

Review of the Macromolecules of Life

Biomolecules or Macromolecules are a group of structures that are important to all living things. All of these molecules are made up of, at least, the following elements:

Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorous, & Sulfur
Or easier know as:

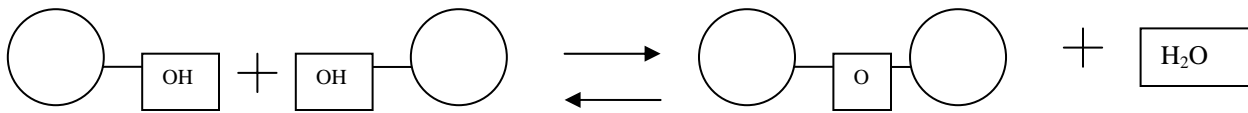
CHONPS

The macromolecules are either monomers or made of many monomers, called polymers.

Monomers are the building blocks of all **polymers**. Monomers are joined together by the process of **dehydration** (or **condensation**) synthesis. Water is lost in the joining of two or more monomers.

Hydrolysis is the process of individual monomers being broken off of a polymer (or when polymers are broken down). Water is added in this breaking down process, hence the name **hydro-**, and **-lysis** meaning to brake down.

Dehydration (or **condensation**) synthesis \longrightarrow
Hydrolysis \longleftarrow



Carbohydrates

Molecules based upon multiples of CH_2O

Ex: $6 \times \text{CH}_2\text{O} = \text{C}_6\text{H}_{12}\text{O}_6$

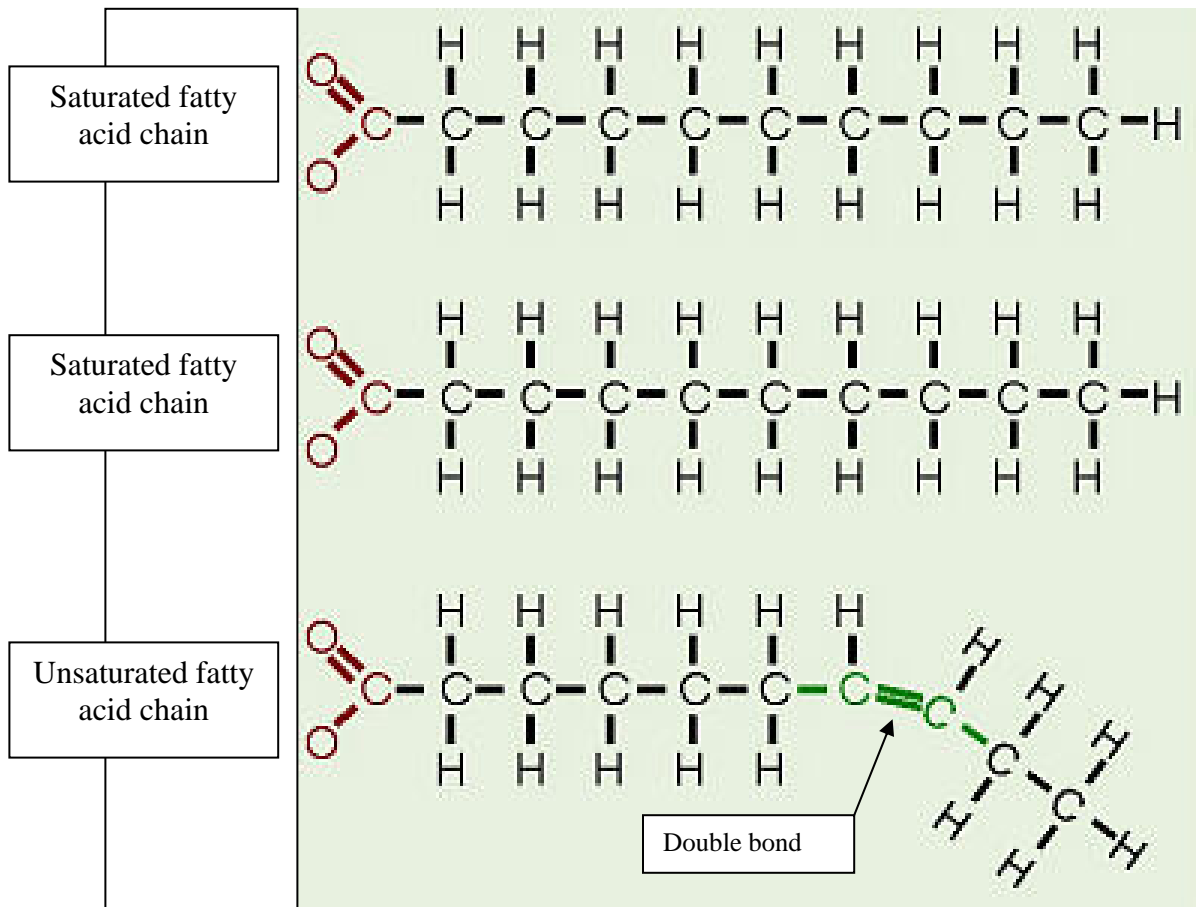
I

Component & Example	Functions
Monosaccharides	
Disaccharides	
Polysaccharides	
	Plant Storage
	Plant Structural
	Animal Storage
	Animal Structural

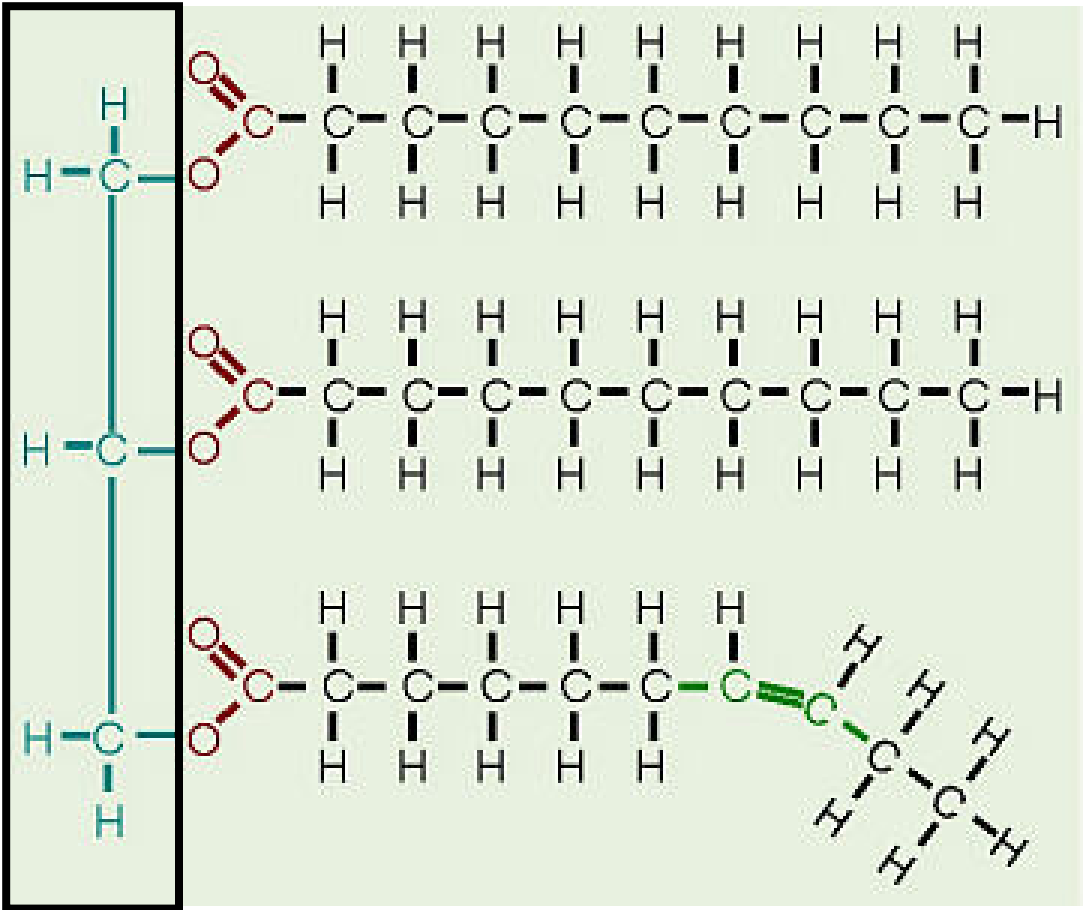
Lipids

I. Fatty acids & Triglycerides (glycerols)

- A. Hydrocarbon chain of 10 to 50 carbons in length.
- B. Tails can be saturated (solid at room temperature) or unsaturated (liquid at room temperature) with hydrogen
- C. Unsaturated tails have fewer hydrogens attached due to double covalent bonds between carbons in the chain.
- D. Functions include:



A triglyceride molecule:



Glycerol

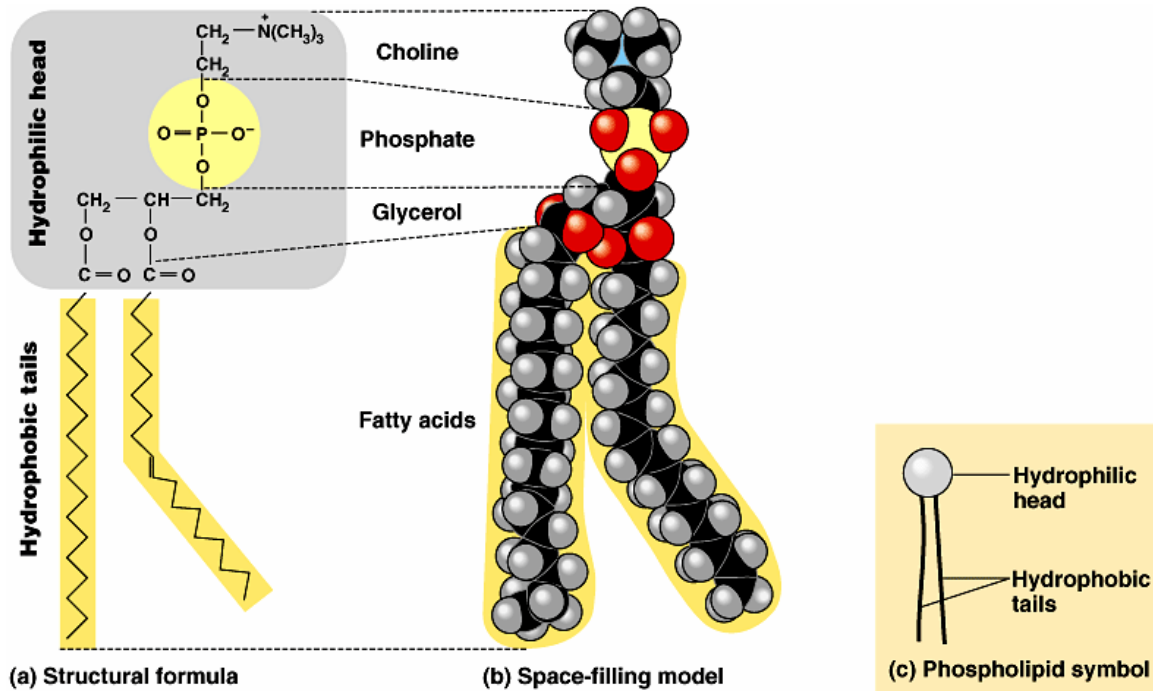
Fatty acid "tails"

II. Phospholipids

A. Phosphate head (polar/water loving)

B. Fatty acid tails (non-polar/water hating)

C. Function:



III. Steroids

A. Four ring structure

B. Cholesterol

C. Functions:

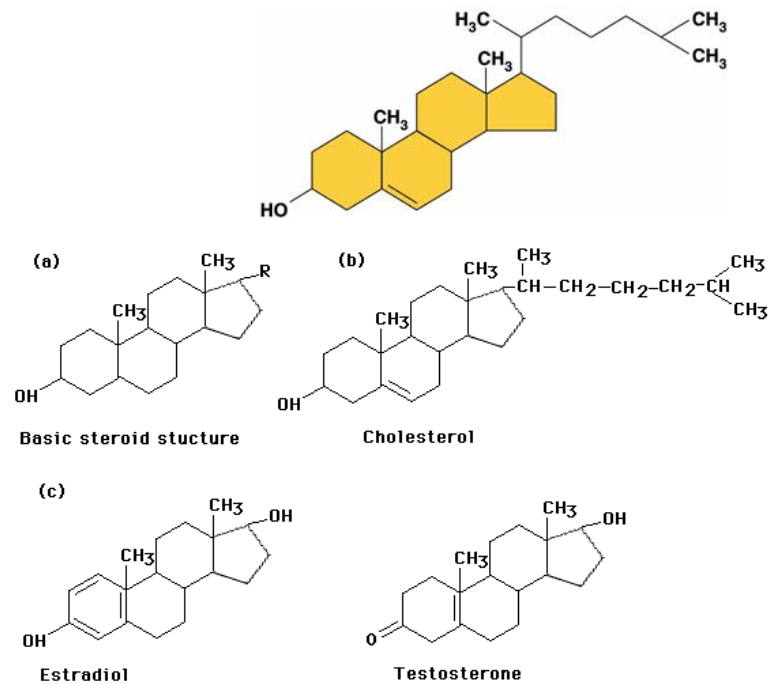
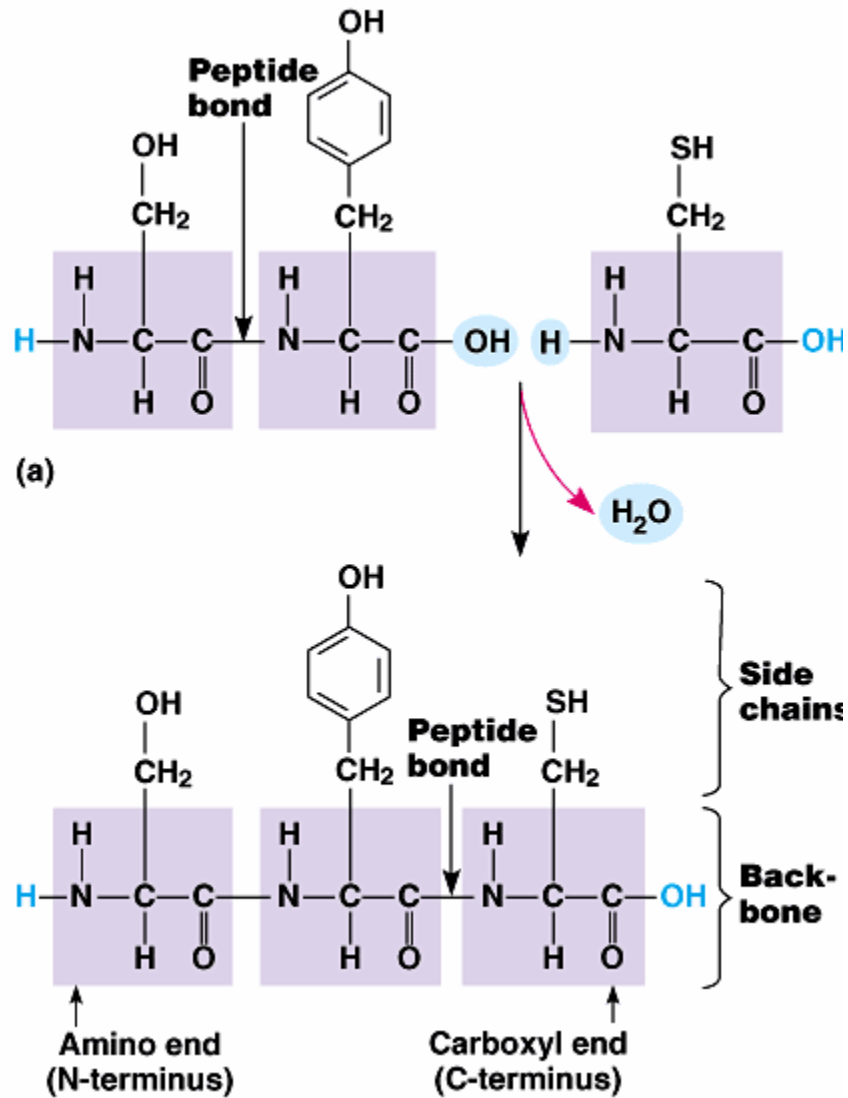


Fig. (a) Basic structure of the steroids. (b) Cholesterol (c) Estradiol, a mammalian female sex hormone. (d) Testosterone, a mammalian male sex hormone

IV. Waxes

Functions:

Amino acids are joined together, by dehydration/condensation synthesis, to form a peptide or the beginnings of a protein. The bond that holds two amino acids together is called a peptide bond.



Proteins have four levels of structure:

Primary:

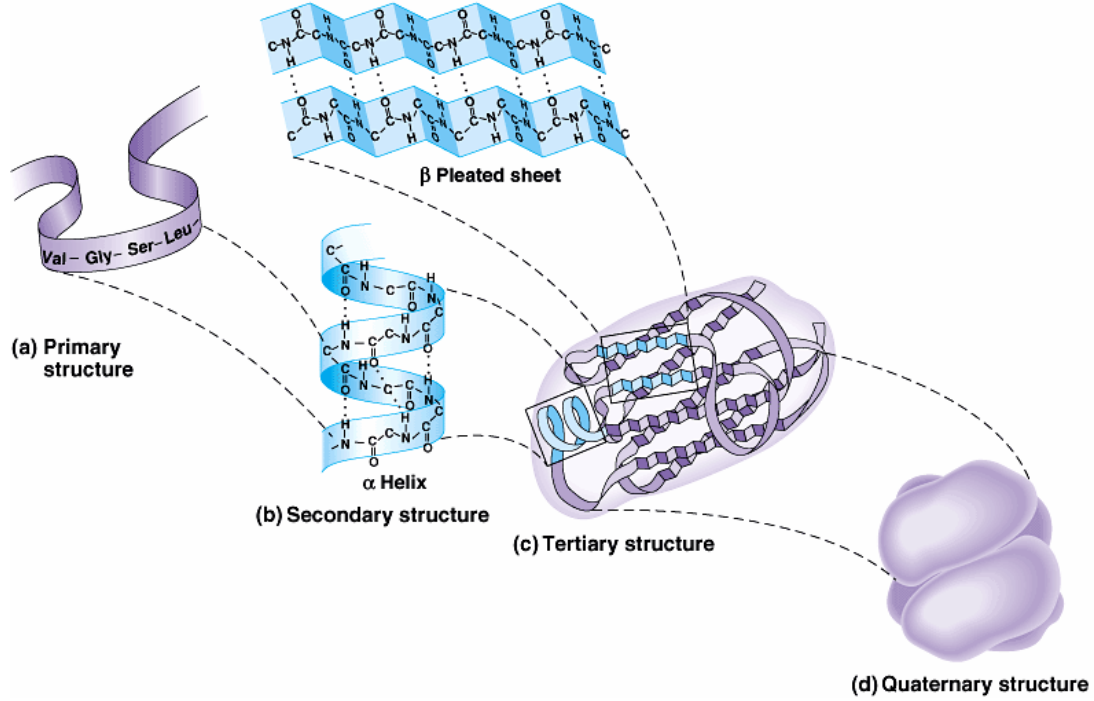
Secondary:

α -helix:

β -pleated sheet:

Tertiary:

Quaternary:



A proteins function is determined by its conformation, which is determined by its structure, which is determined by its amino acid sequence:

Amino acid sequence \rightarrow Protein structure/shape \rightarrow Conformation \rightarrow Function

Protein functions:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

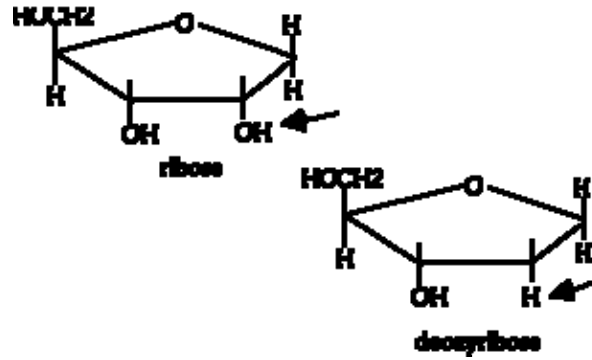
Nucleic Acids

I. DNA (Deoxyribonucleic acid) & RNA (Ribonucleic acid)

II. Monomers are nucleotides

A. Nucleotides are made of:

1. Pentose sugar



2. Nitrogen base

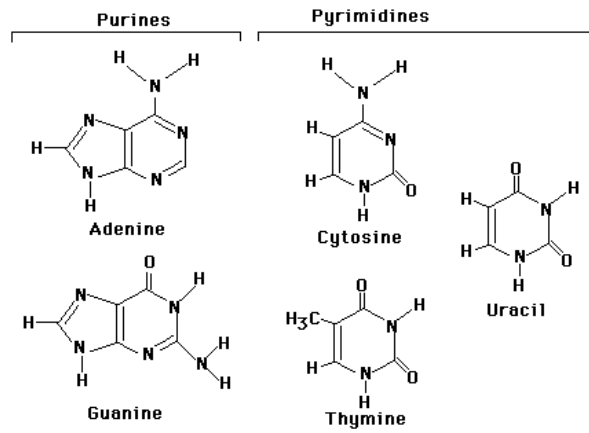
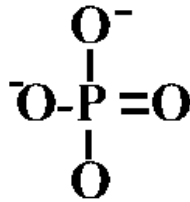
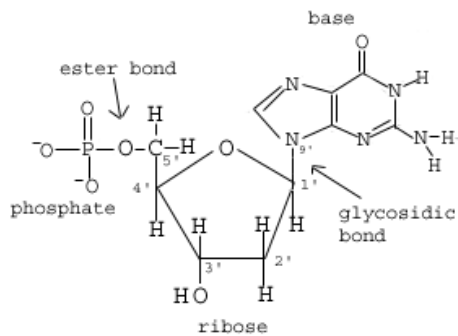


Fig. Structural formulas of the purines and pyrimidines.

3. Phosphate group

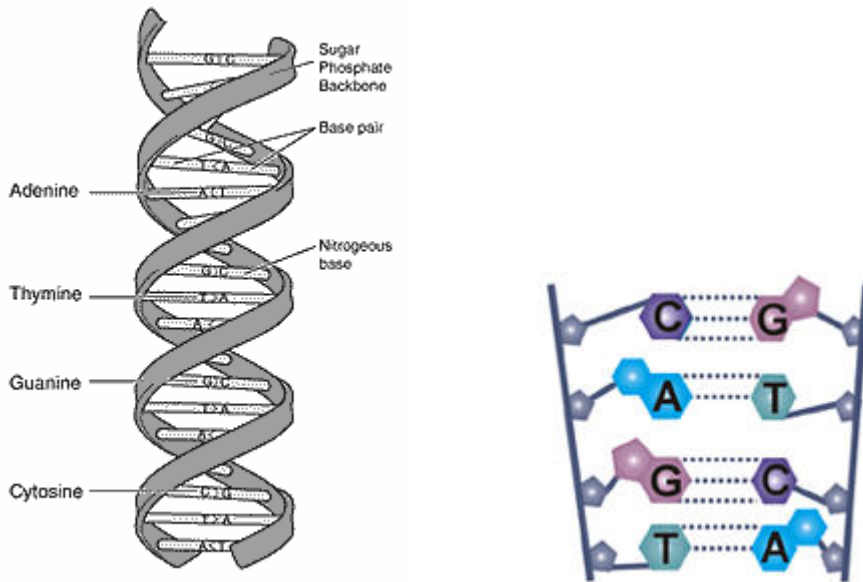


Put it all together :



III. DNA Structure & Function

A. Double alpha-helix



B. DNA Function:

IV. RNA Structure & Function

A. Types of RNA include:

1. rRNA

Function:

2. mRNA

Function:

3. tRNA

Function:

