

# Guided Notes - Macromolecules

Life on earth is Carbon based "Organic"

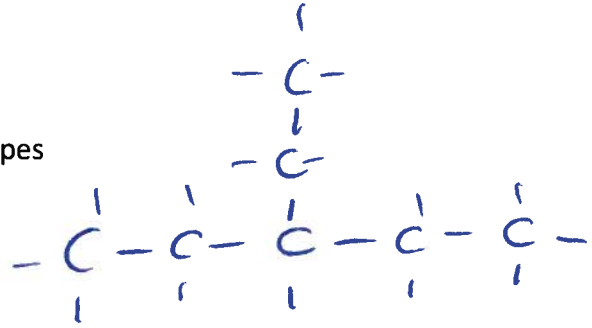
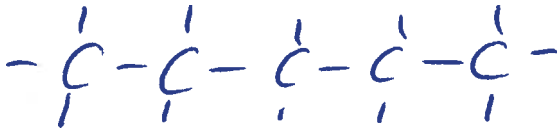
Carbon is special because:

it forms 4  
covalent bonds

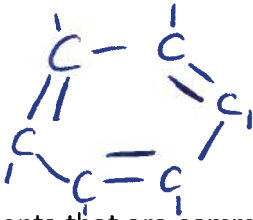
Carbon joins in ways that it forms large molecules in 3 shapes

1) Straight chain

2) Branched



2) Ring



The six elements that are common in all living things are

CHNOPS

Other Elements:

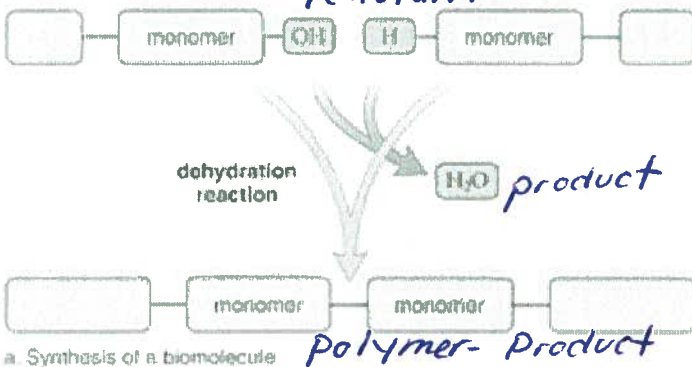
Na, Ca, Mg

Polymers - large molecules formed from smaller molecules (monomers)  
(many) units

## 4 Major Categories of Macromolecules

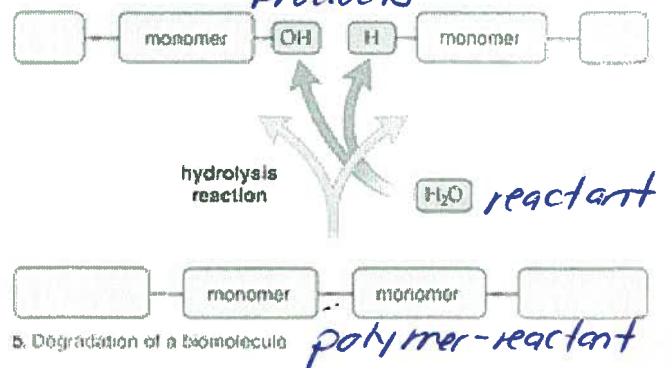
1. Carbohydrates
2. Lipids
3. Proteins
4. Nucleic acids

Made by Dehydration  
reactant



a. Synthesis of a biomolecule

Broken down by hydrolysis  
Products (cut)



b. Degradation of a biomolecule

# 1) Carbohydrates "Sugars and Starches"

\*\*\*There are always two hydrogen to every oxygen!

General structure:

N = # of units in a chain

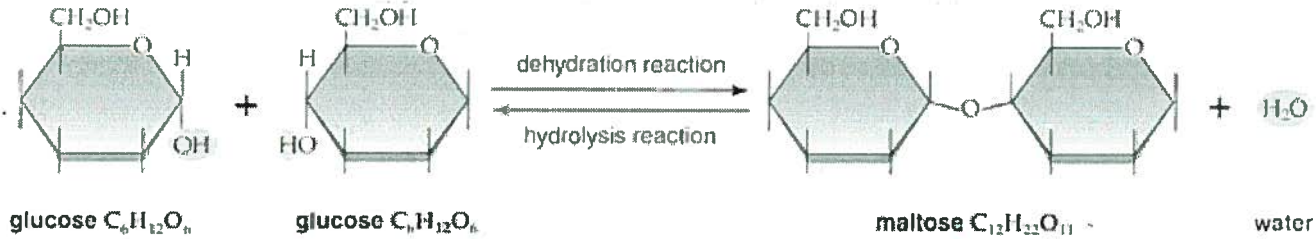


"Monosaccharide" single sugar  
*one sugar*

Glucose

and Fructose

- fast energy source



"Disaccharide" double sugar

lactose  
sucrose

- Found in milk

- Plant sugar (*table sugar*)

"Polysaccharide" many sugars

glycogen  
starch

- energy storage in animals (*liver*)

- energy storage in plants

Functions of Sugars:

*Fast #1*

- energy source
- energy storage
- structural support (cellulose, chitin)

→ plant cell walls

→ Fungus cell walls

Carbohydrate chains are in our cell membranes

2) Lipids - "Fats, Oils, and Waxes"

contain C, H, little O

### General structure:

\*fatty acids - chain of carbon/hydrogen "tails"

glycerol - alcohol "backbone"

other components - ex. Phosphate chain (ATP) or 4 carbon rings (Steroids)

no true monomer

mostly hydrocarbons  
that are  
nonpolar  
(hydrophobic)

### Types of Lipids

1. phospholipid - chains with phosphate groups → found in cell membrane

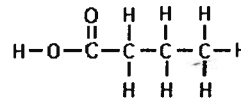
2. steroids - lipids like cholesterol (insulin) and estrogen and testosterone  
(hormones)

3. Fats - long term energy storage

### Three Structures of Fatty Acids

1. Saturated:

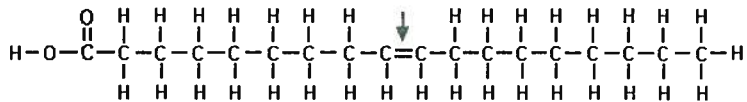
No double bonds ↔ carbon in chain



Butyric Acid- Saturated Fatty Acid

2. unsaturated:

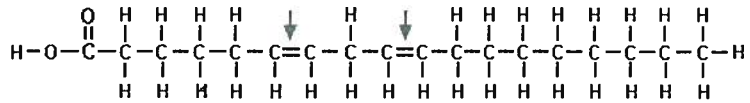
One double bond ↔ carbon in chain



Oleic Acid- Monounsaturated Fatty Acid

3. polyunsaturated:

Two or more double bonds ↔ carbons in chain



Linoleic Acid- Polyunsaturated Fatty Acid

### Functions of Lipids:

- Long term energy storage
- Barriers = cell membrane
- hormone production  
estrogen  
testosterone

# 3) Proteins

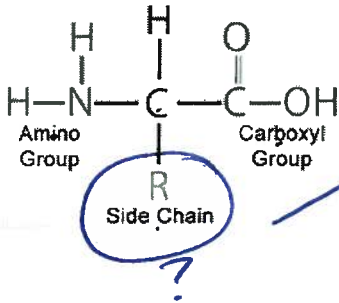
**General structure:** Amino Acids held together by peptide bonds in 3 dimensional chains

Elements:

*C H O N*  
*Sometimes Sulfur*

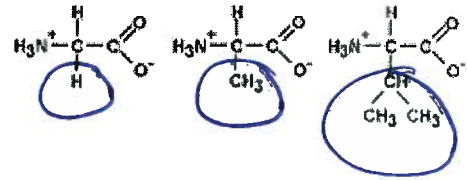
Structure of an Amino Acid:

## Amino Acid Structure



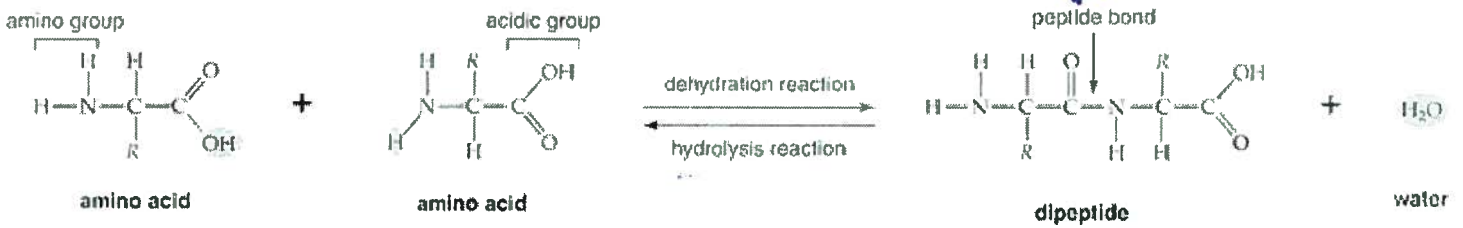
*20 different amino acids*

R = side chain (varies per amino acid)



Glycine (Gly)    Alanine (Ala)    Valine (Val)

Dipeptide – “Two amino acids”



## Protein Shape

1° = primary structure - this is the amino acid sequence in chain

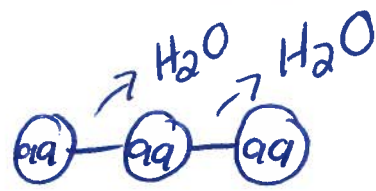
2° = secondary structure – folding into a unique 3 dimensional shape



3° = tertiary structure = *Protein Functions*

Ex. *muscle fiber*

Ex. *hemoglobin on red blood cells*



**Function of Proteins:** \*15% of your body mass is protein

EXAMPLES:

- Muscles, skin, hair
- Structural support
- Transport substances in/ within
- Communication in/ within
- Control rate of chem rxns
- Control cell growth

*→ ENZYMES*

# 4) Nucleic Acids - "Genetic Information"

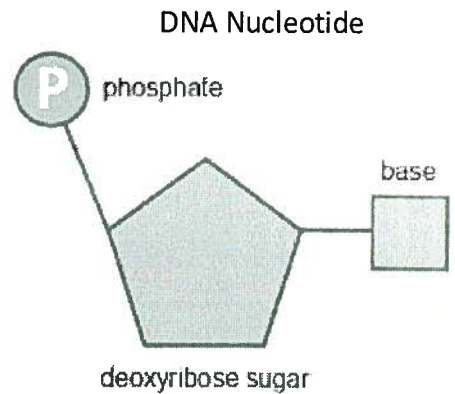
**General structure:** Nucleotides (small repeating subunits composed of C, H, O, N, and P)

3 Parts:

1. Phosphate group
2. 5 carbon sugar (Deoxyribose or ribose)
3. Nitrogen Base

Structure of Nucleotide:

DNA = A, T, C, G  
RNA = A, U, C, G



## 2 Types of Nucleic Acids

- 1) Deoxyribonucleic Acid DNA
- 2) Ribonucleic Acid RNA

## Functions of Nucleic Acids:

- Storage of genetic info *DNA*
- transmission of genetic info *RNA*
- chemical energy store (ATP) adenosine triphosphate

