胆固醇)	Component of the plasma membrane (reduces the fluidity of cell membranes)
Bile acids (胆汁酸) (in salt form)	Emulsify (乳化) fats
Testosterone (睾丸酮)	Male reproductive hormone
Oestrogen (雌激素) and progesterone (黄体酮)	Female reproductive hormone
Vitamin D	Regulation of calcium and maintenance of phosphorus levels in the blood