CONCEPT MAP

BIOMOLECULES

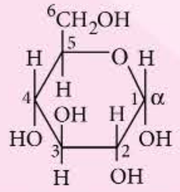
CARBOHYDRATES

These are polyhydroxyaldehydes or polyhydroxyketones or substances which yield such products on hydrolysis. These are also known as *saccharides*. Their general formula is $C_x(H_2O)_y$ where x and y can be 3, 4, 5 ..... etc.

Monosaccharides

Simplest carbohydrates which cannot be hydrolysed to smaller molecules.

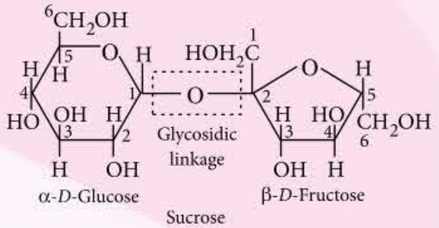
- **General formula :** $(CH_2O)_n$, $n = 3 - 7$
  e.g., Glucose, fructose, galactose.
- **Source :** Fruits, vegetables, etc.
- These provide energy and converted to glycogen for storage.



α-*D*-(+)-Glucopyranose

Diasaccharides

- Two monosaccharides units joined by glycosidic linkage, *e.g.*, sucrose, maltose, lactose.

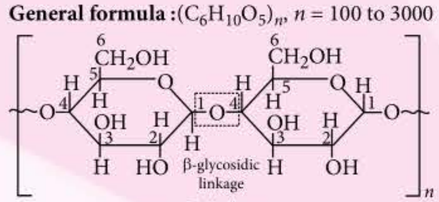


Sucrose

- **Source :** Sugarcane, beet root, milk, etc.
- Excess is stored as fats.

Polysaccharides

- Large number of monosaccharides units joined by glycosidic linkage. *e.g.*, starch, cellulose, glycogen.
- **General formula :** $(C_6H_{10}O_5)_n$, $n = 100$ to 3000



Cellulose

- **Source :** Rice, cereal, bread, etc.
- Used in synthesis of DNA.

PROTEINS

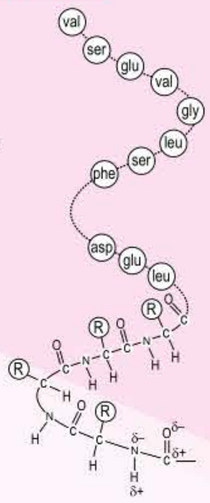
Proteins are fundamental basic unit of life (structural and functional). They are high molecular mass complex biopolymers of α-amino acids. They occur naturally in milk, cheese, pulses, peanuts, fish, meat, etc.

Proteins $\xrightarrow{\text{Hydrolysis}}$ Peptides

Peptides $\xrightarrow{\text{Hydrolysis}}$ α-Amino acids

Primary Structure

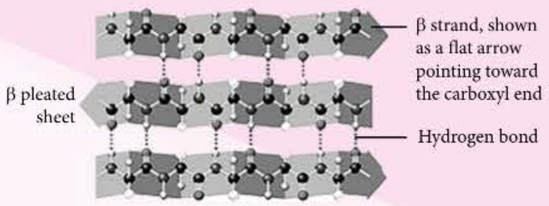
- Refers to number and linear sequence of α-amino acids held together by peptide bonds.
- Permanent dipoles exist along the length of the chain at very regular intervals.



Secondary Structure

- It is due to folding or coiling of the peptide chain.
- **α-helix :** These coils are stabilised by hydrogen bonds between carbonyl oxygen of first amino acid to amide hydrogen of fourth amino acid.

- **β-pleated sheet structure :** β-pleated sheet structure is formed when hydrogen bonds are formed between the carbonyl oxygens and amide hydrogens of two or more adjacent polypeptide chains.

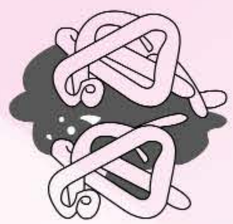


Tertiary Structure

It represents further folding of secondary structure, *e.g.*, myoglobin, insulin monomer, etc.

Quaternary Structure

The globular proteins may further associate to give quaternary structure *i.e.*, haemoglobin, insulin hexamer, etc.



LIPIDS

Lipids are organic compounds found in every type of plant and animal cell. They contain the elements carbon, hydrogen and oxygen (but less oxygen than in carbohydrates). All lipids are insoluble in water.

Types of Lipid

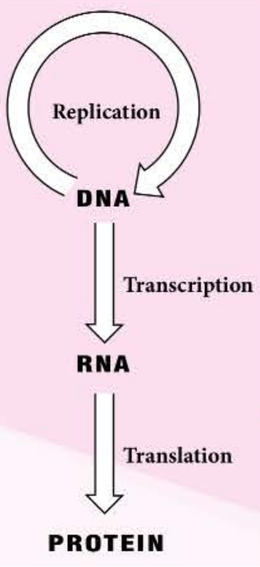
- **Triglycerides :**
  - Most common type of lipid.
  - 3 factty acids and a glycerol molecule are linked by an ester bond formed during dehydration synthesis.
- **Phospholipids :**
  - Same as triglycerides except one of the fatty acid molecule is replaced by a phosphate group (PO_4^{3-}).
  - The phosphate groups is polar and so is attracted to water, therefore the phospholipid has two distinct 'ends'.
  - A hydrophilic end ('water loving') that dissolves in water and a hydrophobic end ('water hating') that is repelled by water.
- **Steroids** having different structure in which four carbon rings are arranged in a specific molecular configuration.

NUCLEIC ACIDS

Nucleic acids are the polymers of nucleotides present in nucleus of all living cells and play an important role in transmission of the hereditary characteristics and biosynthesis of proteins.

Nucleotide $\xrightarrow{\text{Hydrolysis}}$ Nucleoside + Phosphoric acid

Nucleoside $\xrightarrow{\text{Hydrolysis}}$ Base + Sugar



DNA (Deoxyribose Nucleic Acid)	RNA (Ribose Nucleic Acid)
Double-stranded	Generally single-stranded
Deoxyribose as the sugar	Ribose as the sugar
Bases used : Thymine (T), Cytosine (C), Adenine (A), Guanine (G)	**Bases used :** Uracil (U), Cytosine (C), Adenine (A), Guanine (G)
Storage of genetic information	Expression of genetic information

Thymine

Uracil