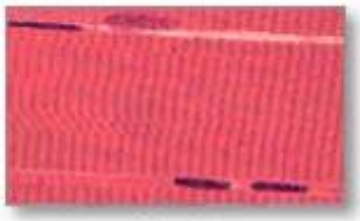
Section 10.1: The Function of Digestion

SBI3UP

Connective tissue

Epithelial tissue



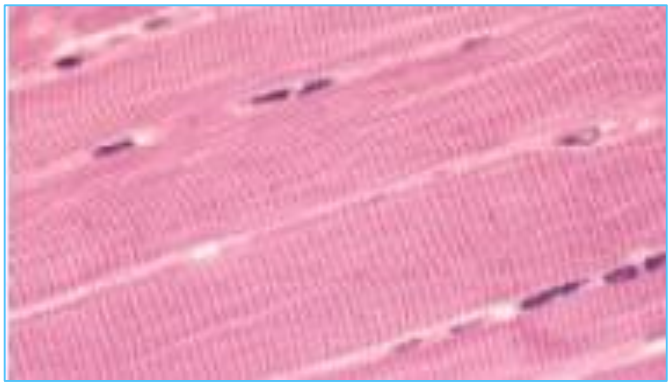
Muscle tissue

Nervous tissue

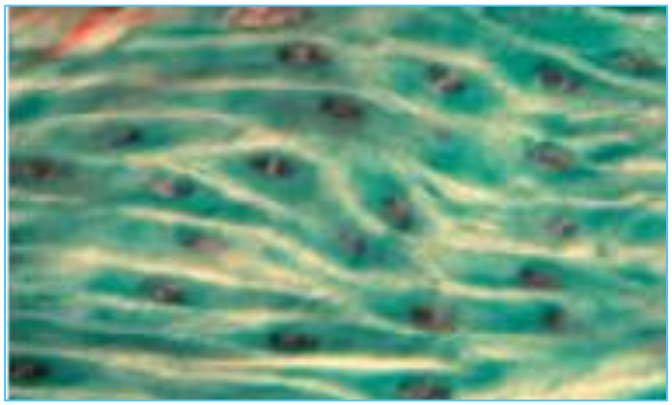
Tissue: a cluster of similar cells that share the same specialized structure and function.

There are four main types of tissue:

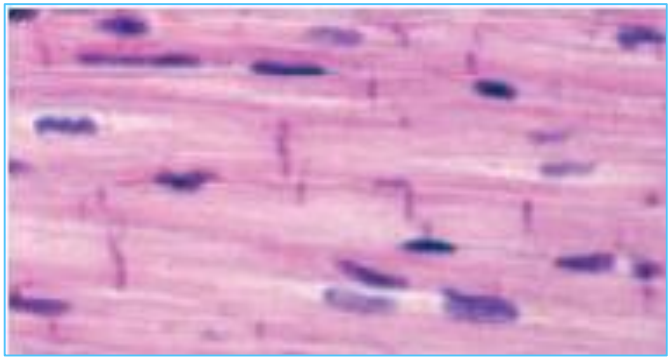
1. Epithelial
2. Muscle
3. Nervous
4. Connective



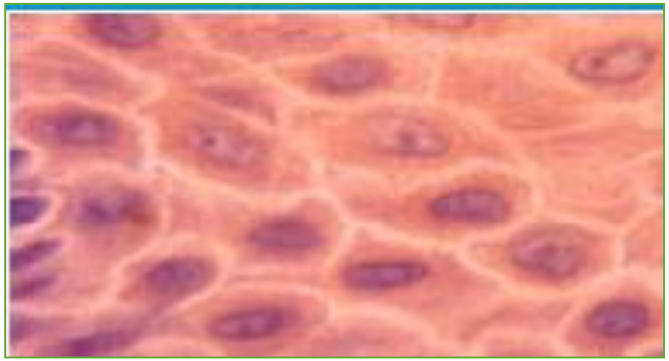
Skeletal Muscle



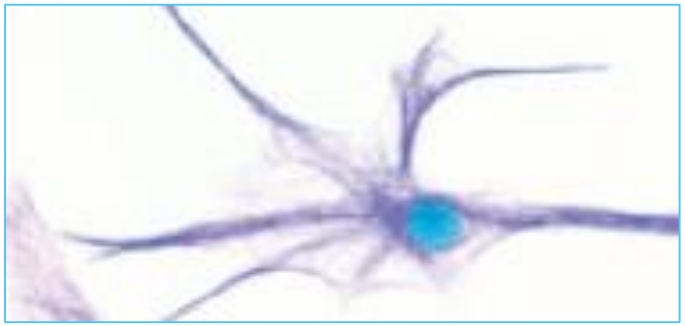
Smooth Muscle



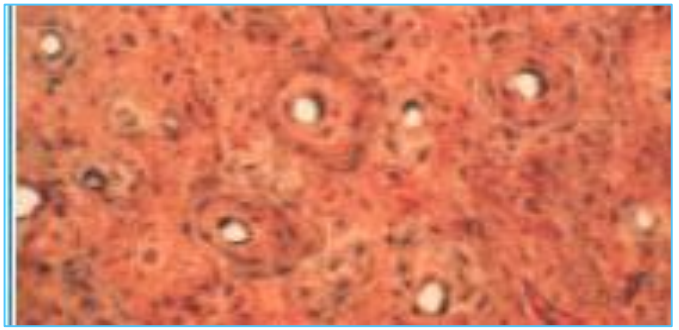
Cardiac Muscle



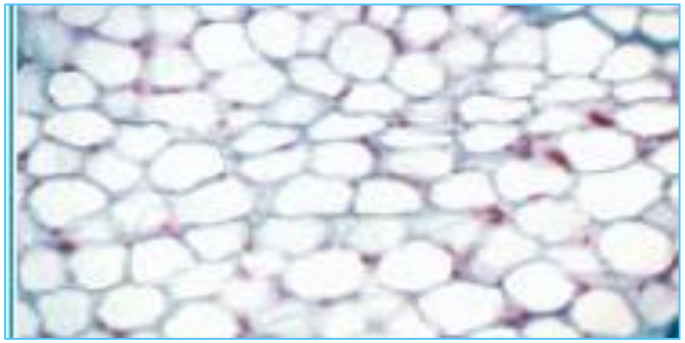
Skin Epithelial



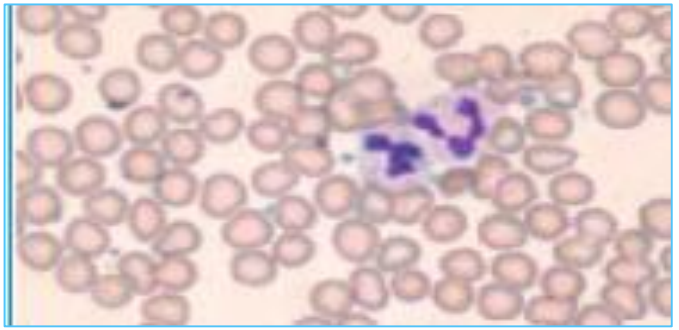
Nervous Tissue



Bone



Fat



Blood

Cells-Tissues-Organs-Organs Systems

Circulatory System

- transports blood, nutrients, gases, and wastes

Digestive System

- takes in food and breaks it down
- absorbs nutrients
- removes solid waste from the body

Respiratory System

- controls breathing
- exchanges gases in lungs

Excretory System

- removes liquid wastes from the body

Immune System

- defends the body against infections

Muscular System

- works with the bones to move parts of the body

Cells-Tissues-Organs-Organs Systems

Endocrine System

- manufactures and releases hormones that act, along with the nervous system, to keep various body systems in balance

Reproductive System

- includes reproductive organs for producing offspring

Integumentary System
[pronounced in-TEG-u-MEN-tar-ee]

- includes skin, hair, and nails
- creates a waterproof barrier around the body

Nervous System

- detects changes in the environment and signals these changes to the body, which then responds

Skeletal System

- supports, protects, and works with muscles to move parts of the body

What does it mean to be healthy?

"Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." -*World Health Organization*

Physical Health + Mental Health + Social Health

What does it mean to be healthy?

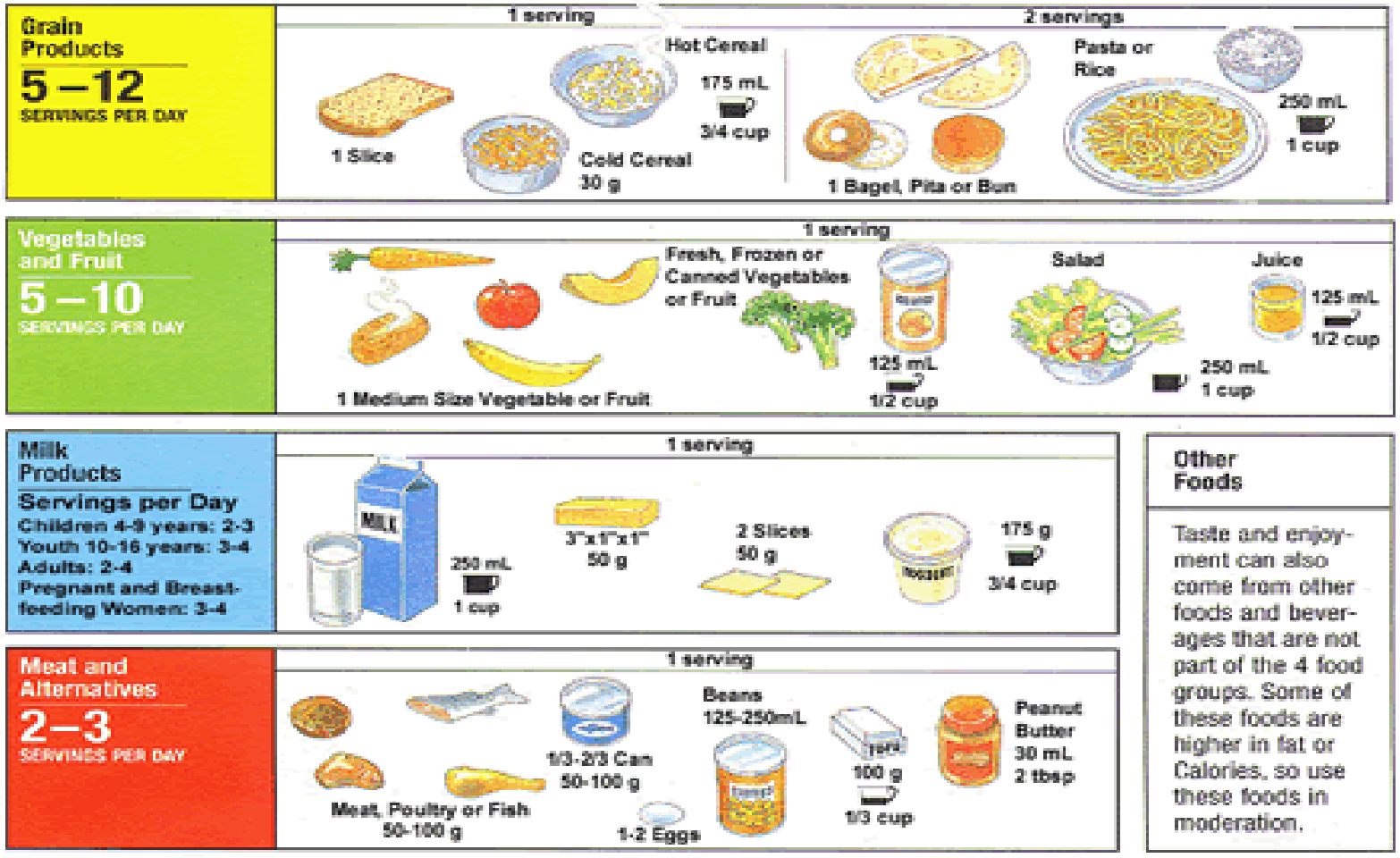
Physical Health

Balanced Diet

Regular Exercise

Limited Exposure to Toxins

Canada's Food Guide



Energy from Food

Cells in the body require constant supply of energy to perform functions.

Energy comes from consumption of food and the process of cellular respiration.

The amount of energy required depends on the individual.

Caloric Intake per Day

Males

Age	Sedentary[1] Level	Low Active[2] Level	Active[3] Level
2-3 y	1100	1350	1500
4-5 y	1250	1450	1650
6-7 y	1400	1600	1800
8-9 y	1500	1750	2000
10-11 y	1700	2000	2300
12-13 y	1900	2250	2600
14-16 y	2300	2700	3100
17-18 y	2450	2900	3300
19-30 y	2500	2700	3000
31-50 y	2350	2600	2900

Females

Age	Sedentary Level	Low Active Level	Active Level
2-3 y	1100	1250	1400
4-5 y	1200	1350	1500
6-7 y	1300	1500	1700
8-9 y	1400	1600	1850
10-11 y	1500	1800	2050
12-13 y	1700	2000	2250
14-16 y	1750	2100	2350
17-18 y	1750	2100	2400
19-30 y	1900	2100	2350
31-50 y	1800	2000	2250

Energy from Food

The amount of daily energy required usually depends on an individual's:

1) Physical activity
2) Medical conditions
3) Gender (female vs. Male)
4) Age

Energy Consumption

Food provides energy and building blocks for many organisms.

The energy consumed must be converted into a usable form that the body's cells recognize (i.e ATP).

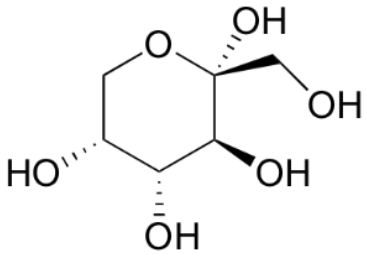
The food we consume when broken down into smaller subunits can be used by the cells in the body to create new molecules that the cell can use for metabolism.

Nutrient:

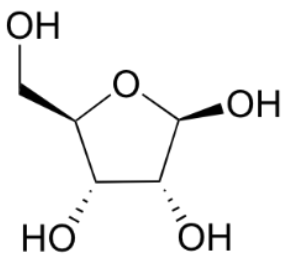
Nutrients

Nutrients are divided into two groups:

1) ***Organic****
   - produced by living organisms
   - carbohydrates, proteins and fats
   - contain **C** bonded to **H** and **O**



fructose



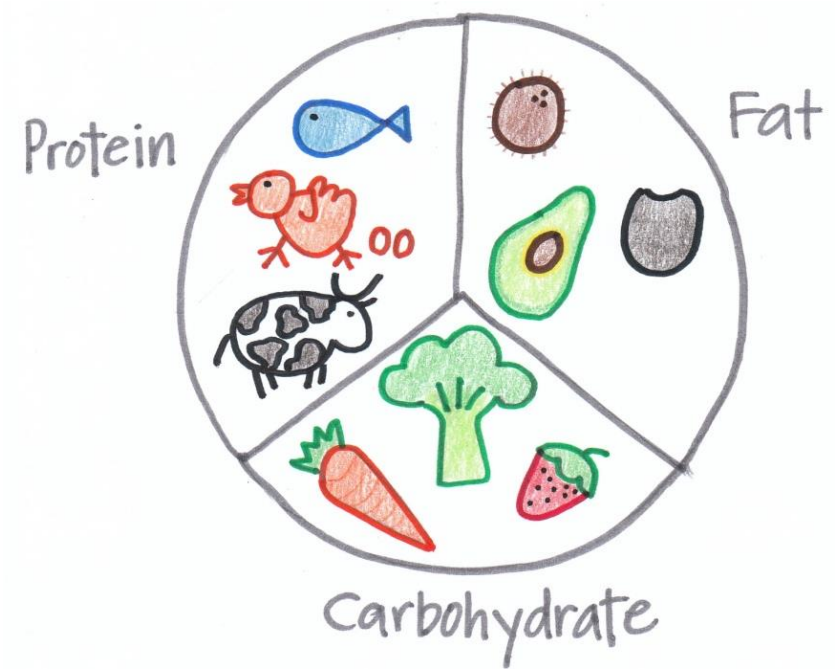
ribose

2) ***Inorganic***
   - comes from rocks, soil and the sea
   - minerals

**different from pesticide free organic in the grocery store – refers to its molecular makeup*

Macromolecules

Macromolecules are large, complex arrangement of organic molecules. These molecules must be consumed everyday in order to receive essential building blocks and energy.

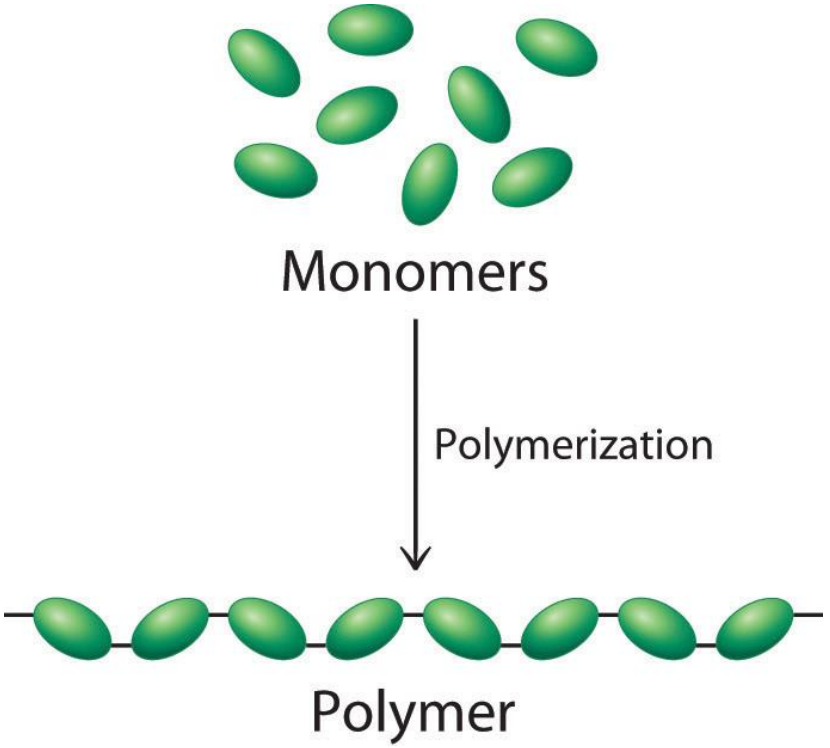


Macromolecules are required everyday and in large quantities.

Macromolecules - Structure

Monomer:

Polymer:



Macromolecules

There are 4 main groups of Macronutrients:

1) Carbohydrates
2) Lipids
3) Proteins
4) Nucleic Acids

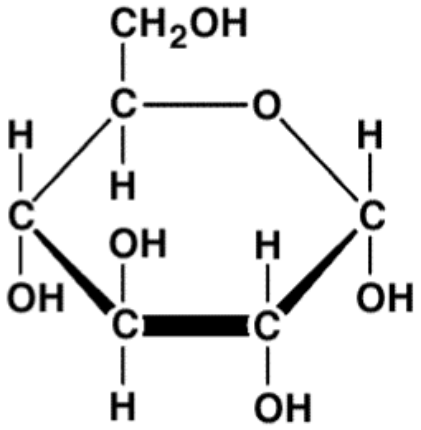
1) Carbohydrates

Consist of **Carbon, Hydrogen & Oxygen** atoms **(Ratio --- 1 : 2 : 1)**

Provides short-term or long-term energy storage for organisms

Provides materials to build cell membrane

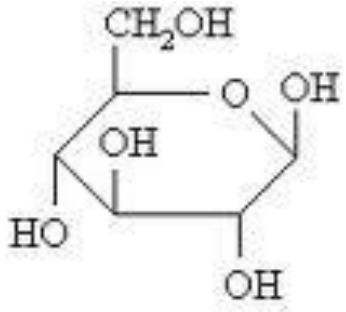
Ex. Glucose ($C_6H_{12}O_6$)



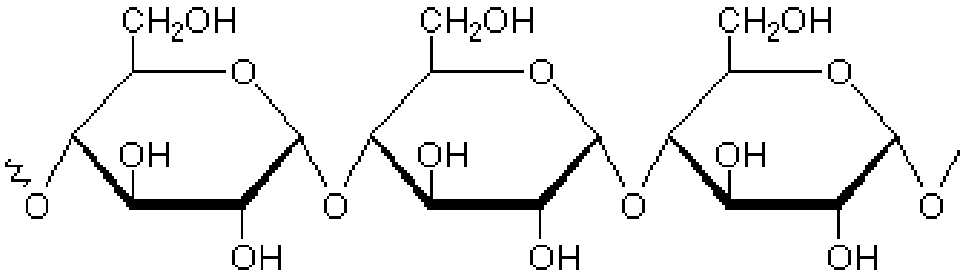
Glucose

1) Carbohydrates

There are two forms of carbohydrates:



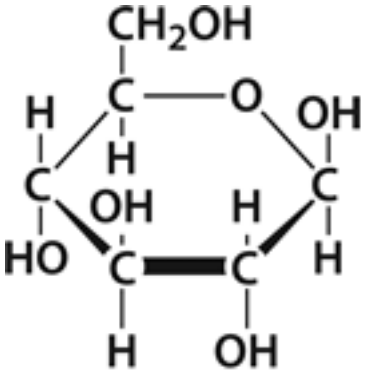
1) Monosaccahride *(Simple Sugar)*



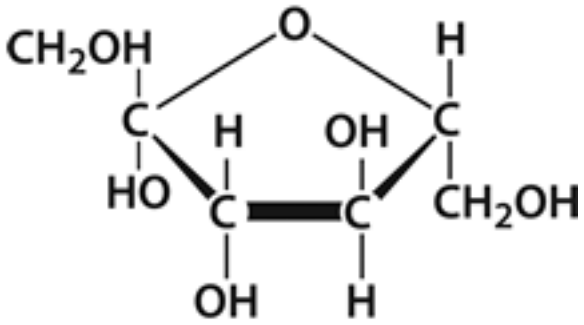
2) Polysaccharide *(Complex sugar)*

1) Carbohydrates

Monosaccharides do not need to be **broken** down and thus can be used directly as a form of quick **energy**



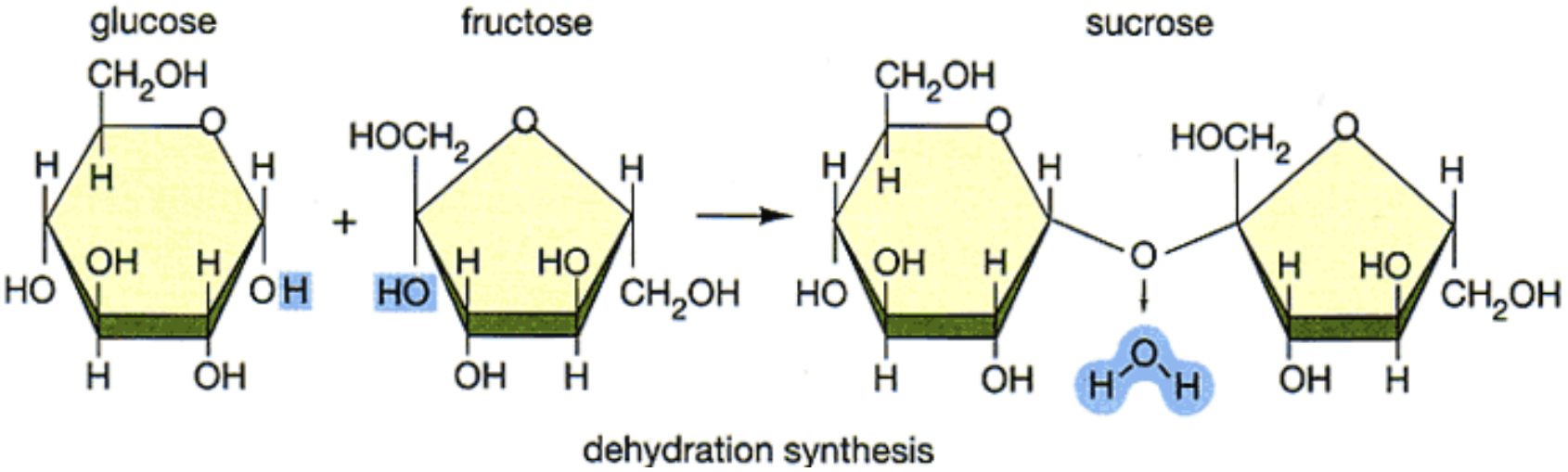
glucose



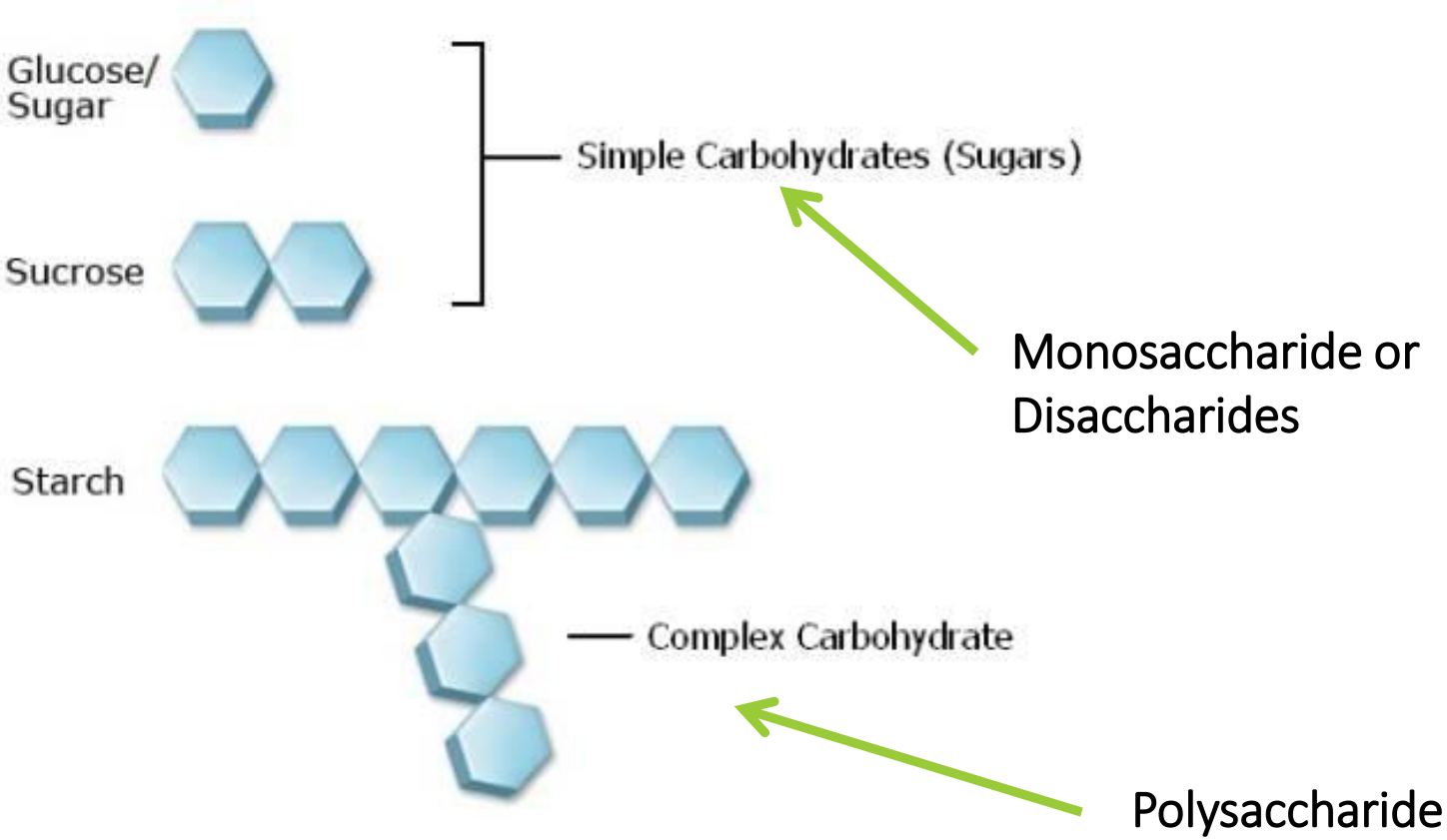
fructose

1) Carbohydrates

Disaccharides consists of two linked simple sugars but must be broken down to obtain **energy**.



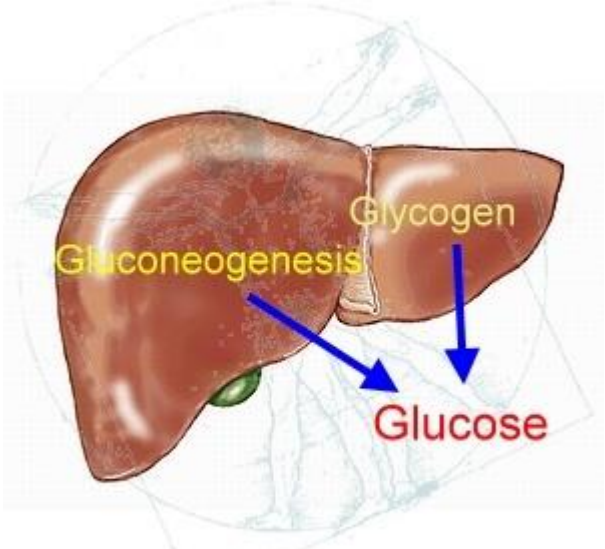
Types of Carbohydrates



1) Carbohydrates

When large amounts of carbohydrates are consumed they are stored as **glycogen** in the liver and converted into fat.

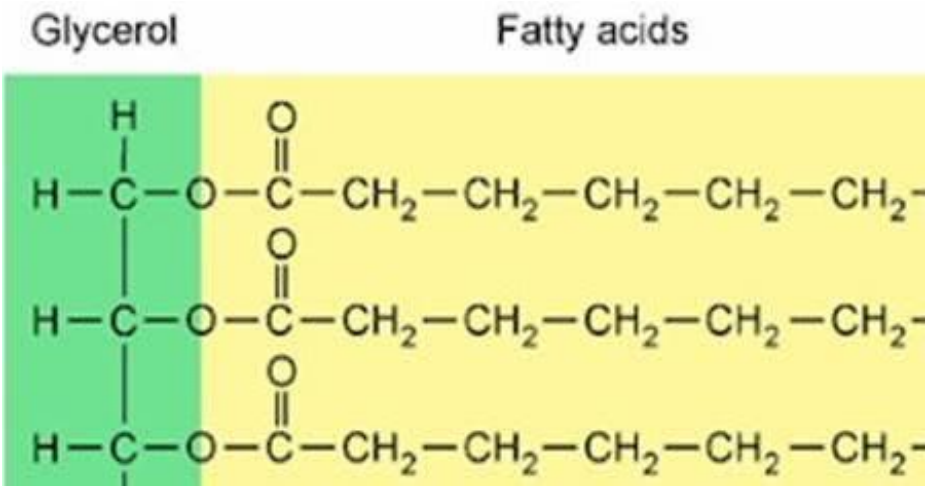
Examples of carbohydrates: potatoes, pasta, rice and bread.



Glycogen can be later broken down into glucose when the body requires energy.

2) Lipids

Lipids are complex compounds that are insoluble in water.

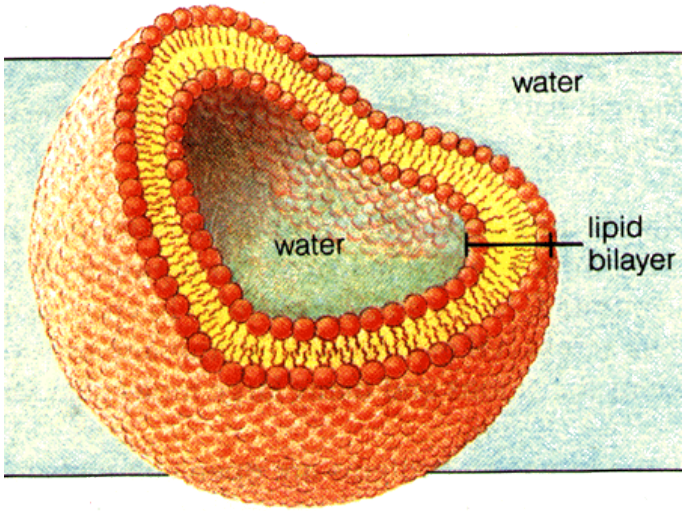


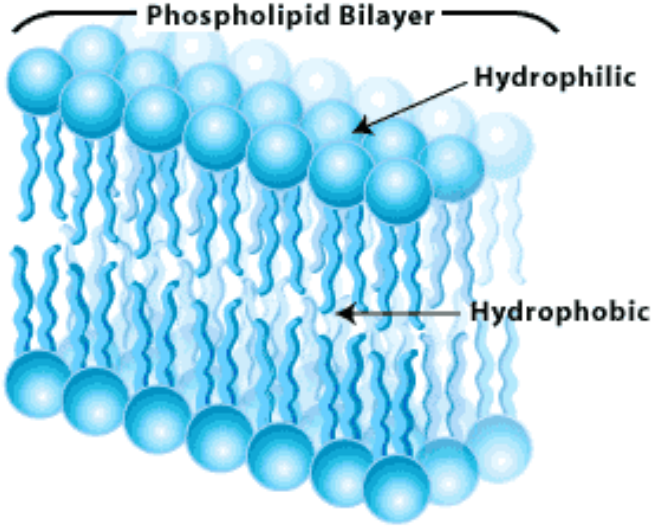
Many lipids consist of three fatty acid chains and a glycerol.

Energy Storage: store 2.25X more energy per gram than other biological molecules

2) Lipids

Phospholipids are a type of lipid that make up the cell membrane. Their hydrophilic (water-loving) and hydrophobic (water-hating) properties enable them to form a micelle.

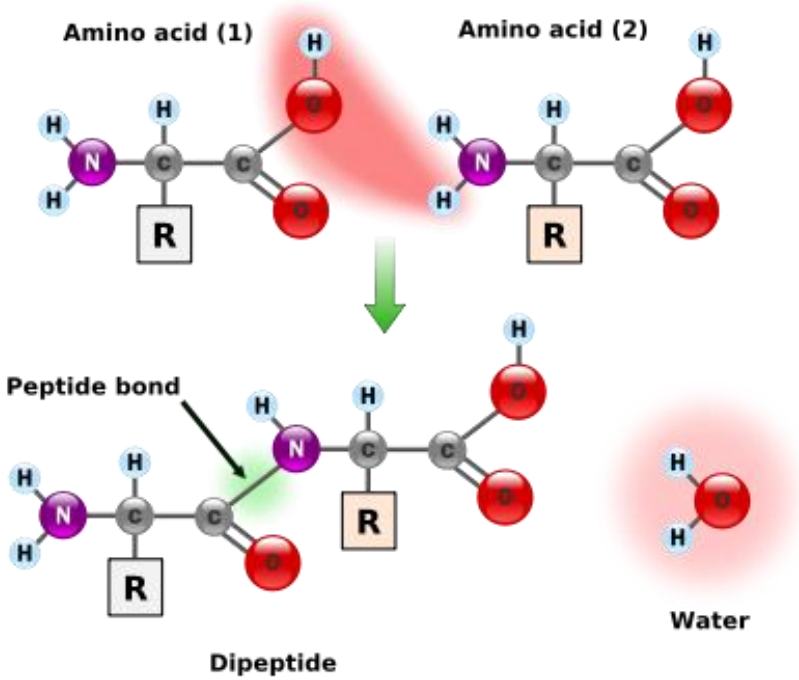




3) Proteins

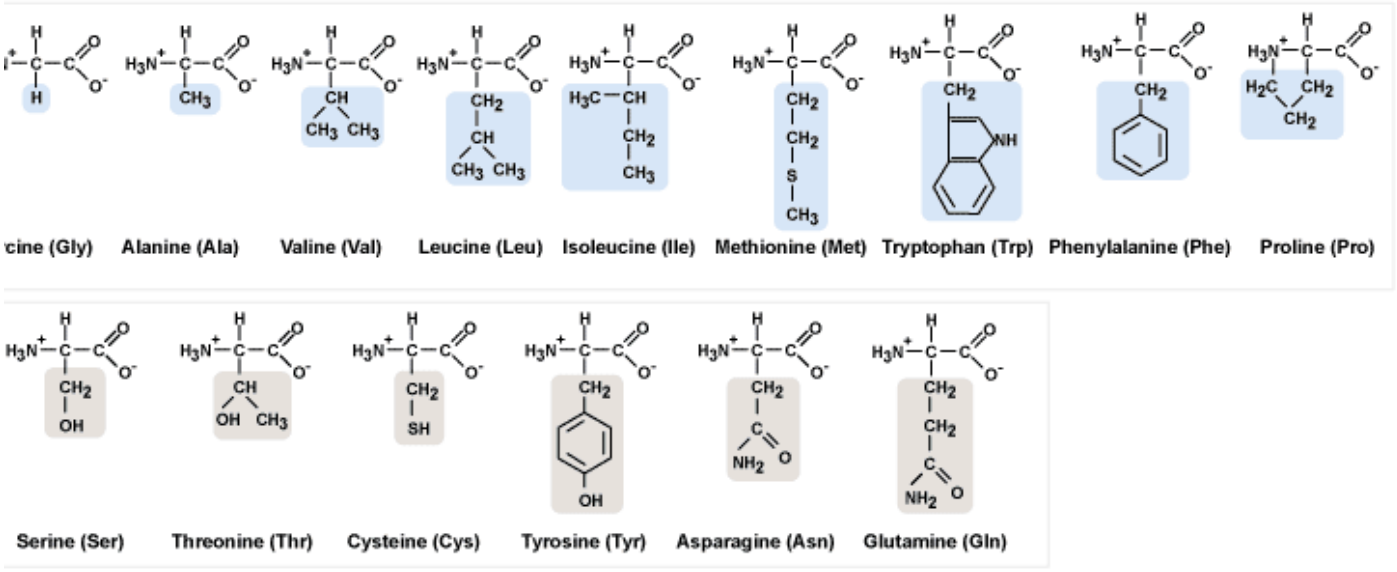
The body has a variety of proteins that differ in **shape**, **function** and **size**.

*They are built from **amino acid** (a.a.) that are joined by **peptide bonds.***



3) Proteins

There are 20 amino acids in total and 8 of them cannot be synthesized by the body and must be obtained by our food.



3) Proteins

Functions of a protein:

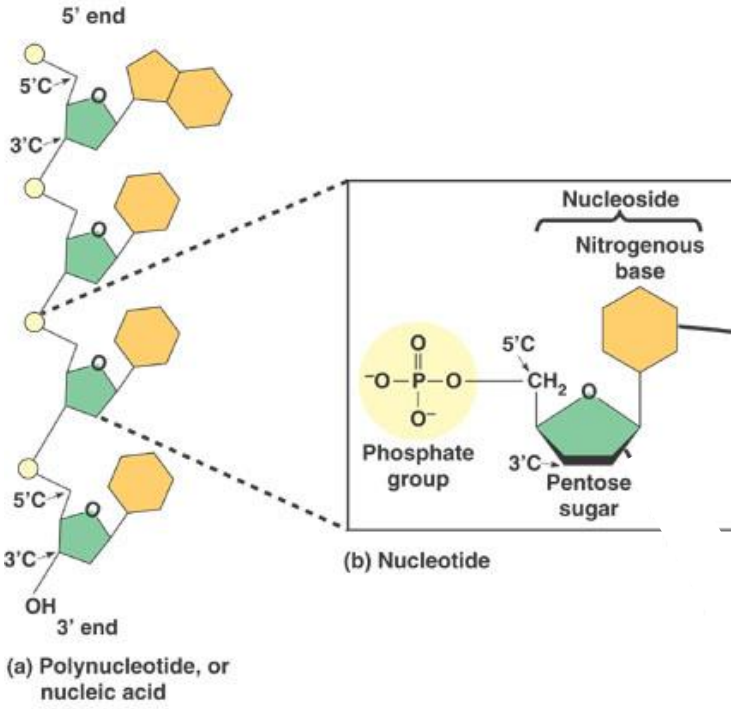
- Structure/support for blood, tissue, muscles
- Act as catalysts
- Provide immunity from infection
- Transport of substances across a cell

4) Nucleic Acids

Nucleic Acids enable an organism to grow and develop due to its ability to create a genetic code.

Composed of:

- 5 C sugar
- Phosphate group
- Nitrogenous base

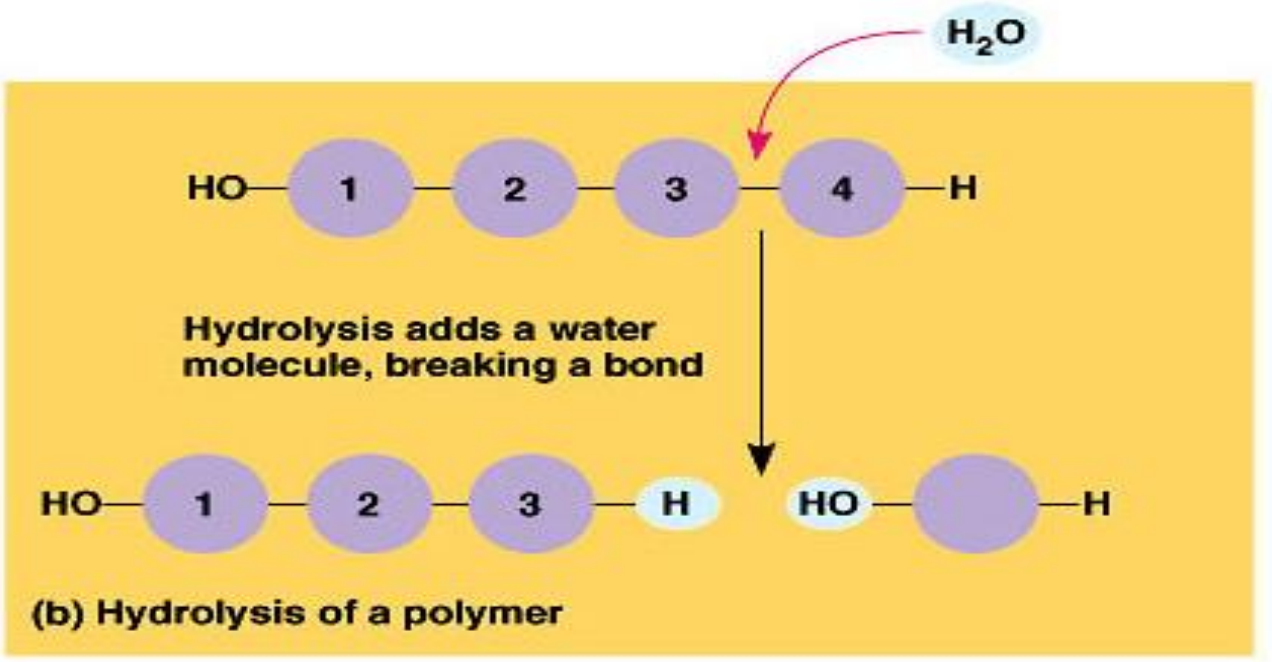


Examples: DNA and RNA

Breakdown of Macromolecules

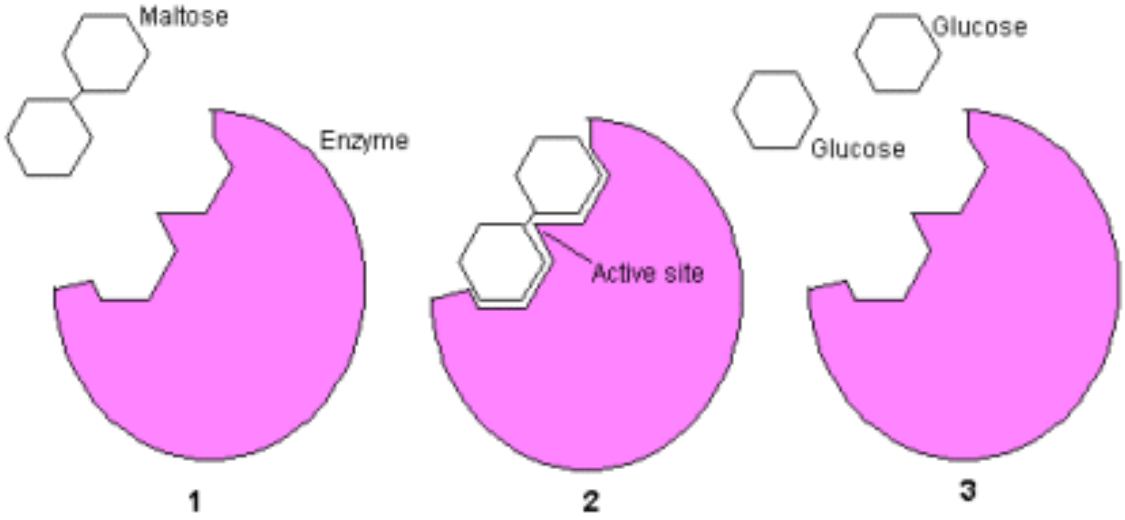
Nutrients must be broken down into smaller units so that they can be absorbed and delivered.

*A **Hydrolysis reaction** must occur to break the bonds of the macromolecules.*



Enzymes

Proteins that behave as catalysts and help to speed up chemical reactions. They enable hydrolysis reactions to occur at a quicker rate.



Highly specialized and combine to particular substrates *(molecule that enzyme bonds to)*

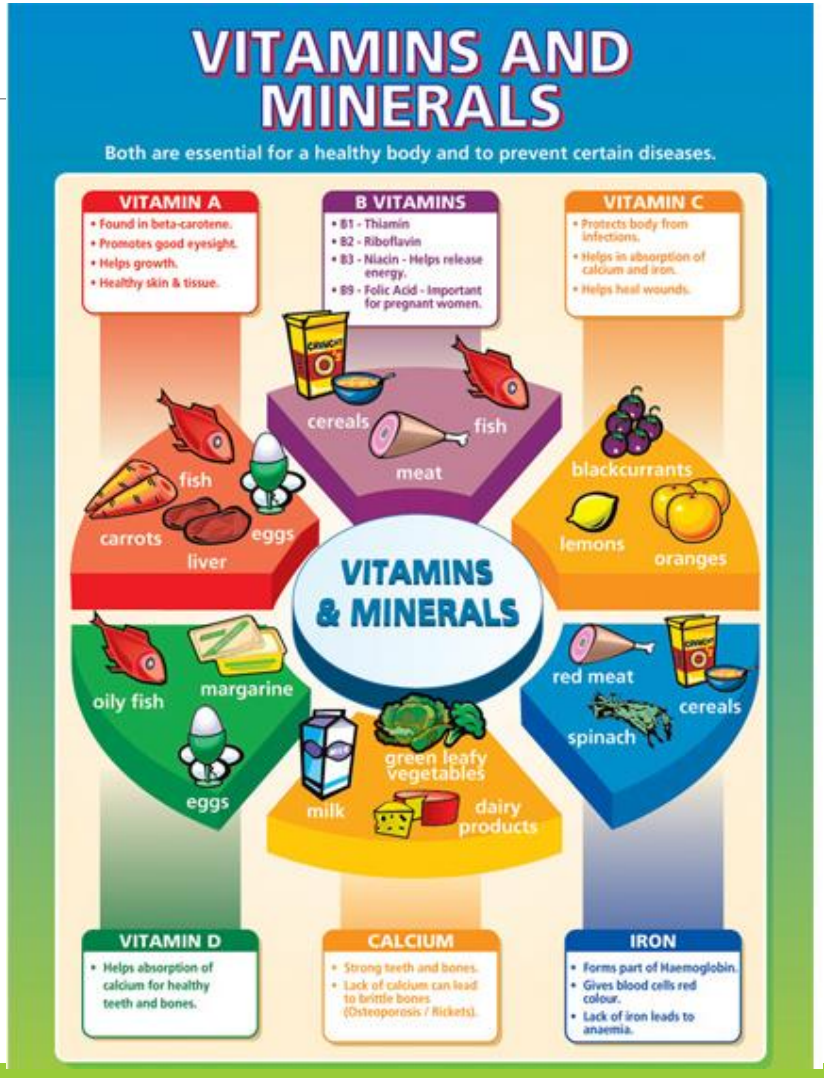
Macromolecule Breakdown

Type of enzyme	Macromolecule broken down	Monomer Subunit
Carbohydrase		
Lipase		
Protease		
Nuclease		

Minerals and Vitamins

Vitamins and minerals are micronutrients

Micronutrients must be taken in small amounts to be part of a balanced diet



Minerals and Vitamins

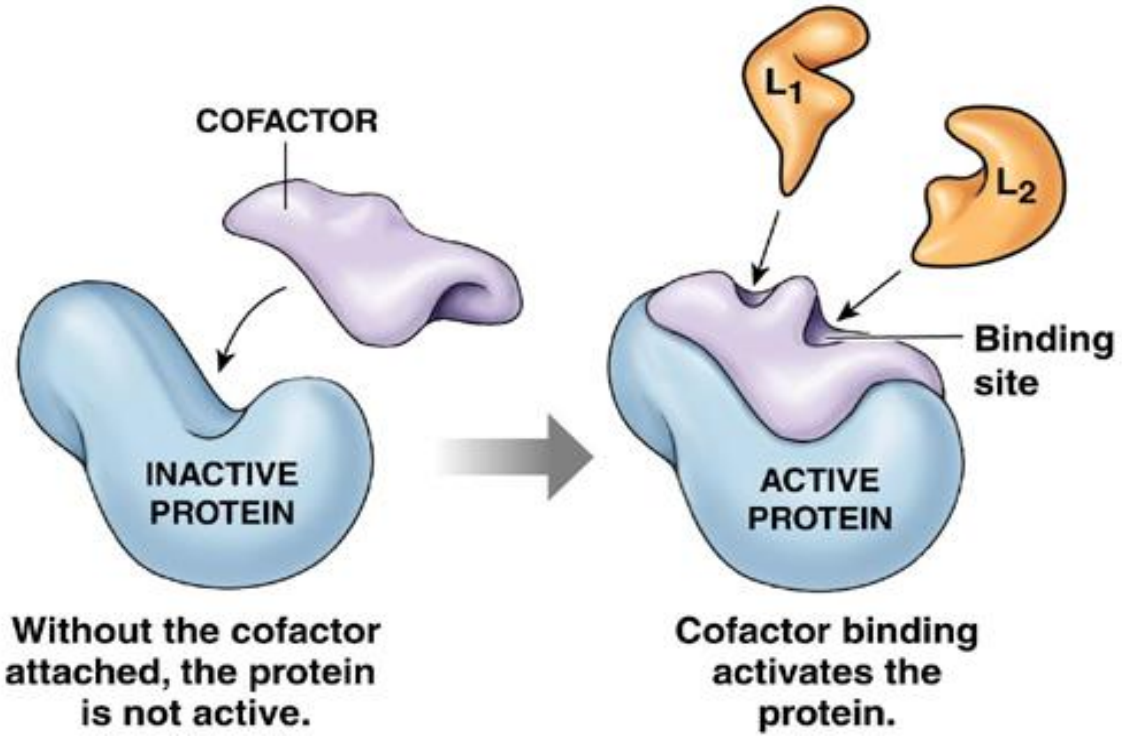
Minerals and vitamins are made up of both inorganic and organic substances.

Functions:

- Enable chemical reactions to occur
- Aid in tissue development and growth
- Immunity.

Vitamins

Vitamins are organic compounds act as co-enzymes. They bind to the active site and activate an enzyme.



Minerals

Minerals are inorganic compounds that must be continuously replenished in small quantities.

E.g: Bananas contain the mineral potassium

The body does not destroy them, but they are released through sweat and urine.

Examples of Vitamins

Vitamin	Key function in the body	Possible Sources
A (carotene)		
B1 (thiamine)		
C (ascorbic acid)		
D		
E		

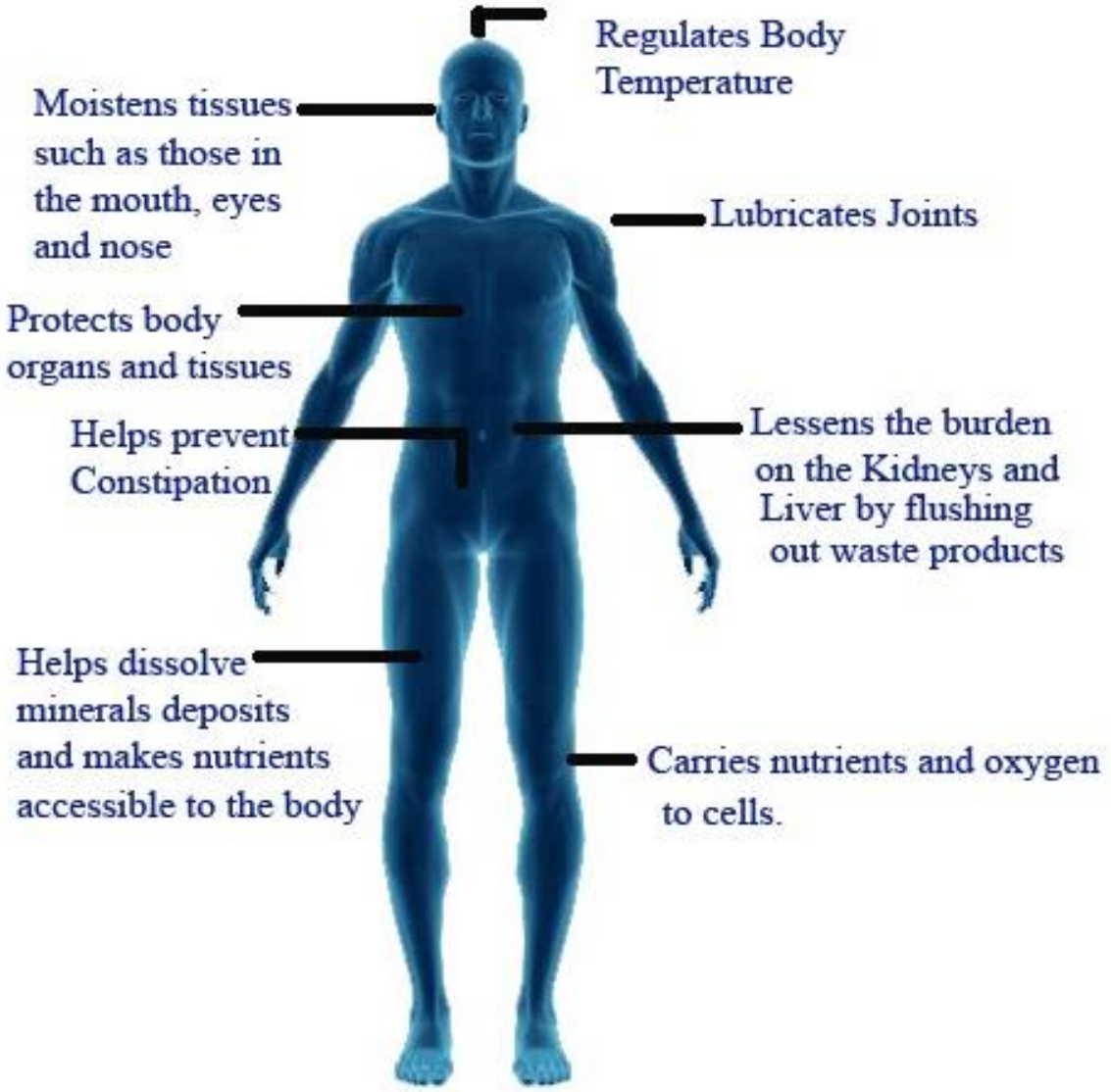
Examples of Minerals

Mineral	Key function in the body	Possible Sources
Calcium		
Iron		
Magnesium		
Potassium		
Sodium		

Water

- Most important substance for the survival of animals.
- Most of human body weight is H_2O.
- 90% of the blood consists of water and it is required for the transport of nutrients in the body
- The extracellular fluid found outside of the cells also contains water, which helps remove waste from the cells.

Functions of water



Homework

Textbook:

1) Complete pg. 406 #1-6

2) Complete worksheets given in class