

## 14. BIO MOLECULES

The molecules present in living system like carbohydrates, proteins, nucleic acids, lipids, vitamins etc. which are essential for the growth and maintenance of our body are called **Biomolecules**.

### 1. Carbohydrates ( Saccharides )

They can be defined as polyhydroxy aldehydes or ketones or the compounds which produce such units on hydrolysis.

**Sugars:-** Carbohydrates which are crystalline, water soluble and sweet in taste are called as sugars. Eg: Glucose, Fructose

**Non-sugars :-** Carbohydrates which are not crystalline, water insoluble and have no sweet taste are called non-sugars. Eg: Cellulose

### 2. Classification of carbohydrates

#### Based on their behaviour on hydrolysis:

Based on this, carbohydrates are classified into three types:

- **Monosaccharides:** These are carbohydrates which cannot be hydrolysed in to simpler units of polyhydroxy aldehydes or ketones. E.g. glucose, fructose, ribose, galactose etc.
- **Oligosaccharides:** These are carbohydrates which give two to ten monosaccharide units on hydrolysis. They are further classified as disaccharides, trisaccharides, tetrasaccharides etc. E.g. Sucrose, maltose, lactose.
- **Polysaccharides:** These are carbohydrates which give a large number of monosaccharide units on hydrolysis. E.g. starch, cellulose, glycogen etc.

Carbohydrates	Monomers
Sucrose	Glucose, Fructose
Maltose	Two units of Glucose
Lactose	Glucose, Galactose
Starch, Cellulose, Glycogen	A large number of Glucose units

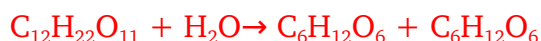
#### Based on their reducing character:

Based on this, carbohydrates are of two types – reducing sugar and non-reducing sugar.

- **reducing sugars :-** Carbohydrates which contain free aldehydic or ketonic groups. All monosaccharides are reducing sugars. Disaccharides like maltose and lactose are also reducing
- **non-reducing sugars.:-** Those which do not contain free aldehydic or ketonic group. sucrose is non-reducing
- ▶ **Why Sucrose is a non reducing Sugar? Due to the absence of free aldehydic group in it.**

### 3. Preparation of glucose

From sucrose (Cane sugar): If sucrose is boiled with dilute HCl or H<sub>2</sub>SO<sub>4</sub> in alcoholic solution, glucose and fructose are obtained in equal amounts.

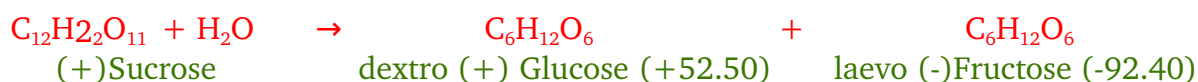


#### 4. Glycosidic Linkage

During the formation of a disaccharide or polysaccharide, the monosaccharide units are joined together through **C-O-C linkage**. Such a linkage is called glycosidic linkage.

#### 5. Invert Sugar

Cane sugar (sucrose) on hydrolysis gives an equimolar mixture of (+)glucose and (-)fructose.



Sucrose is dextro rotatory (+) but the net optical rotation of the product formed after hydrolysis is laevo (-). So the process is called inversion of cane sugar and the product formed is called invert sugar.

#### 6. Starch:

Starch is the main storage polysaccharide of plants. It is a polymer of glucose and consists of two components— Amylose and Amylopectin.

**Amylose** is water soluble component which constitutes about 15-20% of starch. It is a linear polymer of glucose units.

**Amylopectin** is insoluble in water and constitutes about 80- 85% of starch. It is a branched chain polymer of glucose units.

#### 7. Glycogen:

The carbohydrates are stored in animal body as glycogen. It is also known as animal starch because its structure is similar to amylopectin, a branched chain polymer of glucose units.

#### 8. Denaturation of Protein:

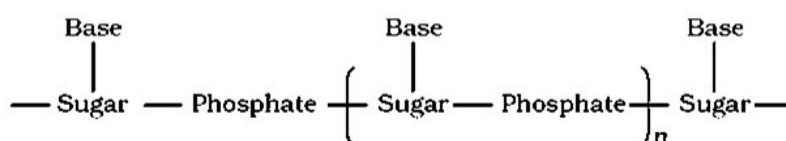
When a protein is subjected to physical change (like change in temperature) or chemical change (like change in pH), it loses the biological activities. This process is called denaturation of protein. E.g. coagulation egg white on boiling, curding of milk etc.

#### 9. Nucleic acids:

They are long chain polymers of nucleotides and are responsible for transmission of heredity. These are of two types – deoxy ribonucleic acid (DNA) and ribonucleic acid (RNA).

The nucleotide units combine to form nucleic acid through **Phospho diester linkage**.

A simplified version of nucleic acid chain is as shown below.



## 10.Differences between DNA and RNA

DNA	RNA
1. DNA is double stranded	1. RNA is single stranded
2. The pentose sugar is deoxyribose	2. The pentose sugar is ribose
3. The nitrogen bases are Adenine, Guanine, Cytosine and Uracil.	3. The nitrogen bases are Adenine, Guanine, Cytosine and Thymine.
4. Undergo replication	4. Not undergoing replication
5. Found in the Nucleus	5. Found in Cytoplasm
6. DNA is the chemical basis of heredity and may be regarded as the reserve of genetic information.	6. Protein synthesis.