

Biology 20

Molecules of Life

Organic chemistry:

CARBON:

- Atomic # = _____, therefore has _____ valence electrons
- Forms covalent bonds with:

Hydrocarbons:

6 FUNCTIONAL GROUPS: (p. 35; Fig. 3.2)

1. **HYDROXYL GROUP**
2. **CARBONYL GROUP**
 - ALDEHYDES** (C dbl bond O at the end)
 - KETONES** (C dbl bond O in middle)
3. **CARBOXYL GROUP**
 - carboxylic acids.**
4. **AMINE GROUP**
 - amines**
5. **SULFHYDRYL GROUP**
6. **PHOSPHATE GROUP**
 - Ex. $\text{ATP} \rightarrow \text{ADP} + \text{Pi}$

Macromolecules:

4 classes of macromolecules in living organisms:

1. Carbohydrates
2. Proteins
3. Nucleic acids
4. Lipids

Classifying organic compounds:

Monomers:

Polymers:

Formation of polymers:

Dehydration synthesis:

Ex. glucose + glucose = maltose (found in beer)

Breaking of polymers:

Hydrolysis (water; loosening or splitting)

Ex. digestive enzymes

Types of Macromolecules:

CARBOHYDRATES:

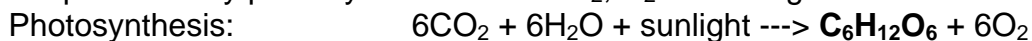
Classified by:

1. **Monosaccharides** = (mono = single; sacchar = sugar) (p. 37; fig. 34B)

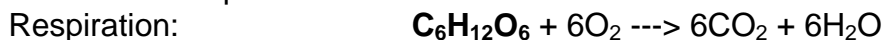
Simple sugar composed of:

Major nutrient for cells, with glucose being the most common.

Can be produced by photosynthesis from CO₂, H₂O & sunlight.



Used in cellular respiration.



Can be used into forming disacchrides & polysaccharides.

2. **Disaccharides** =(Di = two; saccharide = sugar)

Results from the removal of:

(p. 38; fig. 3.5)

Disaccharide	Monomers	Usage
Maltose		
Lactose		
Sucrose		

3. **Polysaccharide:** (p. 28; fig. 2.13)

-2 important biological functions:

1. **Energy storage** (starch & glycogen)

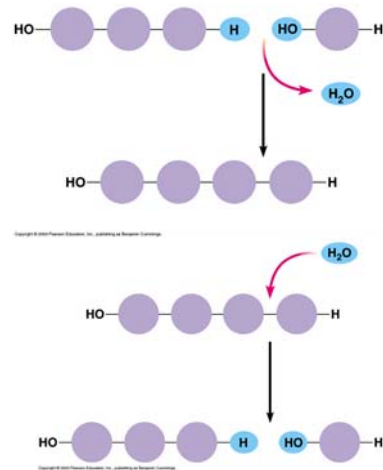
a) **Starch:**

b) **Glycogen:**

2. **Structural support** (cellulose & chitin)

a) **Cellulose:**

b) **Chitin:**



PROTEINS: (pp. 31-35; Figures 2.18 – 2.21)

Peptide bond (p. 32; Fig. 2.18):

-N-C-C-N-C-C- = backbone
Polypeptide chain =

There are **20 amino acids** which make up proteins.

Amino acids contain both **carboxyl** and **amino** functional groups.

Levels of protein structure (p. 34; Fig. 2.20):

a) **Primary structure** (1°):

b) **Secondary structure** (2°):

2 types of secondary structure:

α helix

β pleated sheet

c) **Tertiary structure** (3°):

1. Weak interactions (but cumulatively make it stable)

a)

b)

c)

2. Covalent linkage
disulfide bridges

d) **Quaternary structure** (4°):

Ex. Hemoglobin = 4 subunits

Denaturation:

Causes of denaturation:

1.

2.

3.

4.

8 Functions of proteins:

1. structural support

2. storage

3. transport

4. hormonal

5. receptor

6. contractile

7. defense

8. enzymatic

NUCLEIC ACIDS: (p. 35 - 36; Fig. 2.22)

Nucleotide = building block of a nucleic acid; composed of:

a) Pentose (5-C sugar)

b) Nitrogeneous bases: **Pyrimidine:**

Purine:

c) Phosphate Group:

3 Examples of Nucleotide based molecules:

1. **DNA** = deoxyribonucleic acid

DNA: the double helix = 3-D shape = Watson & Crick => 1953

Contains:

2. **RNA** = ribonucleic acid

Contains:

3. **ATP** = adenosine triphosphate

Functions of Nucleotide based molecules

- a)
- b)
- c)
- d)

LIPIDS: (p. 29 – 31)

1. **Fats:** macromolecules constructed from:

a) glycerol = 3C -OH

b) Fatty acid (carboxylic acid)

 carboxyl:

 hydrocarbon tail:

Formation of fats (p. 30; Fig. 2.15)

Triglycerides:

SATURATED	UNSATURATED
Ex.	Ex.

2. **Phospholipids** (p.31, Fig. 2.16A)

Composed of:

Hydrophilic heads & Hydrophobic tails

Amphipatic:

Micelles:

Surfactant:

3. **Steroids** (p. 31; Fig. 2.16B)

Cholesterol

Functions of lipids:

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