



BIOMOLECULES

DEFINITION OF CARBOHYDRATES

Compounds having general formula $C_n(H_2O)_m$ are commonly known as *carbohydrates*. (the French word *hydrate de carbone* meaning hydrates of carbon) where n and m are simple numbers usually equal to or greater than two.

Classification

Carbohydrates are mainly divided into following three classes—

- (I) Monosaccharides
- (II) Disaccharides
- (III) Polysaccharides

(I) Monosaccharides

Those carbohydrates which generally contains 4 to 10 C-atoms and cannot be hydrolysed into simpler compounds are known as *monosaccharides*.

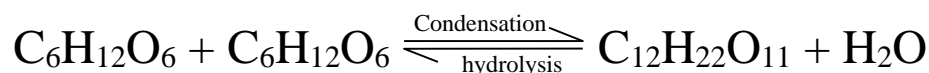
Aldotriose – 3C atoms with one – CHO group
(glyceraldehyde)



Ketotriose—3C atoms with one $>C=O$ group
(Dihydroxyacetone)

(II) Disaccharides

Disaccharides are formed when two monosaccharides (generally hexoses) combine by condensation process.



Example:

Maltose (malt sugar) = Glucose + glucose

Lactose (milk sugar) = Glucose + galactose

Sucrose (cane sugar) = Glucose + fructose

(III) Polysaccharides

Those carbohydrates which can be hydrolysed to many (hundred or even thousands) of monosaccharide units are called polysaccharides.

For example, starch & cellulose \Rightarrow Homopolysaccharides



(Starch)

Inulin \Rightarrow Heteropolysaccharide

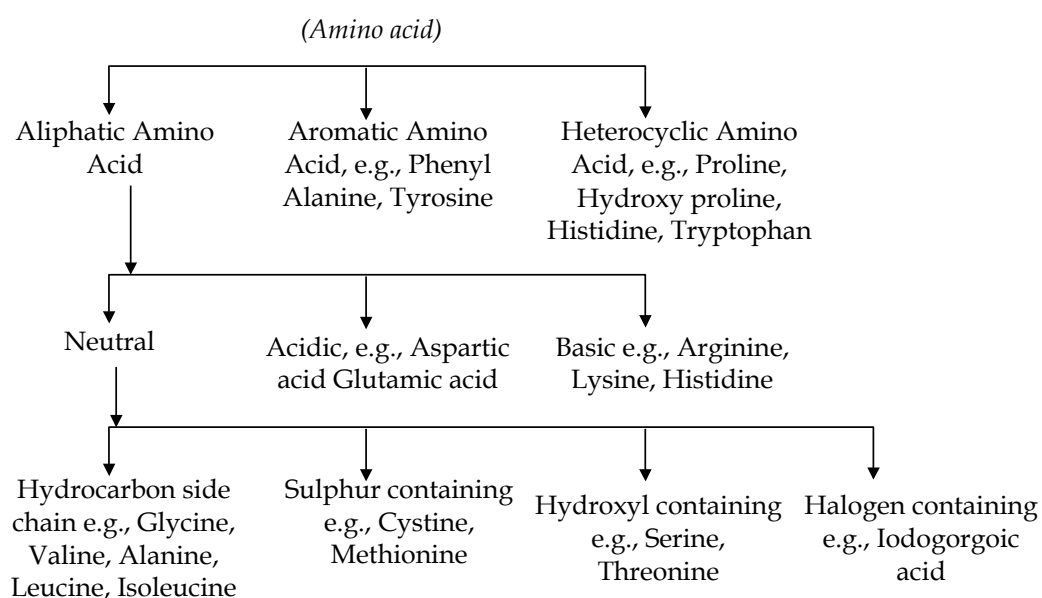


PROTEINS

These are complex nitrogenous natural polymers of amino acids. Amino acids are the essential component of proteins.

CLASSIFICATION

A variety of classification of amino acids are possible.





CLASSIFICATIONS OF PROTEINS

According to Structure

<i>Type of proteins</i>	<i>Nature</i>	<i>Functions</i>
Fibrous proteins	<p>Secondary structure most important.</p> <p>Insoluble in water, physically tough, long parallel polypeptide chains cross-linked at intervals forming long fibres or sheets.</p>	<p>Perform structural function in cells and organisms.</p> <p>Examples: Collagen (Tendons, bone, connective tissues) Myosin (muscles) Silk (spider, web) Keratin (hair, horn, nails, feathers)</p>



Globular proteins	Tertiary structure most important, polypeptide chains tightly folded to form spherical shape. Easily soluble	Form enzymes, antibodies and some hormones e.g. Insulin
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According to composition

<i>Conjugated proteins</i>	<i>Prosthetic group</i>	<i>Occurrence</i>
Phosphoprotein	Phosphoric acid	Casein of milk, vitellin of egg yolk.
Glycoprotein	Carbohydrate	Membrane structure mucin (component of saliva)
Nucleoprotein	Nucleic acid	Component of viruses chromosomes, Ribosome structure.



Chromo protein	Pigment	
		Haemoglobin (iron containing pigment present in blood) Phytochrome (plant pigment)

Functions of Amino Acids

Amino acids—serves as:

(1) Building block of proteins

(2) As precursors of

(a) Hormones

(b) Purines

(c) Pyrimidines

(d) Porphyrins

(e) Vitamins



Some examples of enzymes

Carbonic anhydrase	$\text{H}_2\text{CO}_3 \longrightarrow \text{CO}_2 + \text{H}_2\text{O}$
Pepsin	Proteins \longrightarrow Amino acids
Trypsin	Proteins \longrightarrow Amino acids
Nucleases	DNA, RNA \longrightarrow Nucleotides
DNA Polymerase	Deoxynucleotide triphosphates \longrightarrow DNA
RNA Polymerase	Ribonucleotide triphosphates \longrightarrow RNA
Enzymes	Reaction catalysed
Maltase	Maltose \longrightarrow $2 \times$ Glucose
Lactase	Lactose \longrightarrow Glucose + Galactose
Amylase	Starch \longrightarrow $n \times$ Glucose
Invertase	Sucrose \longrightarrow Glucose + Fructose
Urease	Urea \longrightarrow $\text{CO}_2 + \text{NH}_3$



NUCLEIC ACIDS

Nucleic acids play an essential role in transmission of the hereditary characteristics and the biosynthesis of proteins..

There are two classes of nuclei acids: DNA (deoxyribonucleic acid) and RNA (ribonucleic acid).

Comparison between DNA and RNA

Characters	DNA	RNA
Role	Always act as genetic material.	Synthesis of proteins, sometimes act as genetic material.
Location	Primarily in nucleus but also in cell organelles.	Cytoplasm, nucleus
Pyrimidine bases	Cytosine (C), Thymine(T)	Cytosine (C), Uracil (U)
Pentose sugar	Deoxyribose sugar	Ribose sugar
Hydrolyzing enzymes	DNase	Rnase



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Functions of Nucleic acids

Nucleic acids have two important functions:

- (i) Replication and (ii) Protein synthesis