BIOMOLECULES

9.0 INTRODUCTION :

Complex organic compound which governs the common activities of the living organism are called biomolecules. Living systems are made up of various complex biomolecules like carbohydrates, proteins, nucleic acids, lipids, etc. In addition, some simple molecules like vitamins and mineral salts also play an important role in the functions of organisms.

9.1.1 CARBOHYDRATES

Carbohydrates are primarily produced by plants and form a very large group of naturally occurring organic compounds. Some common examples are cane sugar, glucose, starch, etc. Most of them have a **general formula, $Cx(H_2O)_y$** and were considered as hydrates of carbon from where the name carbohydrate was derived. For example, the molecular formula of glucose ($C_6H_{12}O_6$) fits into this general formula, $C_6(H_2O)_6$. **But all the compounds which fit into this formula may not be classified as carbohydrates. Rhamnose, $C_6H_{12}O_5$ is a carbohydrate but does not fit in this definition.** Chemically, *the carbohydrates may be defined as **optically active polyhydroxy aldehydes or ketones or the compounds which produce such units on hydrolysis.*** Some of the carbohydrates, which are sweet in taste, are also called sugars. **The most common sugar, used in our homes is named as sucrose whereas the sugar present in milk is known as lactose.**

9.1.2 Classification of Carbohydrates :

Carbohydrates are classified on the basis of their behaviour on hydrolysis. They have been broadly divided into following three groups.

(i) Monosaccharides :

A carbohydrate that cannot be hydrolysed further to give simpler unit of polyhydroxy aldehyde or ketone is called a **monosaccharide**. Some common examples are glucose, fructose, ribose, etc.

Monosaccharides are further classified on the basis of number of carbon atoms and the functional group present in them. If a monosaccharide contains an aldehyde group, it is known as an **aldose** and if it contains a keto group, it is known as a **ketose**. Number of carbon atoms constituting the monosaccharide is also introduced in the name as is evident from the examples given in Table

Different Types of Monosaccharides

Carbon Atom	General term	Aldehyde	Ketone
3	Triose	Aldotriose	Ketotriose
4	Tetrose	Aldotetrose	Ketotetrose
5	Pentose	Aldopentose	Ketopentose
6	Hexose	Aldohexose	Ketohexose
7	Heptose	Aldoheptose	Ketoheptose

(ii) Oligosaccharides :

Carbohydrates that yield two to ten monosaccharide units, on hydrolysis, are called oligosaccharides. They are further classified as disaccharides, trisaccharides, tetrasaccharides, etc., depending upon the number of monosaccharides, they provide on hydrolysis. Amongst these the most common are disaccharides. The two monosaccharide units obtained on hydrolysis of a disaccharide may be same or different. For example, sucrose on hydrolysis gives one molecule each of glucose and fructose whereas maltose gives two molecules of glucose only.

(iii) Polysaccharides :

Carbohydrates which yield a large number of monosaccharide units on hydrolysis are called polysaccharides. Some common examples are starch, cellulose, glycogen, etc. Polysaccharides are not sweet in taste, hence they are also called **non-sugars.**

The carbohydrates may also be classified as either reducing or non-reducing sugars. All those carbohydrates which reduce Fehling's solution and Tollens' reagent are referred to as reducing sugars. All monosaccharides whether aldose or **ketose are reducing sugars**.

In disaccharides, if the reducing groups of monosaccharides i.e., aldehydic or ketonic groups are bonded, these are **non-reducing sugars e.g. sucrose**. On the other hand, sugars in which these functional groups are free, are called reducing sugars, for example, maltose and lactose.

9.1.3 GLUCOSE (ALDOHEXOSE)

Preparation of Glucose

1. **From sucrose (Cane sugar)**: If sucrose is boiled with dilute HCl or H_2SO_4 in alcoholic solution, glucose and fructose are obtained in equal amounts.

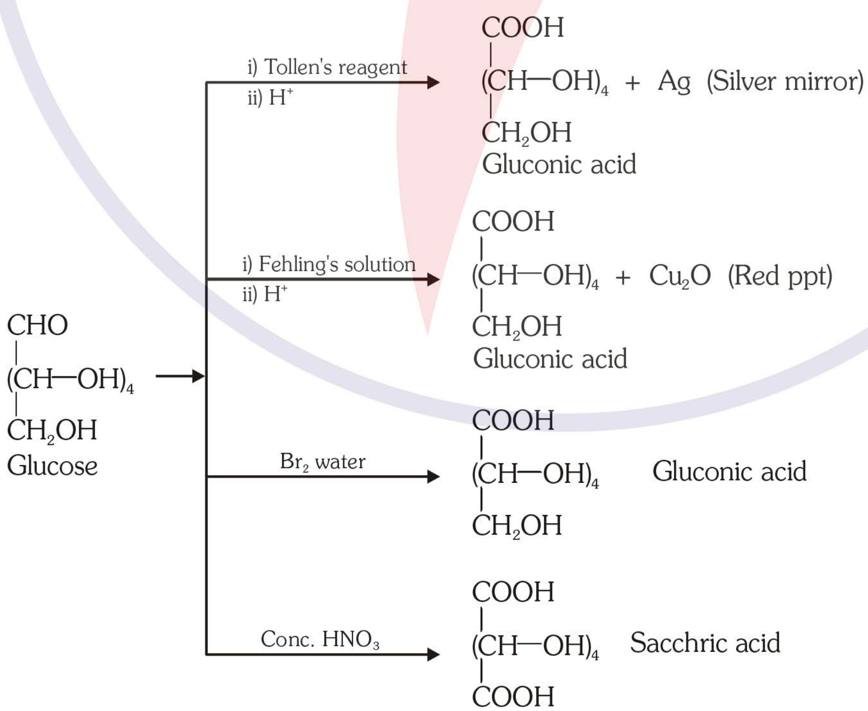
$$\underset{\text{Sucrose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{H^+} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

2. **From starch :** Commercially glucose is obtained by hydrolysis of starch by boiling it with dilute H_2SO_4 at 393 K under pressure.

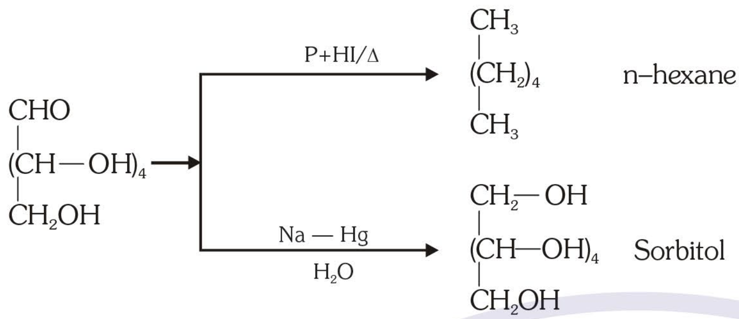
$$\underset{\text{Starch or cellulose}}{(C_6H_{10}O_5)_n} + nH_2O \xrightarrow[393K\,:\,2-3\text{ atm}]{H^+} \underset{\text{Glucose}}{nC_6H_{12}O_6}$$

Chemical reactions of Glucose :

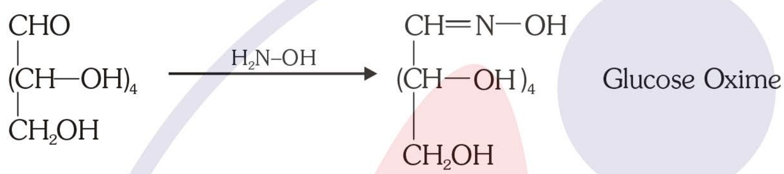
1. **Oxidation :**



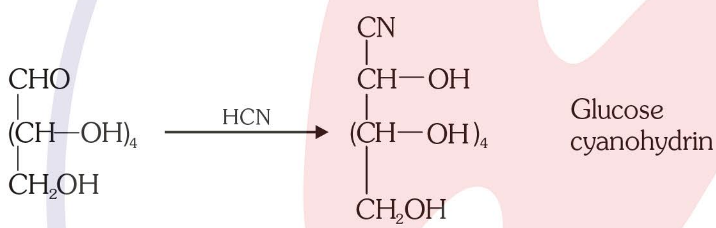
2. Reduction :



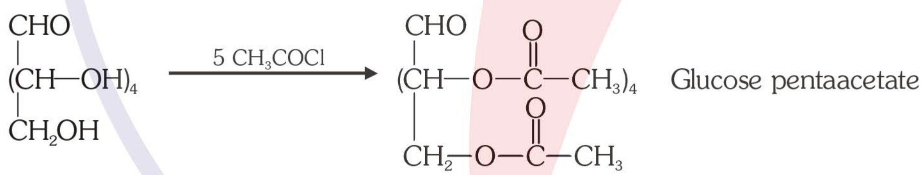
3. Reaction with hydroxyl amine :



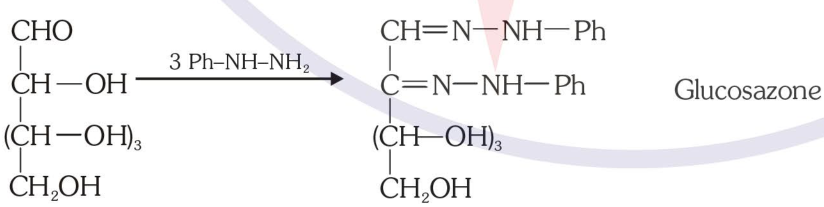
4. Reaction with hydrogen cyanide :



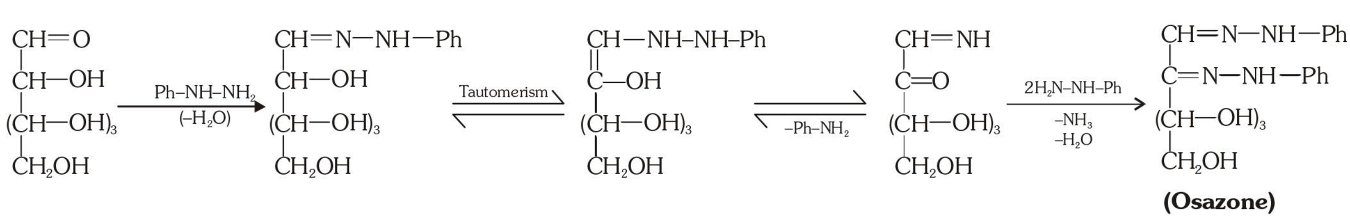
5. Acetylation :



6. Reaction with phenyl hydrazine :

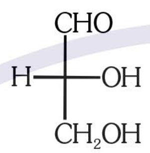


Mechanism :

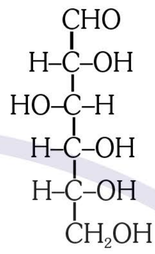


Configuration in monosaccharides :

For assigning the configuration of monosaccharides, it is the lowest asymmetric carbon atom (as shown below) which is compared. As in (+) glucose, —OH on the lowest asymmetric carbon is on the right side which is comparable to (+) glyceraldehyde, so it is assigned D-configuration.



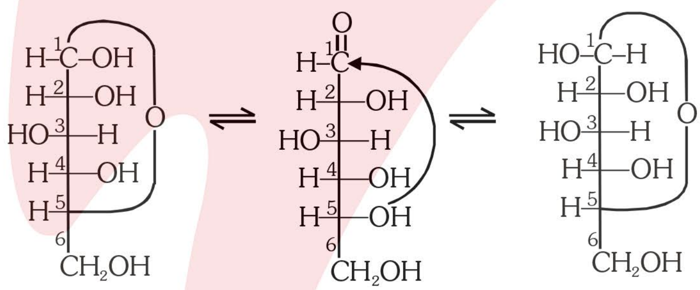
D–(+)-Glyceraldehyde



D-(+) – Glucose

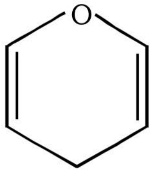
Cyclic structure of Glucose :-

It was found that glucose forms a six-membered ring in which —OH at C-5 is involved in ring formation. This explains the absence of —CHO group and also existence of glucose in two forms as shown below. These two cyclic forms exist in equilibrium with open chain structure.

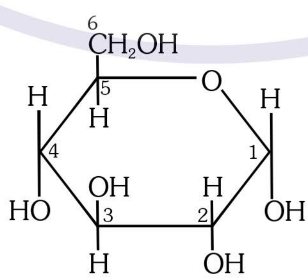


α-D-(+) – Glucose β-D-(+) – Glucose

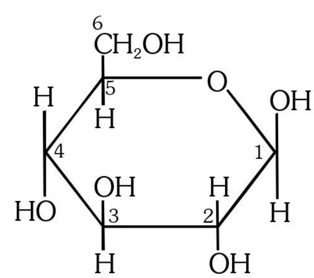
The two cyclic hemiacetal forms of glucose differ only in the configuration of the hydroxyl group at C_1, called anomeric carbon (the aldehyde carbon before cyclisation). Such isomers, i.e., α-form and β-form, are called **anomers**. The six membered cyclic structure of glucose is called **pyranose structure** (α– or β–), in analogy with pyran. Pyran is a cyclic organic compound with one oxygen atom and five carbon atoms in the ring. The cyclic structure of glucose is more correctly represented by **Haworth structure** as given below.



Pyran



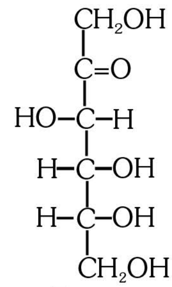
α – D – (+) – Glucopyranose
(α – Pyranose ring)



β – D – (+) – Glucopyranose
(β – Pyranose ring)

9.1.4 FRUCTOSE (KETOHEXOSE)

Structure of Fructose :

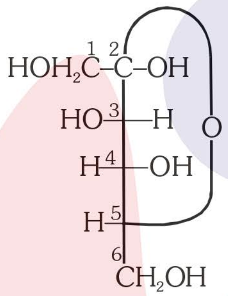


Fructose

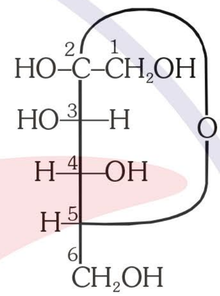
Fructose also has the **molecular formula $C_6H_{12}O_6$** and on the basis of its reactions it was found to contain **a ketonic functional group at carbon number 2** and six carbons in straight chain as in the case of glucose. It belongs to **D-series and is a laevorotatory compound.** It is appropriately written as **D-(–)-fructose.** Its open chain structure is as shown.

It also exists in two cyclic forms which are obtained by the addition of —OH at C5 to the (>C=O) group. The ring, thus formed is a five membered ring and is named as **furanose** with analogy to the compound furan. Furan is a five membered cyclic compound with one oxygen and four carbon atoms.

Furan

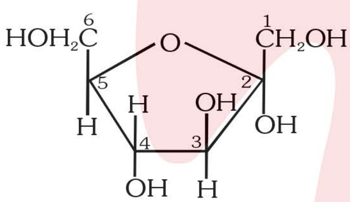


α – D – (–) – Fructofuranose

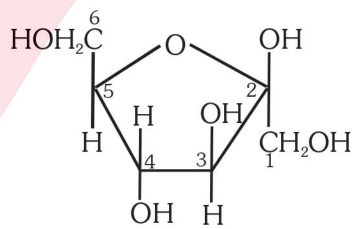


β – D – (–) – Fructofuranose

The cyclic structures of two anomers of fructose are represented by Haworth structures as given.



α – D – (–) – Fructofuranose
(α – Furanose ring)



β – D – (–) – Fructofuranose
(β – Furanose ring)

COMPARISON OF GLUCOSE AND FRUCTOSE

S. No.	Property	Glucose	Fructose
1.	Molecular formula	$C_6H_{12}O_6$	$C_6H_{12}O_6$
2.	Nature	Polyhydroxy aldehyde	Polyhydroxy ketone
3.	Melting point	146°C	102°C
4.	Optical nature	Dextro rotatory	Leavo rotatory
5.	Tollen's reagent	Silver mirror	Silve mirror
6.	Fehling's solution	Red ppt	Red ppt
7.	Molisch test	Violet colour	Violet colour
8.	Phenyl hydrazine	Forms osazone	Forms osazone
9.	Oxidation by conc. HNO_3	Saccharic acid	Mixture of glycollic acid, Tartaric acid and Trihydroxy Gluteric acid

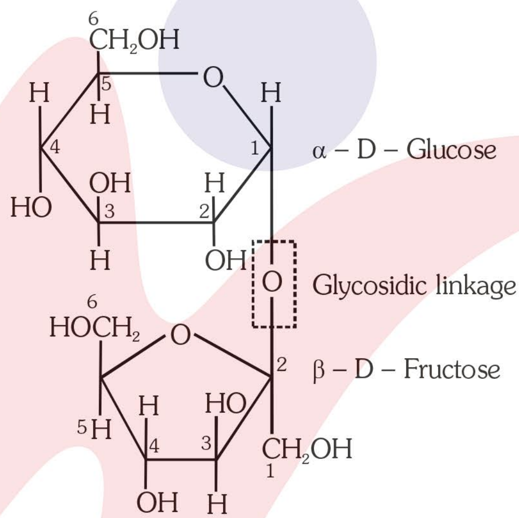
9.1.5 DISACCHARIDES

The two monosaccharides are joined together by an oxide linkage formed by the loss of a water molecule. Such a linkage between two monosaccharide units through oxygen atom is called ***glycosidic linkage***.

(i) **Sucrose :** One of the common disaccharides is **sucrose** which on hydrolysis gives equimolar mixture of D- (+)-glucose and D-(-) fructose.

$$\underset{\text{Sucrose}}{C_{12}H_{22}O_{11}} + H_2O \longrightarrow \underset{\text{D-(+)-Glucose}}{C_6H_{12}O_6} + \underset{\text{D-(-)Fructose}}{C_6H_{12}O_6}$$

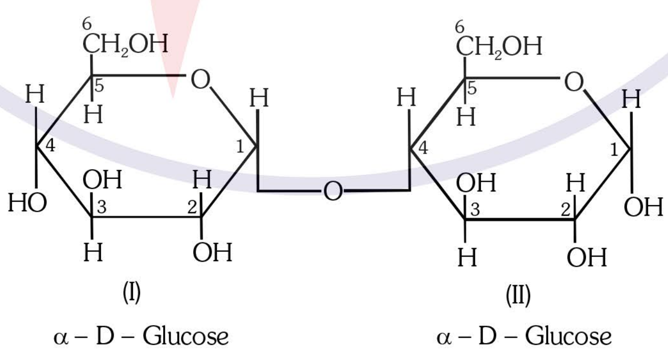
These two monosaccharides are held together by a glycosidic linkage between C_1 of α-glucose and C_2 of β-fructose. Since the reducing groups of glucose and fructose are involved in glycosidic bond formation, sucrose is a **non reducing sugar.**



Sucrose

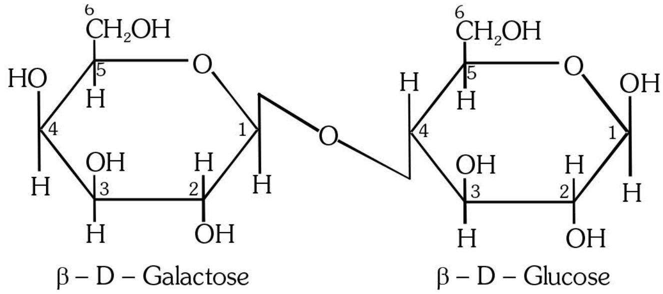
Hydrolysis of sucrose brings about a change in the sign of rotation, from dextro (+) to laevo (–) and the product is named as invert sugar.

(ii) **Maltose**: Another disaccharide, maltose is composed of two α-D-glucose units in which C_1 of one glucose (I) is linked to C_4 of another glucose unit (II). The free aldehyde group can be produced at C_1 of second glucose in solution and it shows reducing properties so it is a **reducing sugar.**



Maltose

(iii) **Lactose** : It is more commonly known as milk sugar since this disaccharide is found in milk. It is composed of β-D-galactose and β-D-glucose. The linkage is between C_1 of galactose and C_4 of glucose. Hence it is also a **reducing sugar.**



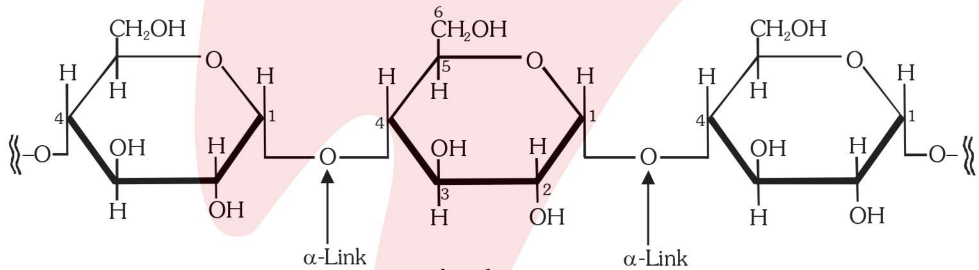
Lactose

9.1.6 POLYSACCHARIDES

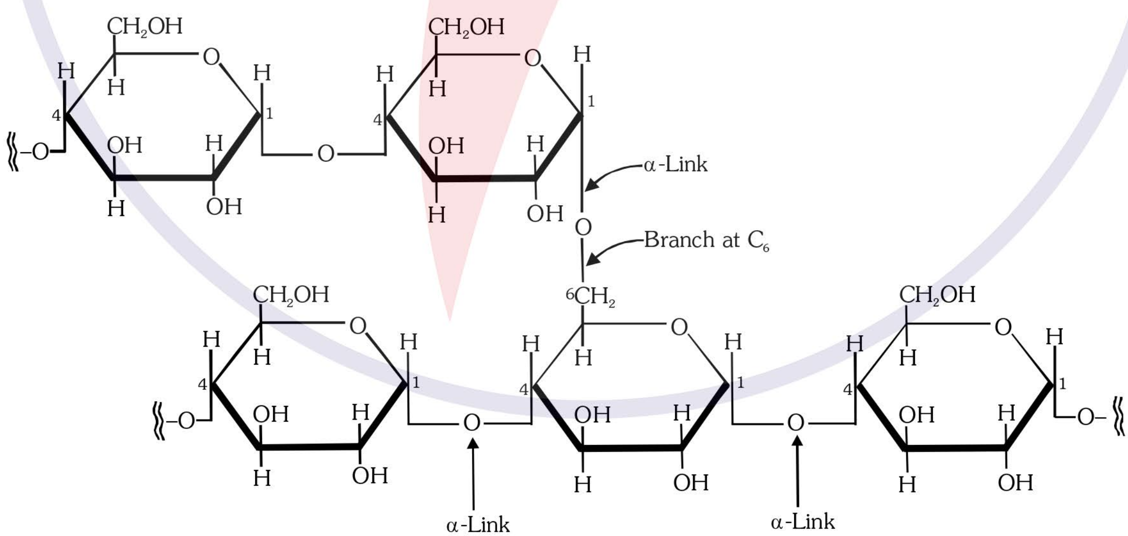
Polysaccharides contain a large number of monosaccharide units joined together by glycosidic linkages. They mainly act as the food storage or structural materials.

(i) ***Starch***: Starch is the main storage polysaccharide of plants. It is the most important dietary source for human beings. High content of starch is found in cereals, roots, tubers and some vegetables. It is a **polymer of α-glucose** and consists of two components—

Amylose and **Amylopectin**. Amylose is hot water soluble component which constitutes about 15-20% of starch. Chemically amylose is a long unbranched chain with 200-1000 α-D-(+)-glucose units held by $C_1 – C_4$ glycosidic linkage. Amylopectin is insoluble in hot water and constitutes about 80-85% of starch. It is a branched chain polymer of α-D-glucose units in which chain is formed by $C_1–C_4$ glycosidic linkage whereas branching occurs by $C_1–C_6$ glycosidic linkage.

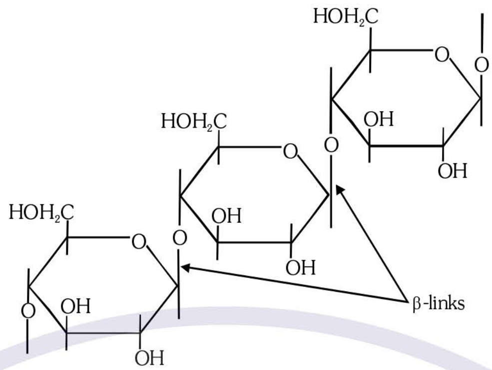


Amylose



Amylopectin

(ii) **Cellulose** : Cellulose occurs exclusively in plants and it is the most abundant organic substance in plant kingdom. It is a predominant constituent of cell wall of plant cells. Cellulose is a straight chain polysaccharide composed only of **β-D-glucose** units which are joined by glycosidic linkage between C_1 of one glucose unit and C_4 of the next glucose unit.

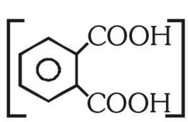


Cellulose

(iii) **Glycogen :** The carbohydrates are stored in animal body as glycogen. It is also known as ***animal starch*** because its structure is similar to amylopectin and is rather more highly branched. It is present in liver, muscles and brain. When the body needs glucose, enzymes break the glycogen down to glucose. Glycogen is also found in yeast and fungi.

POLYMER

9.2 MONOMERS AND POLYMERS

S.N.	Monomer	Polymer	Type of Polymers
1.	$CH_2{=}CH_2$ (Ethylene)	Poly ethene	Addition polymer
2.	$CH_2{=}CHCH_3$ (Propylene)	Poly propylene	Addition homo polymer
3.	$CH_2{=}CHCl$ (Vinyl chloride)	Polyvinyl chloride (PVC)	Homopolymer, chain growth
4.	$CH_2{=}CH{-}C_6H_5$ (Styrene)	Polystyrene (styron)	Addition homo polymer, linear chain
5.	$CH_2{=}CH{-}CN$ (Acrylonitrile)	Ployacrylonitrile (PAN) or Orlon	Addition homopolymer
6.	$CH_2{=}CH{-}CH{=}CH_2$ (1,3 Butadiene) + Styrene	BUNA-S rubbers	Addition copolymer
7.	$CH_2{=}CHOCOCH_3$ (Vinyl acetate)	Poly vinyl acetate (PVA)	Addition homopolymer
8.	$CF_2{=}CF_2$ (Tetrafluoro ethylene)	Teflon	Chain growth homopolymer (Nonstick cookwares)
9.	$CH_2{=}C(CH_3){-}CH{=}CH_2$ (Isoprene)	Natural Rubber	Additon homopolymer
10.	$CH_2{=}C(Cl){-}CH{=}CH_2$ (Chloroprene)	Neoprene (Artificial Rubber)	Addition homopolymer
11.	Ethylene Glycol + terephthalic acid	Terylene or Dacron (Polyester)	Condensation Copolymer, step growth
12.	Hexamethylene diamine + adipic acid	Nylon-6,6 (Polyamide)	Copolymer, step growth linear
13.	Formaldehyde + urea	Urea formaldehyde resin	Copolymer, step growth
14.	Formaldehyde + Phenol	Bakelite	Copolymer, step growth
15.	Methyl methacrylate $CH_2{=}C(CH_3){-}COOCH_3$	Poly methyl meth acrylate (PMMA)	Addition homopolymer
16.	Ethylene Glycol + Phthalic acid 	Glyptal or alkyd resin	Copolymer, linear step growth, thermo plastic
17.	Melamine + formaldehyde	Melamine formaldehyde resin	Copolymer, step growth thermosetting polymer
18.	Hexamethylene diamine + sebasic acid	Nylon - 6,10	Copolymer, step growth linear
19.	Caprolactam	Nylon - 6	Homopolymer, step growth linear

CHEMISTRY IN EVERY DAY LIFE

9.3.1 DRUGS

Drugs :

Drugs are the chemicals of low molecular masses which interact with macromolecular target and produce a biological responce.

Medicines :

Medicines are the drug which are therapeutic and used for diagnosis, prevention and treatment of diseases.

CLASSES OF DRUGS

(A) Antiseptics :

Which prevent or destroy the growth of the harmful micro organism on living organism externally like wound, cut or skin surface. Common antiseptics are-

Dettol, Savlon, Cetavelon, acriflavin, lodine, methylene blue, mercurochrome, Furacine, Soframicine

Dettol is a mixture of chloroxylenol and terpineol.

Bithional -It is added to soap to impart antiseptic properties

Iodoform is also used as an antiseptic for wounds. Boric acid in dilute aqueous solution is weak antiseptic for eyes.

(B) Disinfectants :

The chemical compounds capable of completely destroying the micro organism on non-living objects are termed as disinfectants. These are toxic to living tissues.

These are utilized for sterilization of floor, toilets instruments and cloths.

Same substance can act as an antiseptic as well as disinfectant by varying the concentration.

eg. 1% solution of phenol in disinfectant while 0.2% solution of phenol is antiseptic.

(C) Analgesics :

The substance which are used to get relief from pain. These are of two types -

(a) Narcotics or habit forming drugs

(b) Non-narcotics or non-addictive

(a) Narcotics : These are alkaloids and mostly opium products, causes sleep and unconsciousness when taken in higher doses.

e.g. Morphine, codeine, heroin

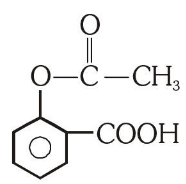
(b) Non-narcotics : Analgesics belonging to this category are effective antipyretics also.

e.g. Aspirin, Novalgin, Ibuprofen and Naproxen

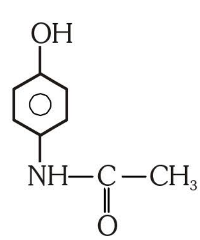
(D) Antipyretics :

To bring down the body temp. in high fever are called antipyretics.

e.g - (a) Aspirin, (b) Analgin (Novalgin), (c) Paracetamol, (d) Phenacetin



Aspirin



Paracetamol

(E) Antimalarials :

Drug which is used to prevent or cure malaria.

e.g. Quinine, Chloroquine, Paraquine and Primaquine etc.

(F) Tranquilizers :

The chemical substances which acts on the central nervous system and has a calming effect.

Since these are used for mental diseases so are known as psycotherapeutic drugs.

They are of two types - (a) Sedative or hypnotics (b) Mood elevators

(a) **Sedative** : Reduce nervous tension and promote relaxation. e.g. Reserpine, barbituric acid and its derivatives as luminal, seconal & veronal.

(b) **Mood elevators or Antidepressants :** A drug used for treatment of highly depressed patient, who has lost confidence.

e.g. Benzedrine (amphetamine), Iproniazid and phenelzine

Chlordiazepoxide and meprobamate are relatively mild tranquilizers suitable for relieving tension.

(G) Anesthetics :

These are chemical substances used for producing general or local insensibility to pain and other sensation.

These are of two types (a) General (b) Local

(a) General : - Produce unconsciousness and are given at the time of major surgical operations.

e.g. - Gaseous form $\rightarrow$ Nitrous oxide, ethylene, cyclopropane etc.

Liquid form $\rightarrow$ Chloroform, divinyl ether and sodium pentothal etc.

(b) Local anaesthetics: Produce loss of sensation on a small portion of the body. It is used for minor operations.

e.g. Jelly form $\rightarrow$ Oxylocain

Spray form $\rightarrow$ Ethyl chloride

Injection form $\rightarrow$ Procain

(H) Antibiotics : Initially antibiotic were the chemical substances produced from some micro organism (fungi bacteria or mold) and are used to inhibit the growth or even destroy micro organism.

But now, antibiotics are substances produced wholly or partially by chemical synthesis which in low concentrations inhibits the growth or destroy micro-organism by intervening in their metabolic processes.

These are effective in the treatment of infections diseases.

The range of bacteria or other micro-organisms that are affected by a certain antibiotic is expressed as its spectrum of action.

Three types of spectrum of action :

(i) Broad spectrum antibiotics – Antibiotics which kill or inhibit a wide range of gram-positive and gram-negative bacteria. e.g. Ofloxacin, Ampicillin, Amoxycillin, Chlorapheniol

(ii) Narrow spectrum antibiotics – Those effective mainly against gram-positive or gram-negative bacteria are narrow spectrum antibiotics. e.g. – penicillin G

(iii) Limited spectrum antibiotic – Those effctive against a single organism or disease are limited spectrum antibiotics. e.g. – dysidazirine – toxic toward certain strain of cancer cell.

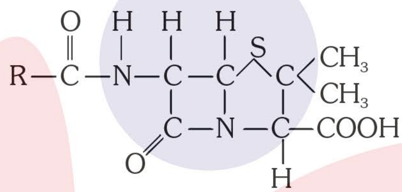
Antibiotics have either cidal (killing) effect or a static (inhibitory) effect on microbes. A few example of the two types are –

Bactericidal	**Bacteriostatic**
Penicillin	Erythromycin
Aminoglycosides	Tetracycline
Ofloxacin	Chloramphenicol

eg. Salvarsan, Arsphenamine, Prontosil (Sulphanilamide is active part)

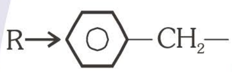
Penicillin - It is highly effective drug for pneumonia, Bronchitis, abcesses, sore throat etc.

Other naturally occuring penicillin -



General Structure of Penicillin

R - May be -

 (Penicillin G)

$R \rightarrow CH_3—CH_2—CH{=}CH—CH_2—$ (Penicillin-F)

$R \rightarrow CH_3—(CH_2)_6—$ (Penicillin-K)

Note: Ampicillin & Amoxycillin are synthetic penicillin.

Synthetic antibiotics are Streptomycin, Chloromycetin, Tetracyclins

(I) Antacids

Over production of acid in the stomach causes irritation and pain. In severe cases, ulcers are developed in the stomach. Only treatment for acidity was administration of antacids, such as sodium hydrogencarbonate or a mixture of aluminium and magnesium hydroxide. However, excessive hydrogencarbonate can make the stomach alkaline and trigger the production of even more acid. Metal hydroxides are better alternatives because of being insoluble, these do not increase the pH above neutrality.

A chemical, histamine, stimulates the secretion of pepsin and hydrochloric acid in the stomach. The drug cimetidine (Tegamet), was designed to prevent the interaction of histamine with the receptors present in the stomach wall. This resulted in release of lesser amount of acid. Other e.g. – Ranitidine (Zantac)

(J) Antihistamine

Histamine is responsible for the nasal congestion associated with common cold and allergic responce pollen.

Synthetic drugs, brompheniramine (Dimetapp) and terfenadine (Seldane), act as antihistamines. They interfere with the natural action of histamine by competing with histamine for binding sites of receptor where histamine exerts its effect.

Ques. : Why do antihistamines not affect the secretion of acid in stomach ?

Ans. : Reason is that antiallergic and antacid drugs work on different receptors.

9.3.2 ARTIFICIAL SWEETENING AGENTS

Natural sweeteners, e.g., sucrose add to calorie intake and therefore many people prefer to use artificial sweeteners. Ortho-sulphobenzimide, also called saccharin, is the first popular artificial sweetening agent. It is about 550 times as sweet as cane sugar. It is excreted from the body in urine unchanged. It appears to be entirely inert and harmless when taken. Some other commonly marketed artificial sweeteners and their relative sweetness value in comparison to canesugar is :-

Artificial Sweetner	Sweetness value in Comparison to cane sugar
Aspartame	100
Saccharin	550
Sucralose	600
Alitame	2000

9.3.3 FOOD PRESERVATIVES

Food preservatives prevent spoilage of food due to microbial growth. The most commonly used preservatives include table salt, sugar, vegetable oils and sodium benzoate. Sodium benzoate is used in limited quantities and is metabolised in the body. Salts of sorbic acid and propanoic acid are also used as preservatives.

9.3.4 CLEANSING AGENTS

These are soaps and synthetic detergents. These improve cleansing properties of water. These help in removal of fats which bind other materials to the fabric or skin.

Soaps

Soaps are sodium or potassium salts of long chain fatty acids, e.g., stearic, oleic and palmitic acids. Soaps containing sodium salts are formed by heating fat (i.e., glyceryl ester of fatty acid) with aqueous sodium hydroxide solution. This reaction is known as saponification.

Soap does not work in hard water due to presence of calcium and magnesium ion in hard water. These ions form insoluble calcium & magnesium soap respectivelly.

$$C_{17}H_{35}COONa + CaCl_2 \longrightarrow 2NaCl + \underset{\text{Insoluble calcium soap}}{(C_{17}H_{35}COO)_2Ca}$$

These insoluble soap seperate as scum in water and are useless as cleansing agent.

Types of soaps

• Toilet soaps • Transparent soaps • Medicated soaps • Shaving soaps •Laundry soaps

Synthetic Detergents

Synthetic detergents are cleansing agents which have all the properties of soaps, but which actually do not contain any soap. These can be used both in soft and hard water as they give foam even in hard water.

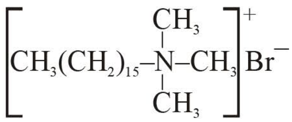
Synthetic detergents are mainly classified into three categories:

(i) Anionic detergents (ii) Cationic detergents and (iii) Non-ionic detergents

(i) Anionic Detergents: Anionic detergents are sodium salts of sulphonated long chain alcohols or hydrocarbons. Alkyl hydrogensulphates formed by treating long chain alcohols with concentrated sulphuric acid are neutralised with alkali to form anionic detergents. The anionic part of the molecule is involved in the cleansing action. Mostly used for household work and in toothpastes.

$$\underset{\text{Lauryl alcohol}}{CH_3(CH_2)_{10}CH_2OH} \xrightarrow{H_2SO_4} \underset{\text{Lauryl hydrogensulphate}}{CH_3(CH_2)_{10}CH_2OSO_3H} \xrightarrow{NaOH(aq)} \underset{\substack{\text{Sodium laurylsulphate} \\ \text{(Anionic detergent)}}}{CH_3(CH_2)_{10}CH_2OS\bar{O}_3\overset{+}{N}a}$$

(ii) Cationic Detergents: Cationic detergents are quarternary ammonium salts of amines with acetates, chlorides or bromides as anions. Cationic part possess a long hydrocarbon chain and a positive charge on nitrogen atom. Hence, these are called cationic detergents. Cetyltrimethylammonium bromide is a popular cationic detergent and is used in hair conditioners.



Cetyltrimethyl ammonium bromide

(iii) Non-ionic Detergents: Non-ionic detergents do not contain any ion in their constitution. One such detergent is formed when stearic acid reacts with polyethyleneglycol.

$$CH_3(CH_2)_{16}COOH + HO(CH_2CH_2O)_nCH_2CH_2OH \xrightarrow{-H_2O} CH_3(CH_2)_{16}COO(CH_2CH_2O)_nCH_2CH_2OH$$

Liquid dish washing detergents are non-ionic type.

GOLDEN KEY POINTS

- Aspirin is used to prevent heart attacks besides being antipyretic and analgesic agents.
- Derivatives of barbituric acid, viz. veronal, amytal, nembutal, luminal and seconal are hypnotic tranquillizer while meprobamate, equanil, valium and serotonin are non-hypnotic tranquiiizers.
- Soaps, detergents and phospholipids are called surfactants since they lower the surface tension of water.
- All surfactants consist of two characteristic groups, i.e., apolar head group which is water-soluble (hydrophilic group) and a non-polar hydrocarbon tail which is oil-soluble (lyophilic or lipophilic group).
- Sodium soaps are hard while potassium soaps are soft. Therefore, washing soaps are mostly sodium soaps while liquid soaps having creams and toilet soaps are potassium salts.
- Unlike soaps, detergents can be used in hard water. The reson being that magnesium and calcium salts of detergents are soluble in water while those of soaps are insoluble in water.
- Aspirin, phenacetin and paracetamol act both as antipyretics and analgesics.
- The alkaloid morphine and its derivatives such as codeine (morphine methyl ether) and heroin (morphine diacetate) are important narcotic analgesic.
- Aspirin is a non-narcotic analgesic but is toxic to liver. It also undergoes hydrolysis in the stomach producing salicylic acid which causes bleeding from the stomach wall. Therefore, other non-narcotic analgesics such as naproxen, ibuprofen and diclofenac sodium or potassium are preferred to aspirin.
- Enovid E which is a mixture of norethindron (a progestogen) and ethynysestradiol (an estrogen) is the most commonly used oral contraceptive.
- Tetracycline, vancomycin, ofloxacin and chloramphenicol are broad spectrum antibiotics.
- AZT (3'-Azido-3-deoxythymidine) is used against AIDS i.e. HIV-infections.
- Sulpha drugs are effective against bacterial infections.
- Ciprofloxacin and norfloxacin are quinolene based antibacterial drugs.
- Artificial sweetners have no caloric value and hence are useful for diabetic persons.