



General Biology

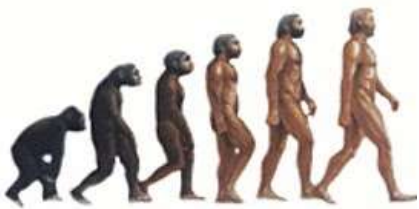
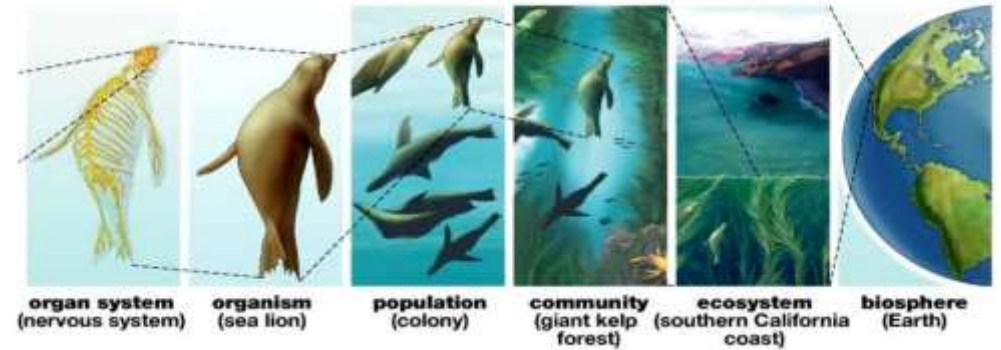
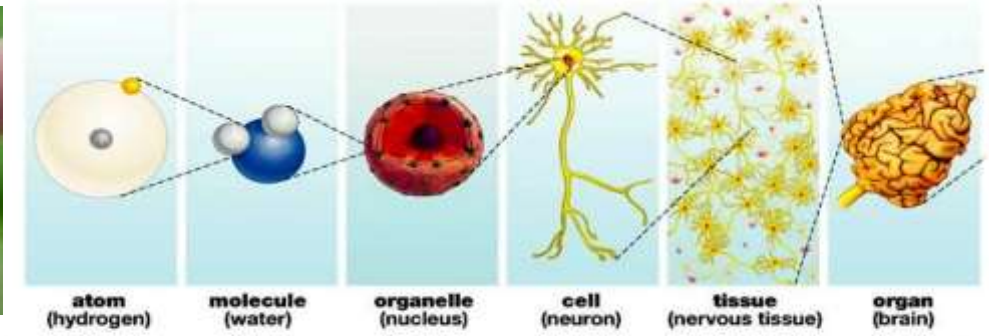
SBI0202

Unit 01: Structure and Function of Living Organisms

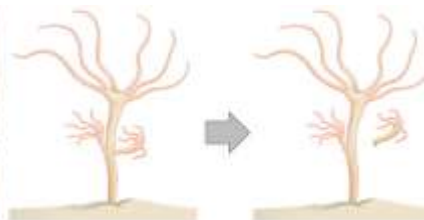
Topic 01: Major biological molecules

Key features that distinguish living organisms from non living matter

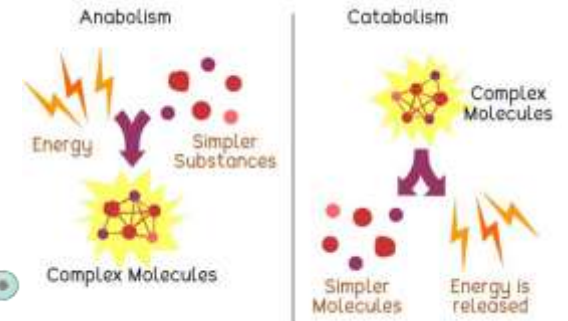
1. Order and Organization
2. Metabolism
3. Growth and Development
4. Irritability and Coordination
5. Adaptation
6. Reproduction
7. Heredity and Evolution



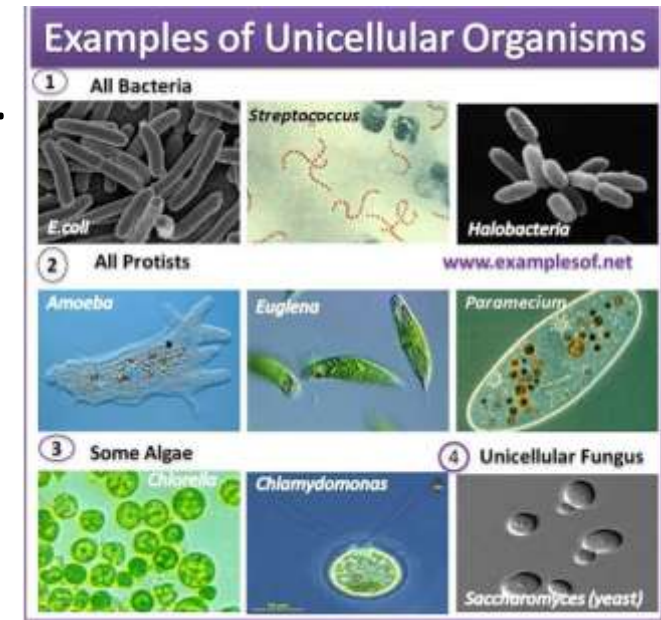
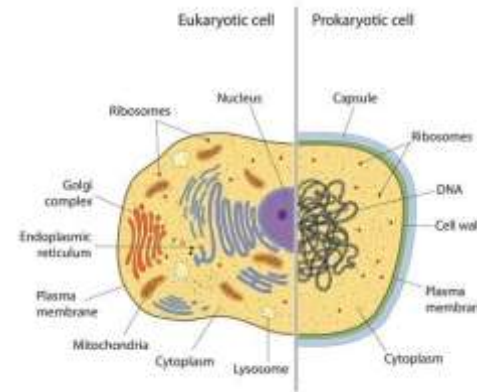
(a) Fission



(b) Budding



- The cell is the basic structural and functional unit of life.
- Organisms may be unicellular or multicellular.
- There are **two** distinct types of cells:
 1. Prokaryotic cells
 2. Eukaryotic cells



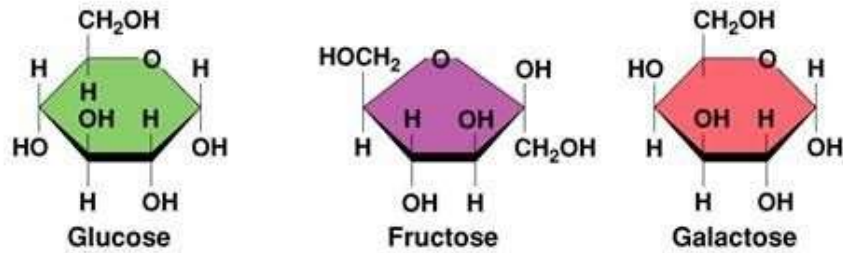
- Cells comprise of organelles which are composed of several important biological molecules.
- An **organelle** is a specific structure present in the cell responsible of performing certain functions and together enable the cell to function as a unit.

Main types of biological molecules

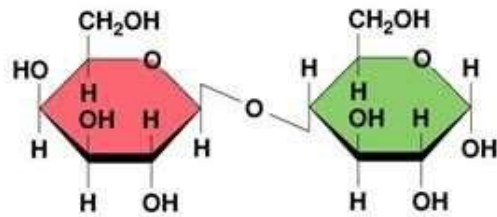
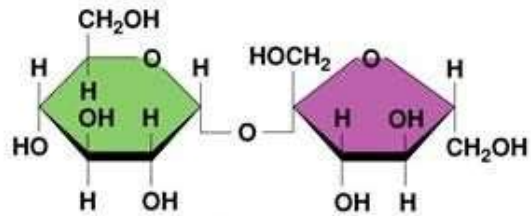
1. Carbohydrates
2. Proteins
3. Lipids
4. Nucleic acids
5. Water

1. Carbohydrates

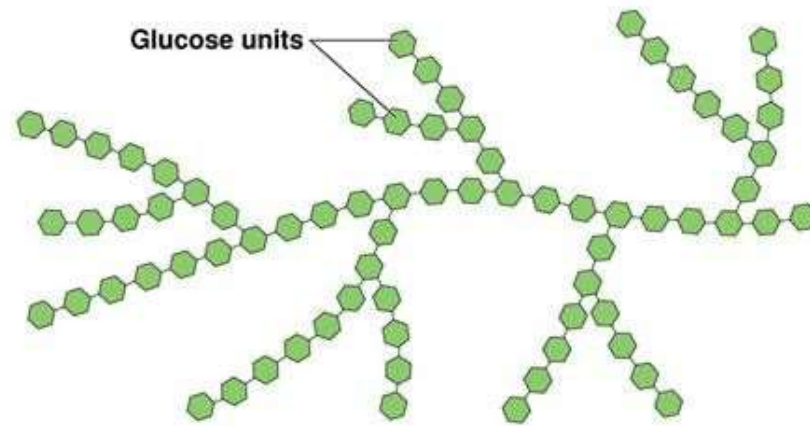
Types of carbohydrates



(a) Monosaccharides

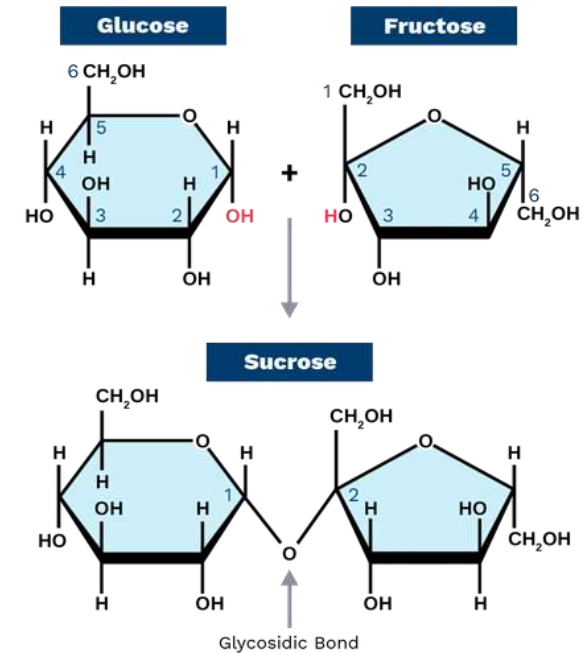
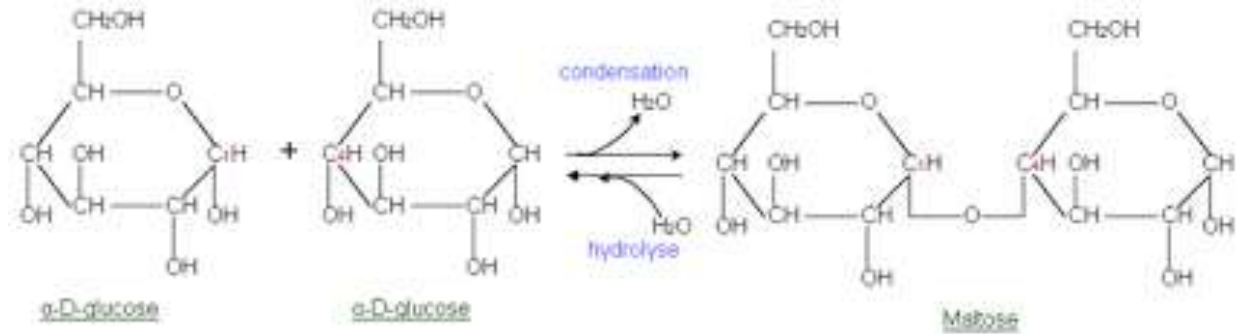


(b) Disaccharides



(c) Polysaccharide

Monosaccharides are combined via glycosidic bonds to form disaccharides and complex sugars



• Functions of carbohydrates

1. Monosaccharides

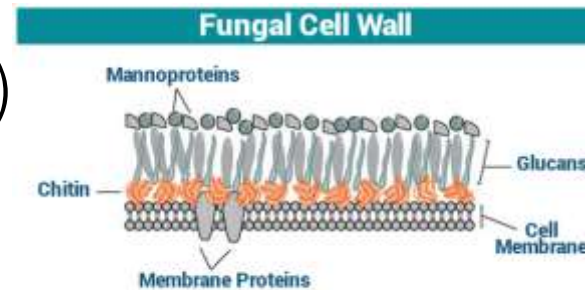
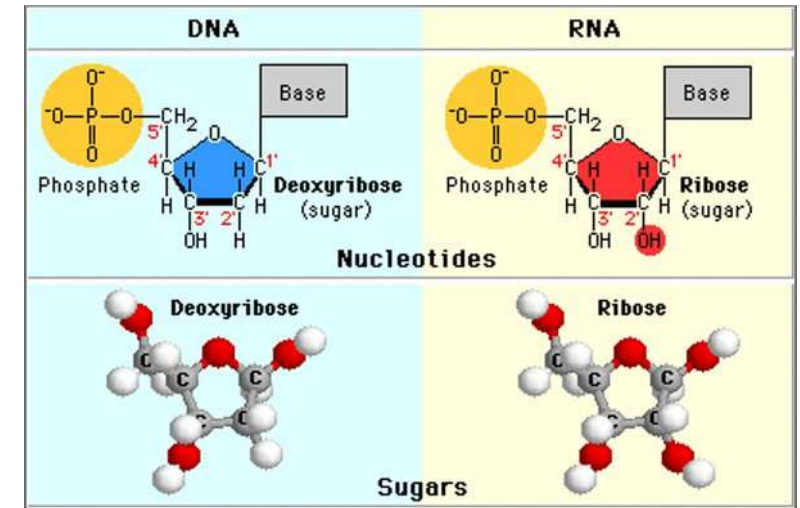
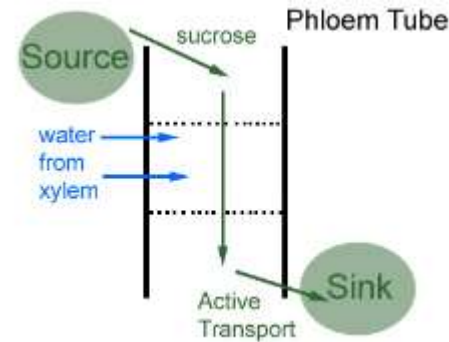
- Energy storage (glucose)
- Building blocks for complex molecules.
- Components of nucleotides (ribose, deoxyribose)

2. Disaccharides

- Storage of energy
- Translocation in phloem (sucrose)
- Storage sugar in milk (Lactose)

3. Polysaccharides

- Energy storage (starch, glycogen)
- Structural support (cellulose, hemicellulose, pectin in plant cell wall, chitin in fungal cell wall and exoskeletons of arthropods)

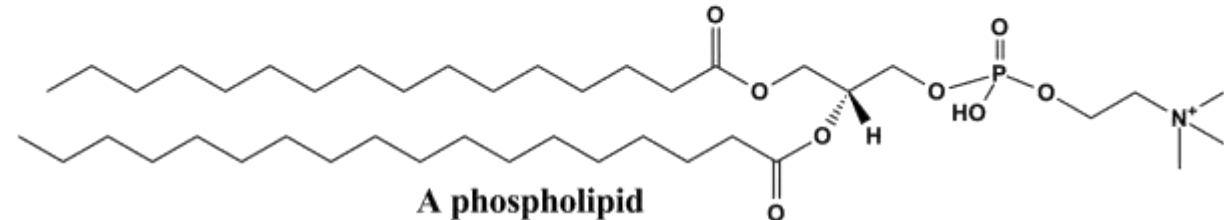
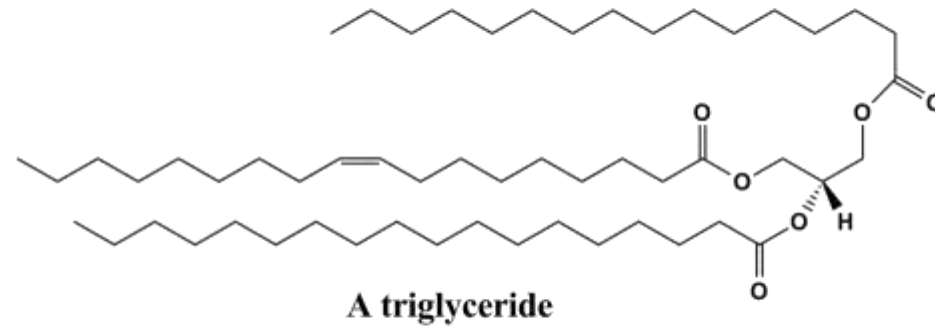
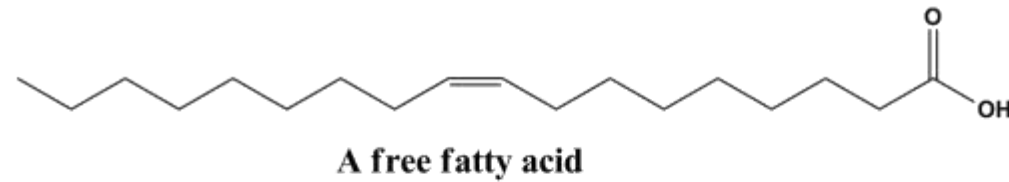
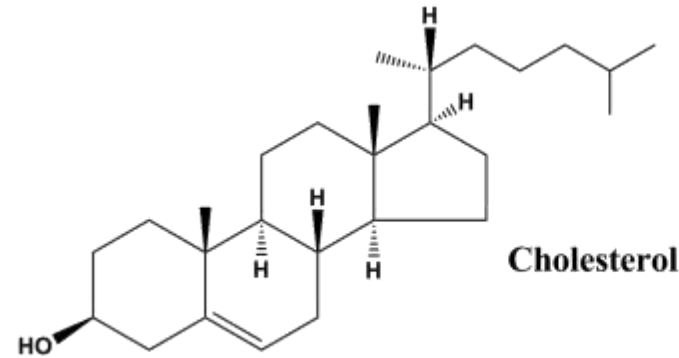


Starch	Glycogen
Structure: long chains of glucose with	
• few branches	• many branches
Function: Storage form of glucose (energy)	
• In plant	• In animals

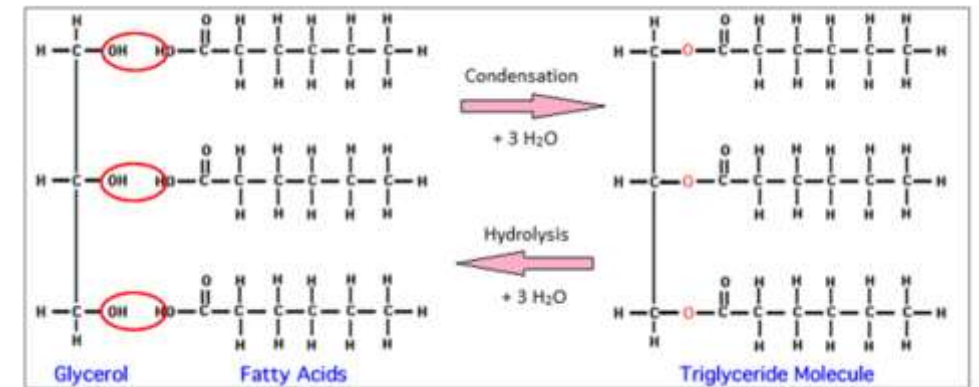
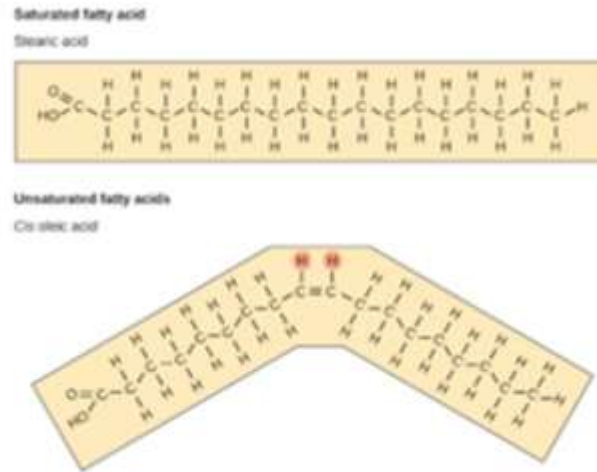
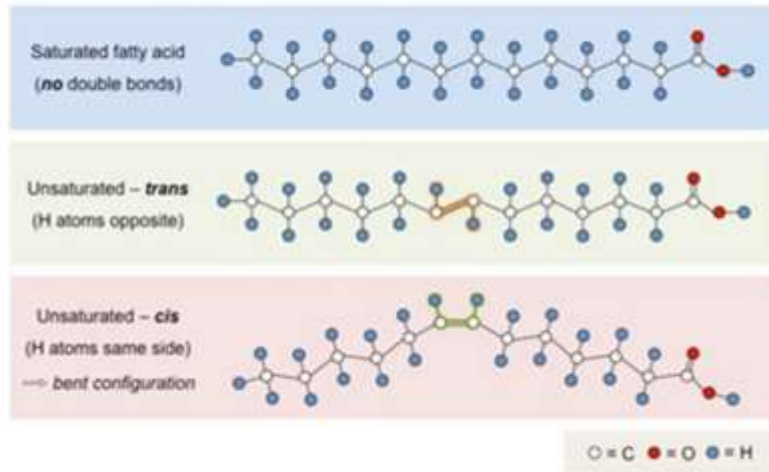
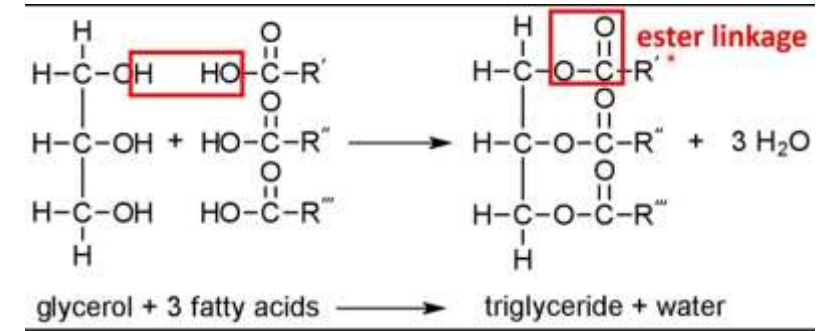
2.Lipids

- Types of lipids:

1. Fats and oils (triglycerides)
2. Phospholipids
3. Waxes
4. Steroids



- 1.Triglycerides
- Esters of glycerol and 3 fatty acids.
- Main constituent of body fat in humans.
- Functions: Energy storage, provide insulation to cells, aid in the absorption of fat-soluble vitamins.



Fatty acids are hydrocarbon chains of differing lengths with various degrees of saturation that end with carboxylic acid groups.

Saturated vs. unsaturated fatty acids

2. Phospholipids

- Lipids with attached phosphate groups (hydrophilic component)
- Amphipathic
- Function: Essential component of the cell membrane (phospholipid bilayer)

3. Wax

- Esters of long chain alcohols and fatty acids
- Function: waxy cuticles of plant leaves aid in reducing water loss, cerumen (earwax) protects the ear canal.

4. Steroids

- Have a structure of 4 fused rings.
- Eg: Cholesterol
- Functions: Hormone precursor, component of animal cell membranes

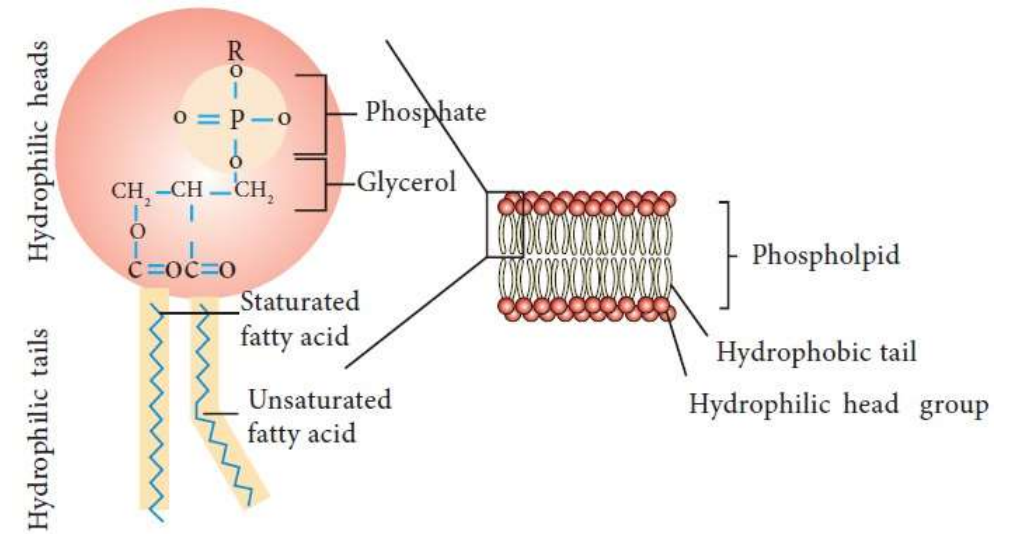
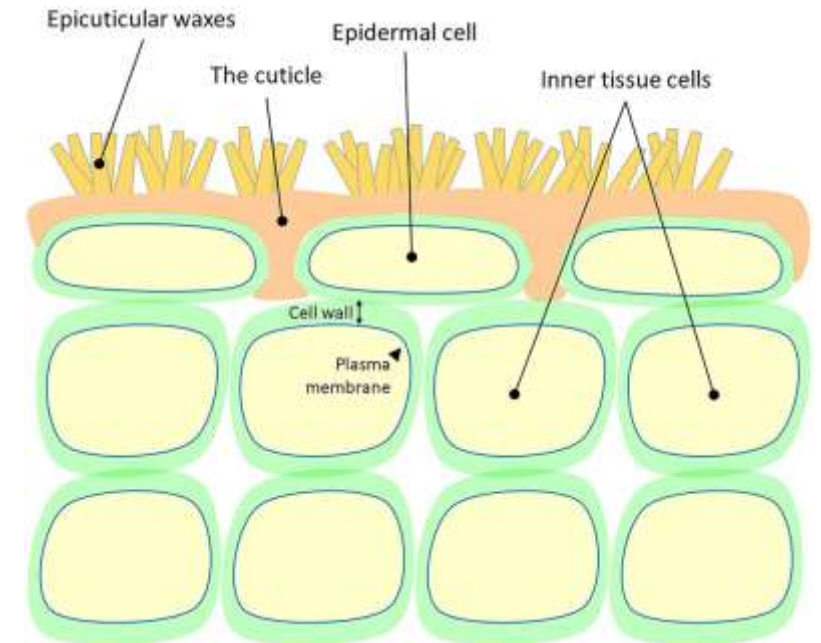
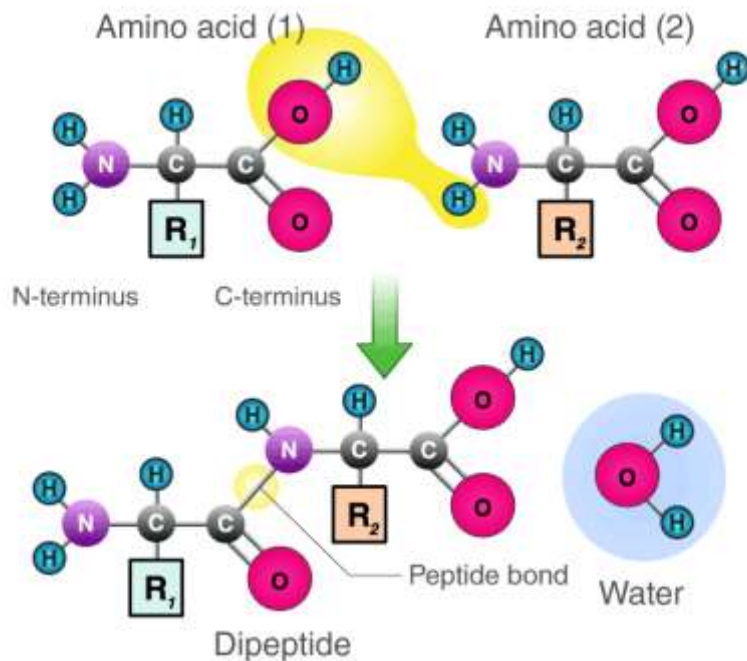


Figure 6.12 Structure of phospholipid

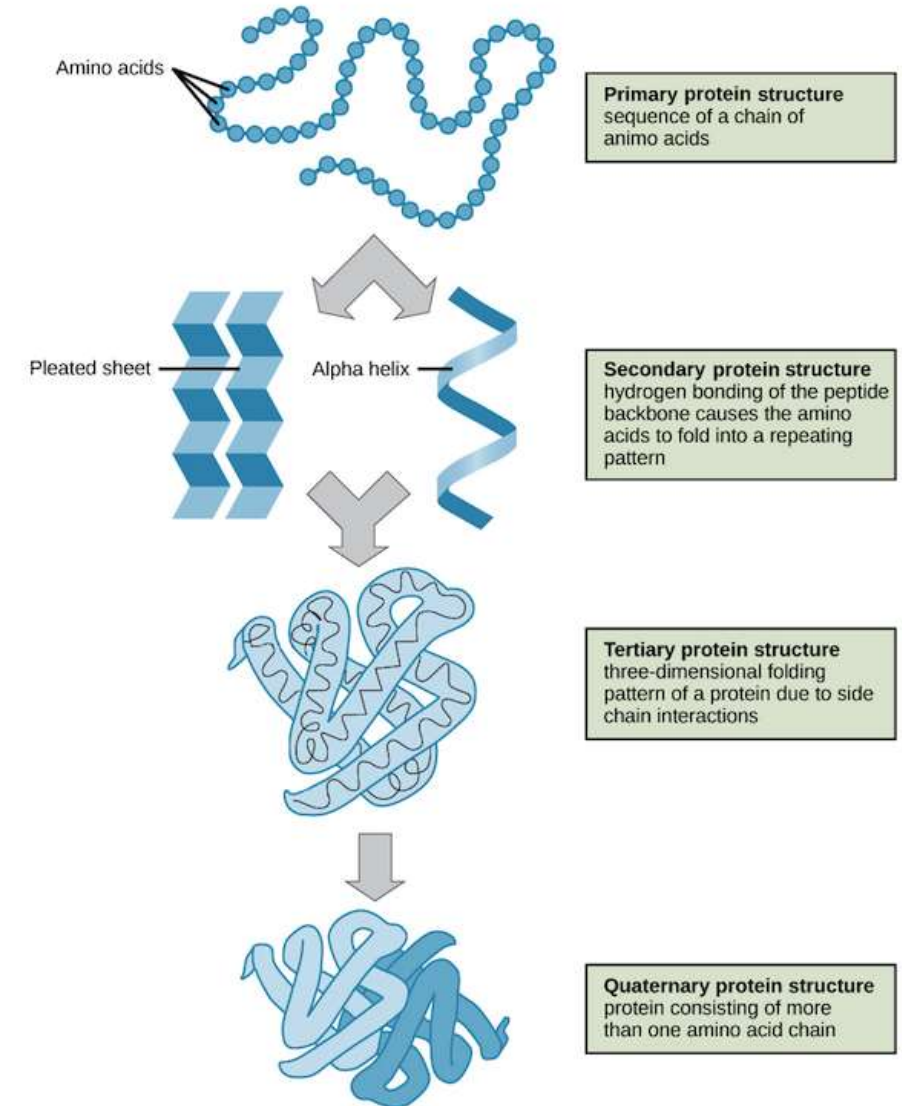


3. Proteins

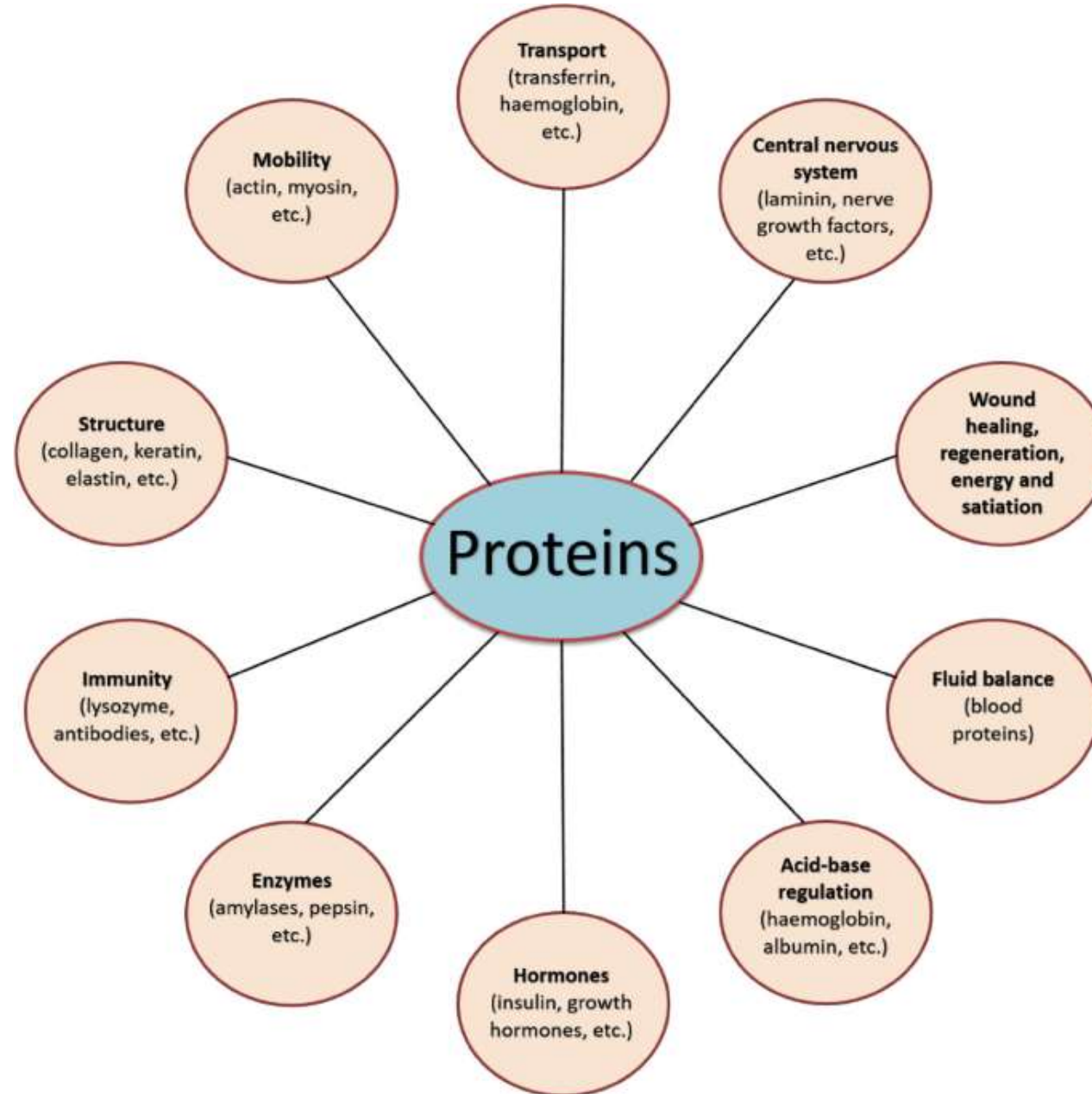
- Polymers of amino acids linked by peptide bonds.
- There are 20 different types of amino acids in the human body.



AMINO ACID STRUCTURES AND ABBREVIATIONS			
Neutral			
 L-Alanine Ala A	 L-Asparagine Asn N	 L-Cysteine Cys C	 L-Glutamine Gln Q
 Glycine Gly G	 L-Isoleucine Ile I	 L-Leucine Leu L	 L-Methionine Met M
 L-Phenylalanine Phe F	 L-Proline Pro P	 L-Serine Ser S	 L-Threonine Thr T
 L-Tryptophan Trp W	 L-Tyrosine Tyr Y	 L-Valine Val V	Acidic L-Aspartic acid Asp D
 L-Arginine Arg R	 L-Histidine His H	 L-Lysine Lys K	 L-Glutamic acid Glu E
Lutrizol Life Science			

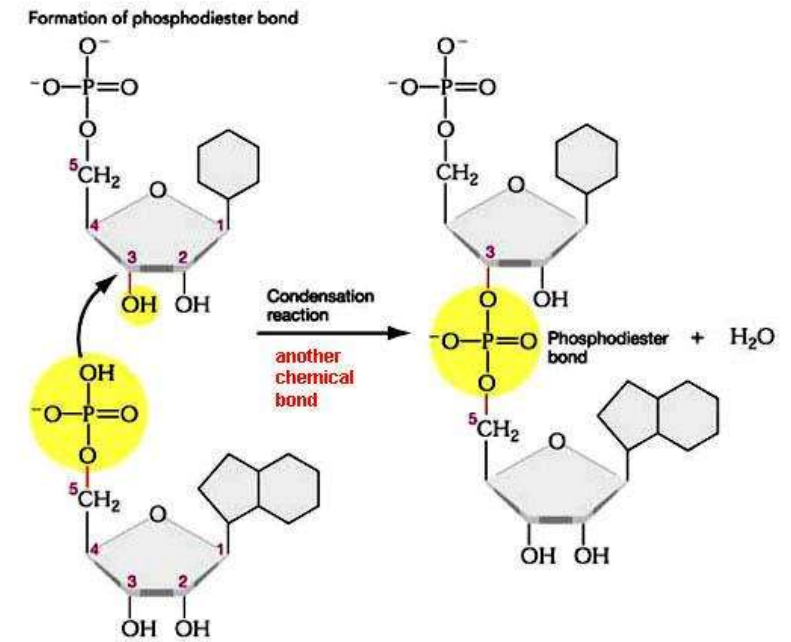
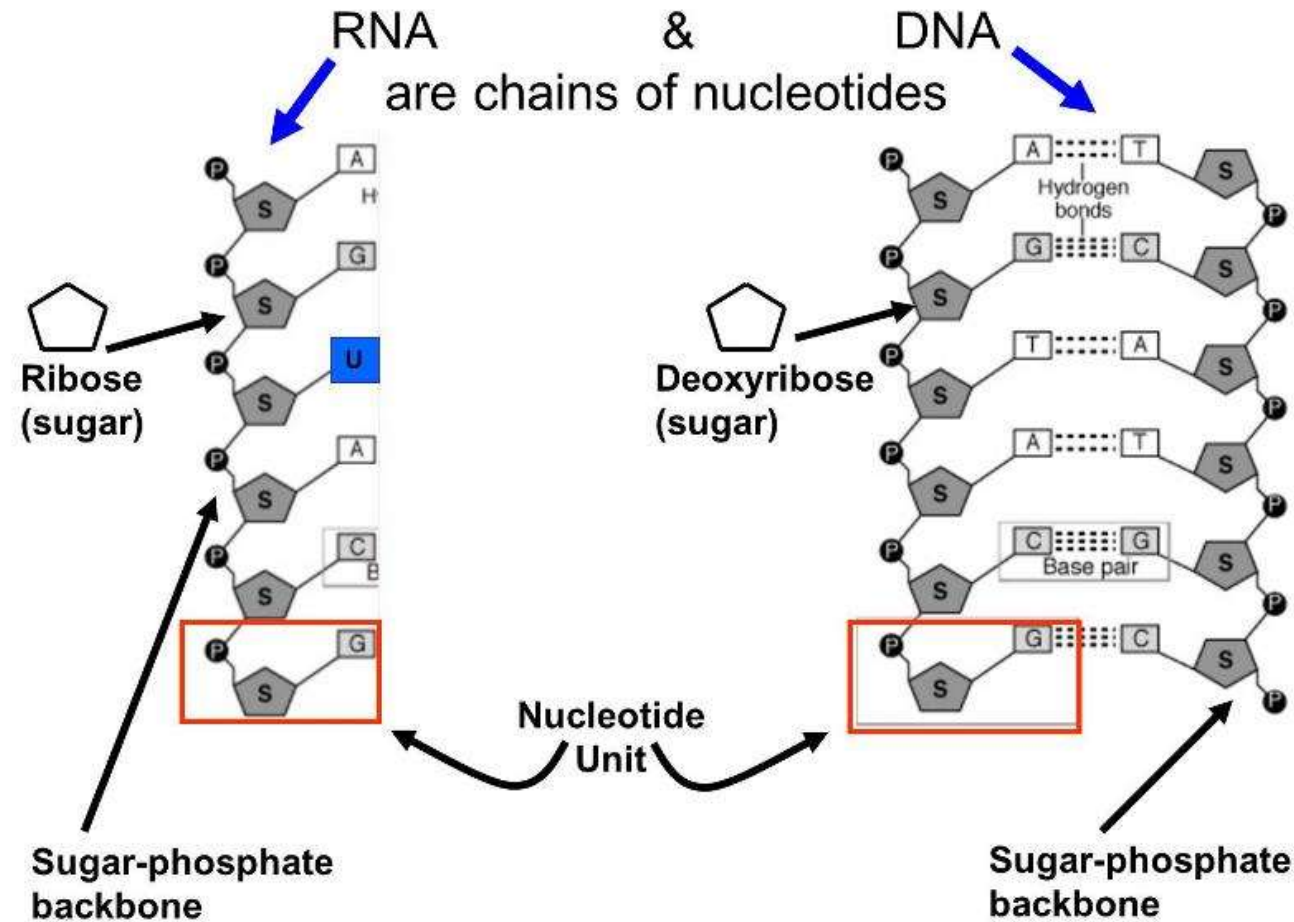


Functions of proteins

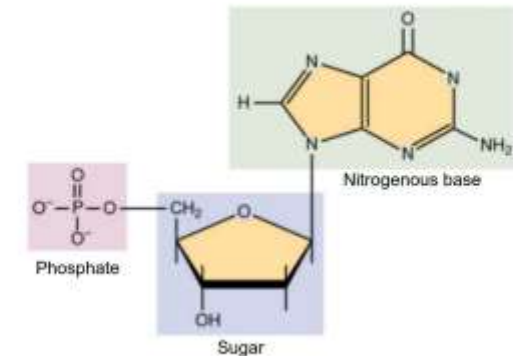


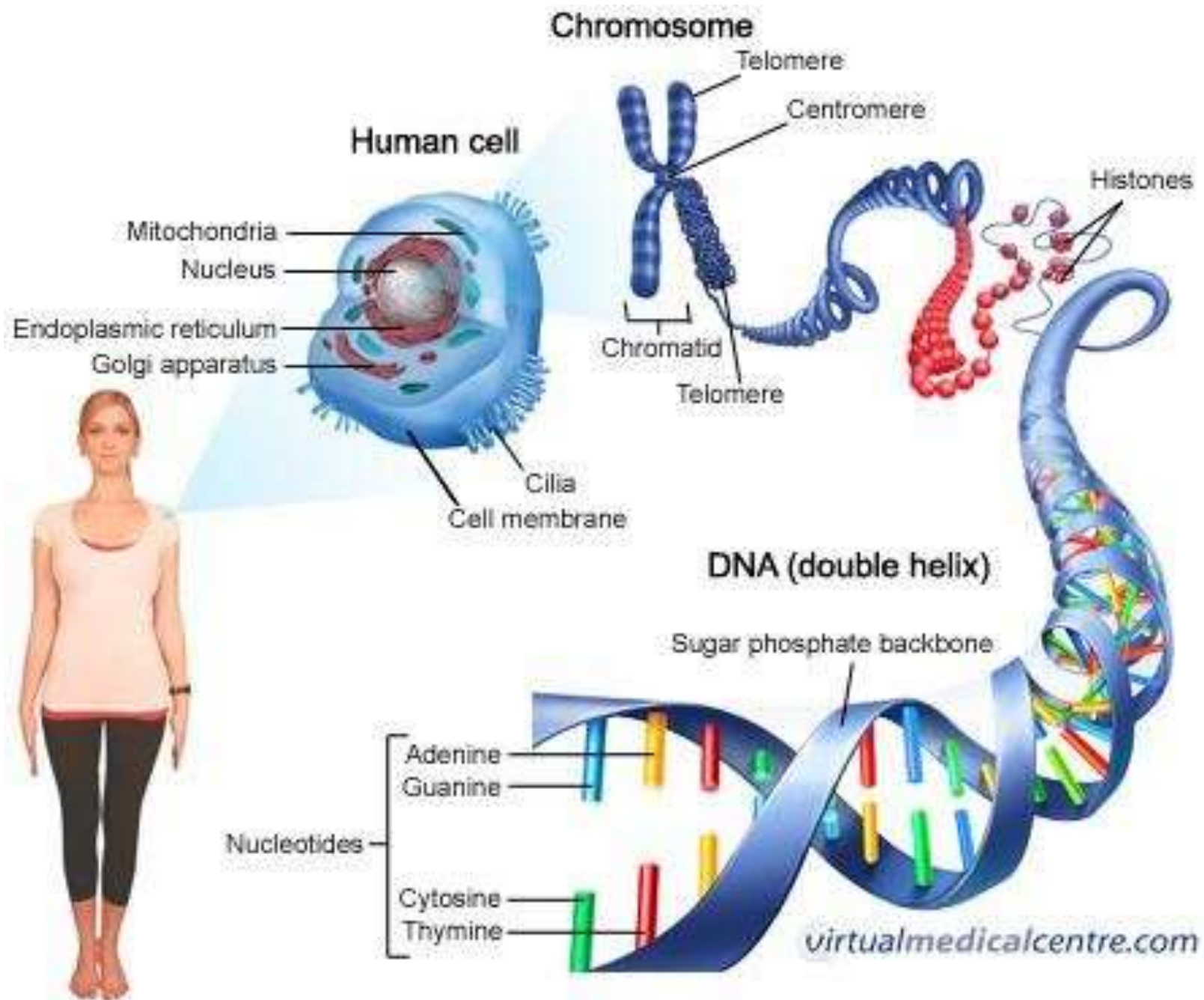
4. Nucleic acids

- Deoxyribonucleic acid and ribonucleic acid



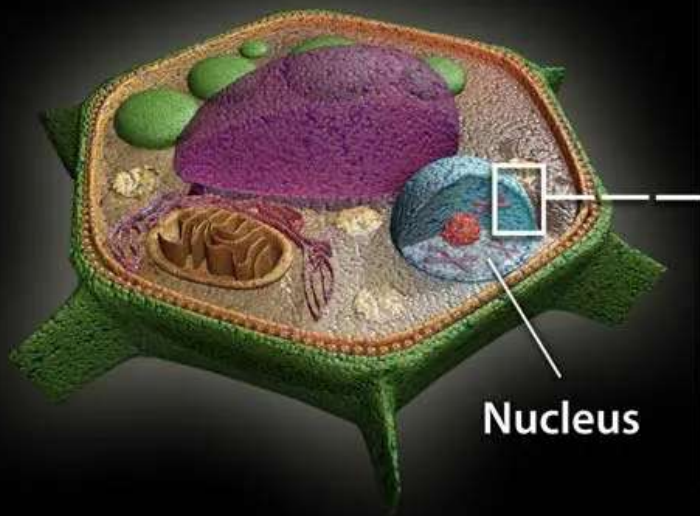
Nucleotide



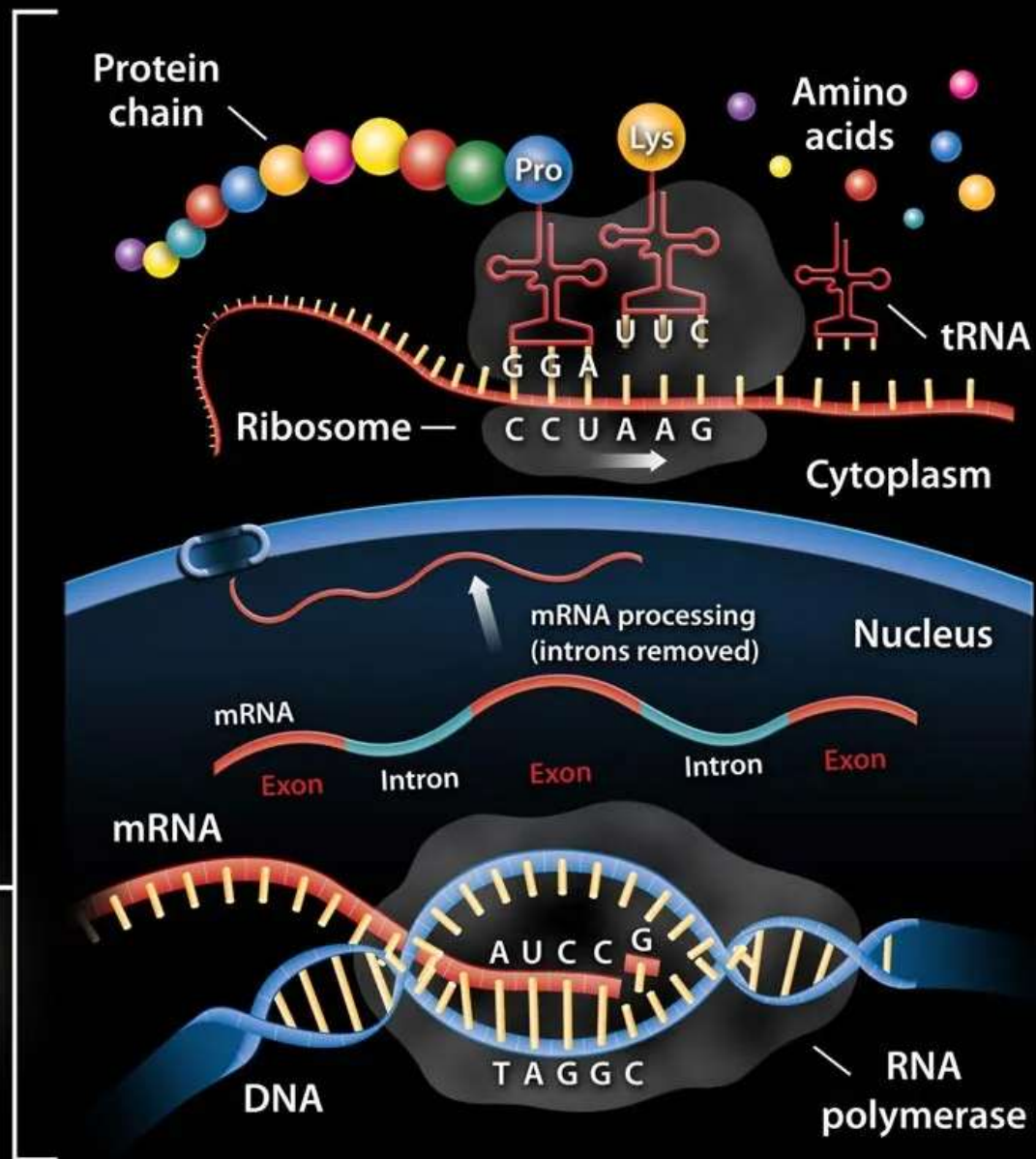


Structural arrangement of DNA inside the cell

Plant cell



Nucleus



Structure and function
of RNA inside the cell

Functions of DNA

- Heredity
- Crossing over results in recombination
- Mutations give rise to variation thereby contributing to the evolutionary process.

Functions of RNA

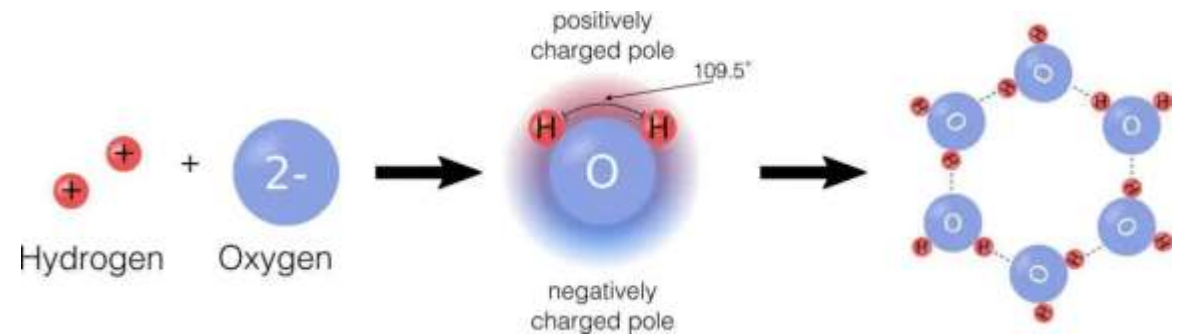
- Main function is protein synthesis
- mRNA (messenger RNA): Act as a template containing transcribed genetic information required for translation of a particular protein.
- tRNA: Delivers the amino acids complementary to the mRNA codons.
- rRNA: Formation of the ribosomes

Biological Role of Water

- molecular structure- Asymmetrical (angular) polar molecule
- Form strong intermolecular H bonds

Properties and functions

- 1.High cohesion- Enable water uptake by plant roots, Maintain body temperature.
- 2.Universal solvent-Enable transport of oxygen, nutrients etc
- 3.Support cellular structure and shape
- 4.Facilitate protein folding
- 5.Reactant eg:Photosynthesis
- 6.Buffer-pH regulation in the body



Thank You