BIOMOLECULES

Monosaccharides

Single sugar units which can not be hydrolysed

- **Fructose** – **Fruit sugar** (sweetest natural Sugar)
- **Glucose** – "Sugar of body" **Blood sugar**).

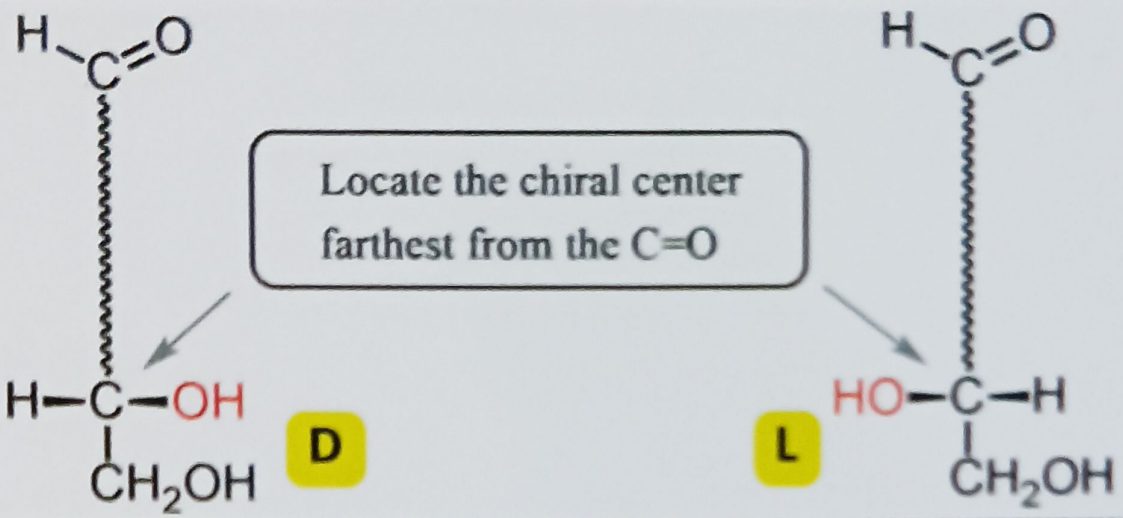
Acidic **Hydrolysis of sucrose** in alcoholic solution gives glucose and fructose

Determination of Structure of Glucose

Reagent used	Observation	End Product
HI	6 Carbon in Straight Chain	n-hexane
NH_2OH/HCN	Presence of Carbonyl group	Glucoxme/ Cyanohydrin
Br_2/H2O	Presence of Aldehydic group	Gluconic acid
Acetic Anhydride	Presence of 5 -OH groups	Glucose pentacetate
Nitric acid	Presence of 1° Alcoholic group	Saccharic acid

On reaction with **$NaBH_4$**, **Sorbitol** is obtained

D & L nomenclature in carbohydrates



- Glucose is Aldohexose, Fructose is Ketohexose.
- **Anomers** : α-D-Glucose and β-D-Glucose differ in position of OH at C1.
- **Epimers :** α-D-Glucose & α-D-Galactose differ in position of OH at C4. (C4 epimers)

Disachharides

Yields two molecules of sugar on hydrolysis

Name	Linkage
Sucrose	C1 of α-D-Glucose and C2 of β-D-Fructose
Maltose	C1 of α-D-Glucose and C4 of α-D-Glucose
Lactose	C1 of β-D-Galactose and C4 of β-D-Glucose

- Sucrose is **a non reducing sugar** not giving positive test for Tollens and Fehlings. (All others give +ve test)
- Hydrolysis of sucrose changes sign of rotation from dextro (+) to laevo (-) owing to **Invert sugar** behaviour
- Lactose is also called milk sugar

Polysachharides

Large no. of monosaccharides joined together

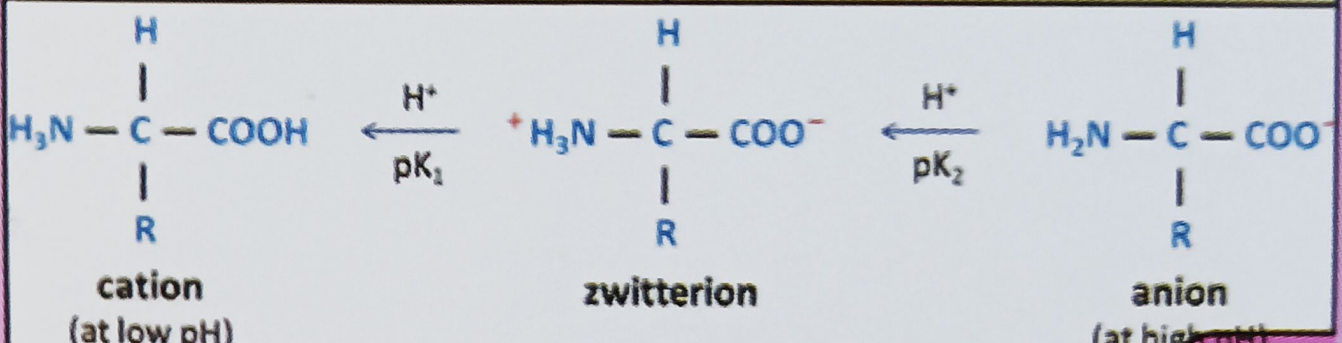
- **Starch** is storage house of plants
  - **Amylose** - Water soluble - constitutes 15-20% of starch - Unbranched chain of α-D(+)-Glucose units - held together with C1-C4 linkage
  - **Amylopectin** - Water insoluble - constitutes 80-85% of starch - Branched chain of α-D(+)-Glucose units - held together with C1-C6 linkage

- **Cellulose** is constituent of cell wall in plant cells.
  - Straight chain of β-D-Glucose (C1-C4 Linkage)

- **Glycogen** (Carbohydrates are stored in human body)
  - Similar to amylopectin

Amino acids

Essential Amino acids	Non Essential A-A
Valine, Leucine, Isoleucine, arginine, Lysine, Threonine, Methionine, Phenylalanine, Tryptophan, Histidine	Glycine, Alanine, Glutamic acid, Aspartic acid, Glutamine, As Paragine, Serine, Cysteine, Tyrosine, Proline



cation (at low pH) | zwitterion | anion (at high pH)

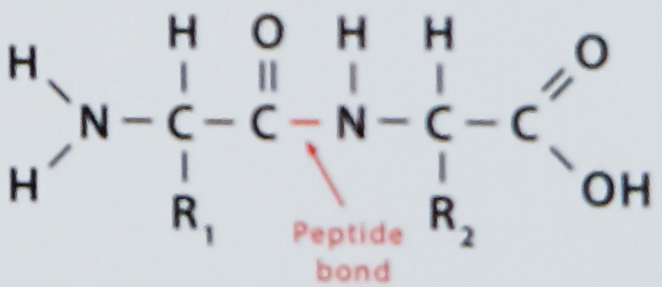
- Zwitter ion is neutral despite having charges.
- Shows amphoteric behaviour (acidic/basic)
- Only Glycine is optically inactive amino acid

Proteins

Polymers of amino acids joined with peptide linkage

Fibrous Proteins	Globular Proteins
long and narrow shape	rounded shape
mostly insoluble in water	Soluble in water
Hydrogen and disulphied bonds	Hydrogen bonding
e.g. Keratin, Myosin	e.g. Albumin, insulin

Peptide Linkage between **-COOH and -NH_2**



Denaturation of Proteins

- Temperature and pH both have a significant impact
- Hydrogen bonding disturbed (Globules unfolds and helix uncoils)
- Protein loses biological activity.
- During Denaturation, only 1° structure remains intact.
- e.g.
  - Coagulation of egg whites
  - Curdling of milk

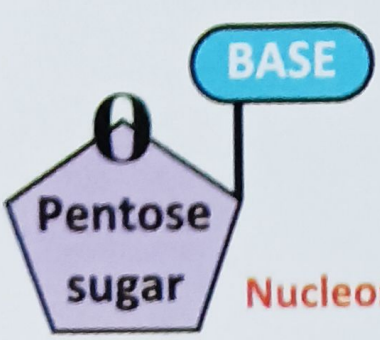
- Lactose is also called milk sugar

Vitamins and their definciency

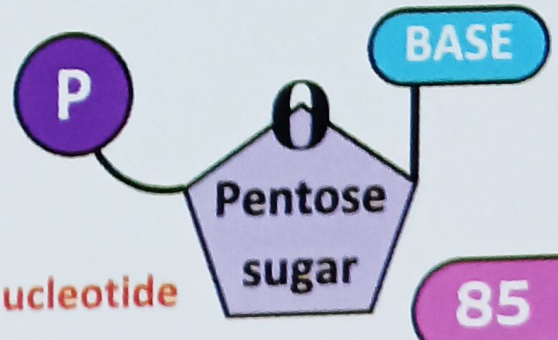
Vitamin	Definciency disease	Solubility
A	Xeropthalmia	Fat Soluble
B1 (Thiamine)	Beri-Beri	Water Soluble
B2 (Riboflavin)	Cheilosis	Water Soluble
B6 (Pyridoxine)	Convulsions	Water Soluble
B12	Pernicious anaemia	Water Soluble
C (Ascorbic acid)	Scurvy	Water Soluble
D	Rickets, osteomalacia	Fat Soluble
E	Muscular Weakness	Fat Soluble
K	Blood clotting time ↑	Fat Soluble

Important Points about Nucleic acids

- Total 5 bases : Adenine (A), Guanine (G), Cytosine (C), Thymine (T), Uracil (U).
- Nucleoside : Base + Sugar (1' position)
- Nucleotide : Base + Sugar (1') + Phosphate (5')
- Nucleotides are joined together by phospho-diester linkage between 5' and 3' of sugar moiety



Nucleoside



Nucleotide

	DNA	RNA
Bases	A,G,C,T	A,G,C,U
Sugar	β-2-deoxyribose	β-D-ribose
Strand	Double stranded	Single Stranded
Stability	It is stable	Unstable
Chargaff's rule	Obeys	Doesn't obey
Sensitivity	UV Sensitive	UV Resistant