CONCEPT MAP

BIOMOLECULES

Carbohydrates (saccharides)

Optically active polyhydroxy aldehydes or ketones or the compounds which produce such units on hydrolysis.

Classification

On the basis of their behaviour on hydrolysis.

Monosaccharides : cannot be hydrolysed further. According to number of carbon atoms and functional group present.

Types

- **Aldoses**: Contain aldehyde group (–CHO) *e.g.* arabinose, ribose, etc.
- **Ketoses**: Contain keto group (> C = O) *e.g.* ribulose, fructose, etc.

Oligosaccharides : Yields 2-10 monosaccharide units on hydrolysis classification (on number of monosaccharide units given) :

- **Disaccharides**
- **Trisaccharides** *e.g.* raffinose
- **Tetra** *e.g.* stachyrose

Sucrose (Non-reducing) : D – (+) – glucose and D – (–) – fructose held by **glycosidic linkage** between C1 of α-glucose and C2 of β-fructose. On hydrolysis it changes from dextro (+) to laevo (–) → **Invert sugar**.

Maltose (Reducing): Two α – *D* – glucose units in which C1 of one glucose linked to C4 of another glucose unit.

Lactose (Reducing) (Milk sugar): β – *D* – glucose and β – *D* – glucose with linkage between C1 of galactose and C4 of glucose.

Polysaccharides : Yield a large number of monosaccharide units. *e.g.*, starch, cellulose, glycogen, etc.

Starch : Polymer of α-glucose, have 2 components – Amylose (15-20%) (water soluble) → unbranched chain polymer and amylopectin (80-85%) (water insoluble) → branched chain polymer.

Importance

Starch – storage in plants.
Glycogen – in animals.
Cellulose – cell wall of bacteria and plants
aldopentoses *viz.* D-ribose and 2-deoxy-D-ribose - present in nucleic acids.

Proteins

are the polymers of α-amino acids connected to each other by Peptide Bond or Peptide Linkage.

↓ Hydrolysis

Peptides

↓ Hydrolysis

α-amino acids.

$R-\underset{H}{\underset{|}{C}}(NH_2)-COOH$

Essential amino acids: Which cannot be synthesised in the body and must be obtained through diet.

Non-essential amino acids : (10) (dispensable) can be synthesized by body.

Classification Based on molecular structure

- **Fibrous :** Thread like *e.g.*, keratin, collagen, myosin, etc.
- **Globular :** Spheroidal *e.g.*, insulin, Hb, antibodies, albumin, etc.

Structure

- **Primary :** Sequence of α-amino acids.
- **Secondary:** Shape due to H-bonding.
- **Tertiary :** Overall folding of the polypeptide chains (secondary structure).
- **Quaternary :** Spatial arrangement of subunits w.r.t. each other.

Denaturation

Due to coagulation, native shape of the protein is destroyed and biological activity is lost (2° and 3° structures destroyed, 1° remains intact).

Nucleic Acids

(Pentose sugar + base + phosphoric acid)

DNA

Sugar is β-D-2-deoxyribose
4 bases are : Adenine (A), Guanine (G), Cytosine (C), Thymine (T).

RNA

Sugar is β-D-ribose
3 bases are same + fourth one is Uracil (U) instead of Thymine (T).

Cellulose : In plants cell wall, straight chain, composed of β-D-glucose units joined by glycosidic linkage between C1 of one glucose unit and C4 of the next glucose unit.

Glycogen : In animals brain, liver and muscles. Similar to amylopectin.