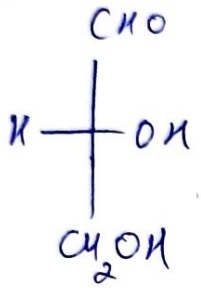
Carbohydrate: optically active polyhydroxy aldehyde or ketone. ①

↳ general formula → $C_x(H_2O)_y$ eg. Glucose ($C_6H_{12}O_6$)

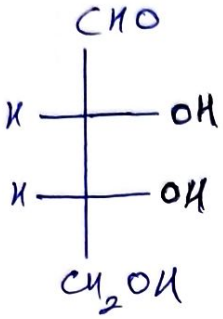
Exception: Rhamnose ($C_6H_{12}O_5$)

Aldotriose

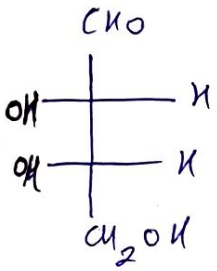


Glyceral or Glyceraldehyde

Aldotetrose

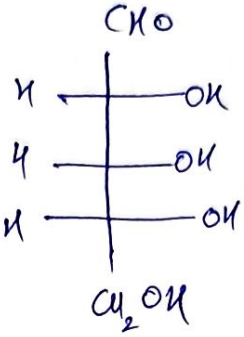


D - Erythrose

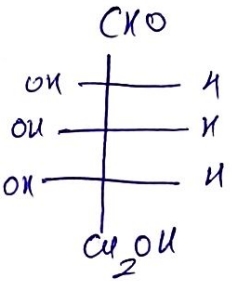


L - Erythrose

Aldopentose

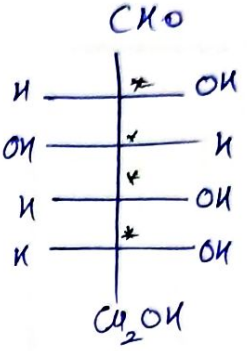


D - Ribose



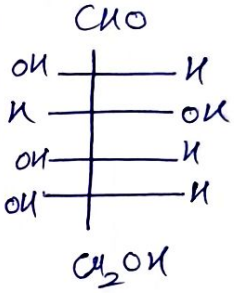
L - Ribose

Aldohexose

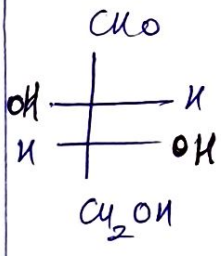


D - Glucose

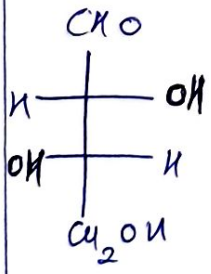
4-chiral carbon



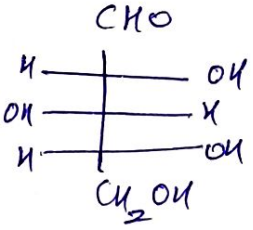
L - Glucose



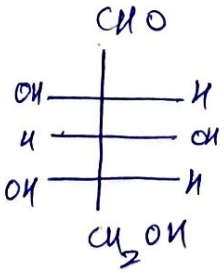
D - Threose



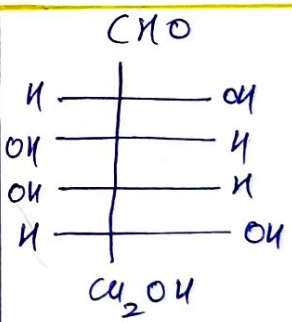
L - Threose



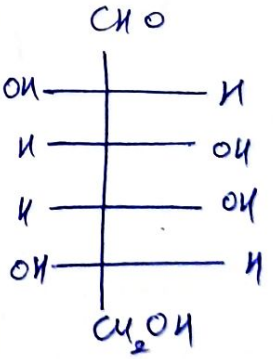
D - Xylose



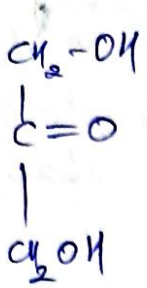
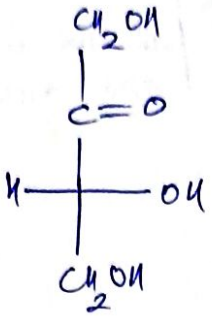
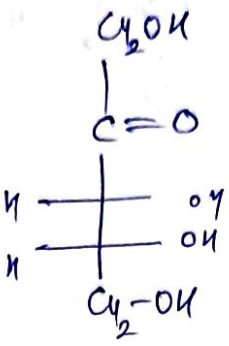
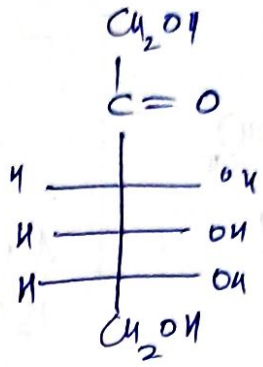
L - Xylose



D - Galactose



L - Galactose

2. otriose	keto tetrose	keto pentose	keto hexose
			
Dihydroxy acetone	Erythrulose	Ribulose	fructose

3-chiral carbon

Oligosaccharides – (2 to 10)

- Disaccharides (On hydrolysis yield two units)
  eg. Sucrose, Maltose, Lactose
- Trisaccharides (On hydrolysis yield three units)
  eg. Raffinose
- Tetrasaccharides (On hydrolysis yield four units)
  eg. stachyose

Carbohydrates

Sugars

- Carbohydrates which are crystalline, sweet to taste & soluble in water
  eg. Monosaccharides & Oligo..

Non sugars

- Carbohydrates which are amorphous, tasteless & insoluble in water.
  eg. Polysaccharides

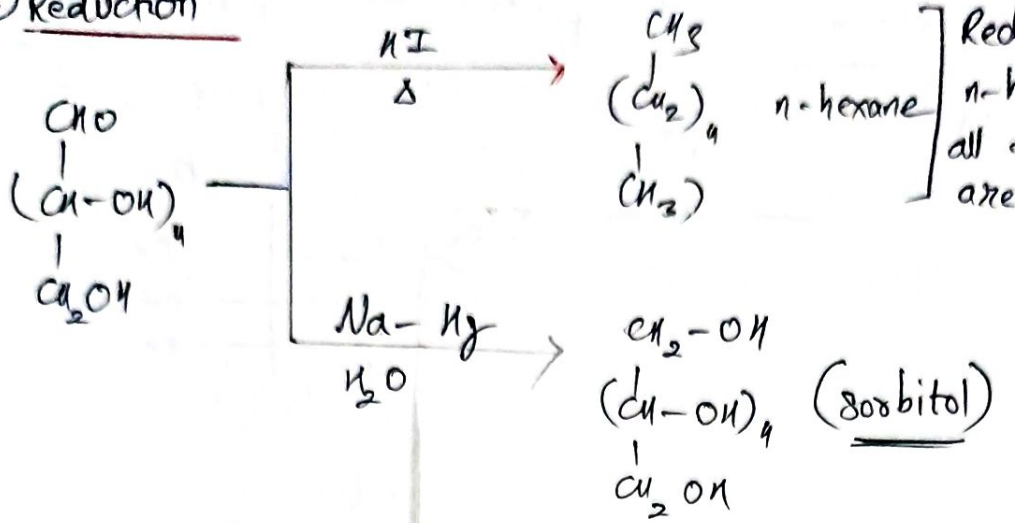
Reducing sugars

- Reduces the Fehling's sol^n & Tollon's reagent.
- free carbonyl groups present
  eg. Maltose, Lactose, fructose, Glucose, Glactose

Non-Reducing sugar

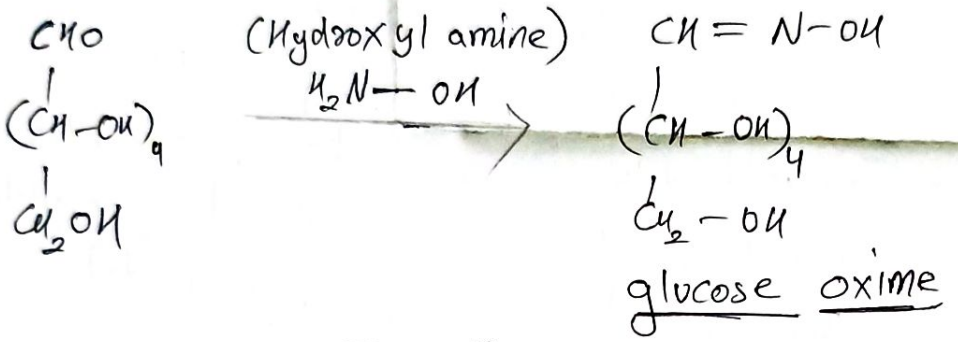
- Not Reduce the Reagent
- free carbonyl group ABSENT
  eg. Sucrose, Cellulose, starch

(B) Reduction

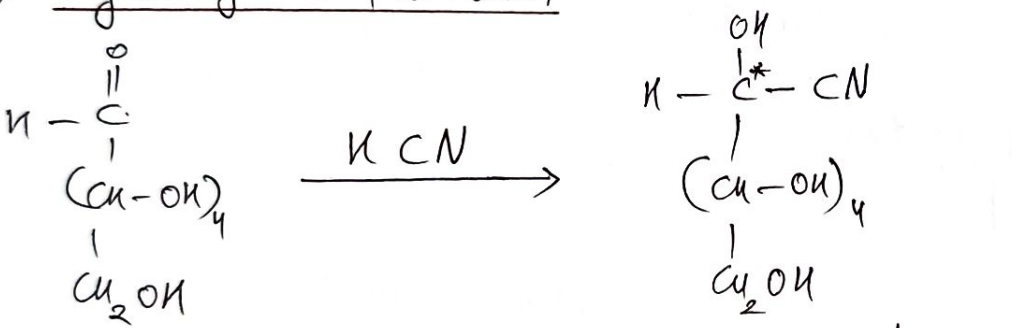


Reduction with HI gives n-hexane which shows that all the 6-carbons of glucose are arranged in straight chain.

(C) Oxime formation

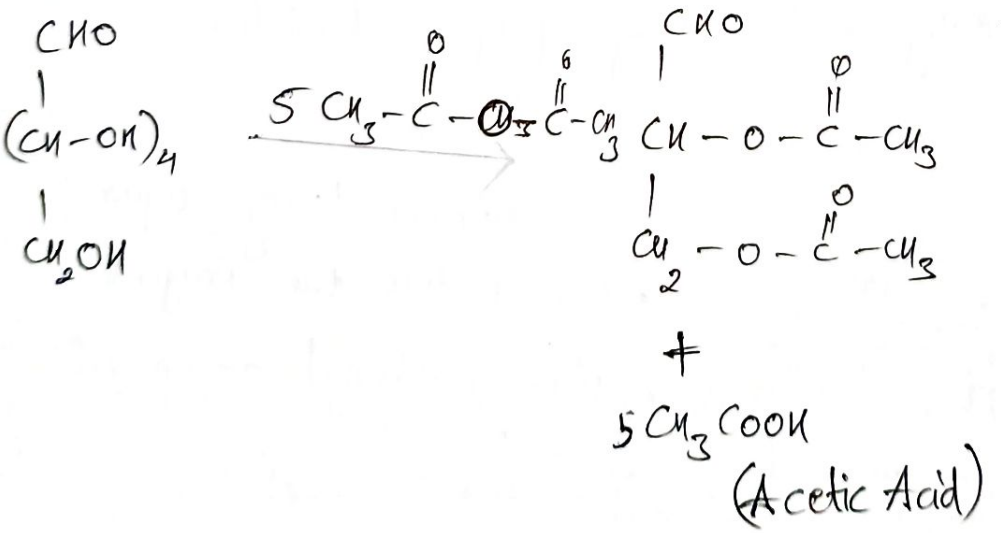


(D) Cyano hydrin Formation



Glucose molecule contain one carbonyl group.

(E) Acetylation



Glucose contains five hydroxyl groups.

Glucose

A) From sucrose (cane sugar) : Sucrose is Boiled with dil HCl or H_2SO_4 in alcoholic soln. (3)

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{H^+} \underset{\text{glucose}}{C_6H_{12}O_6} + \underset{\text{fructose}}{C_6H_{12}O_6}$$

sucrose

} Laboratory method

B) From strach : strach is boiled with dilute H_2SO_4 at 393K under pressure.

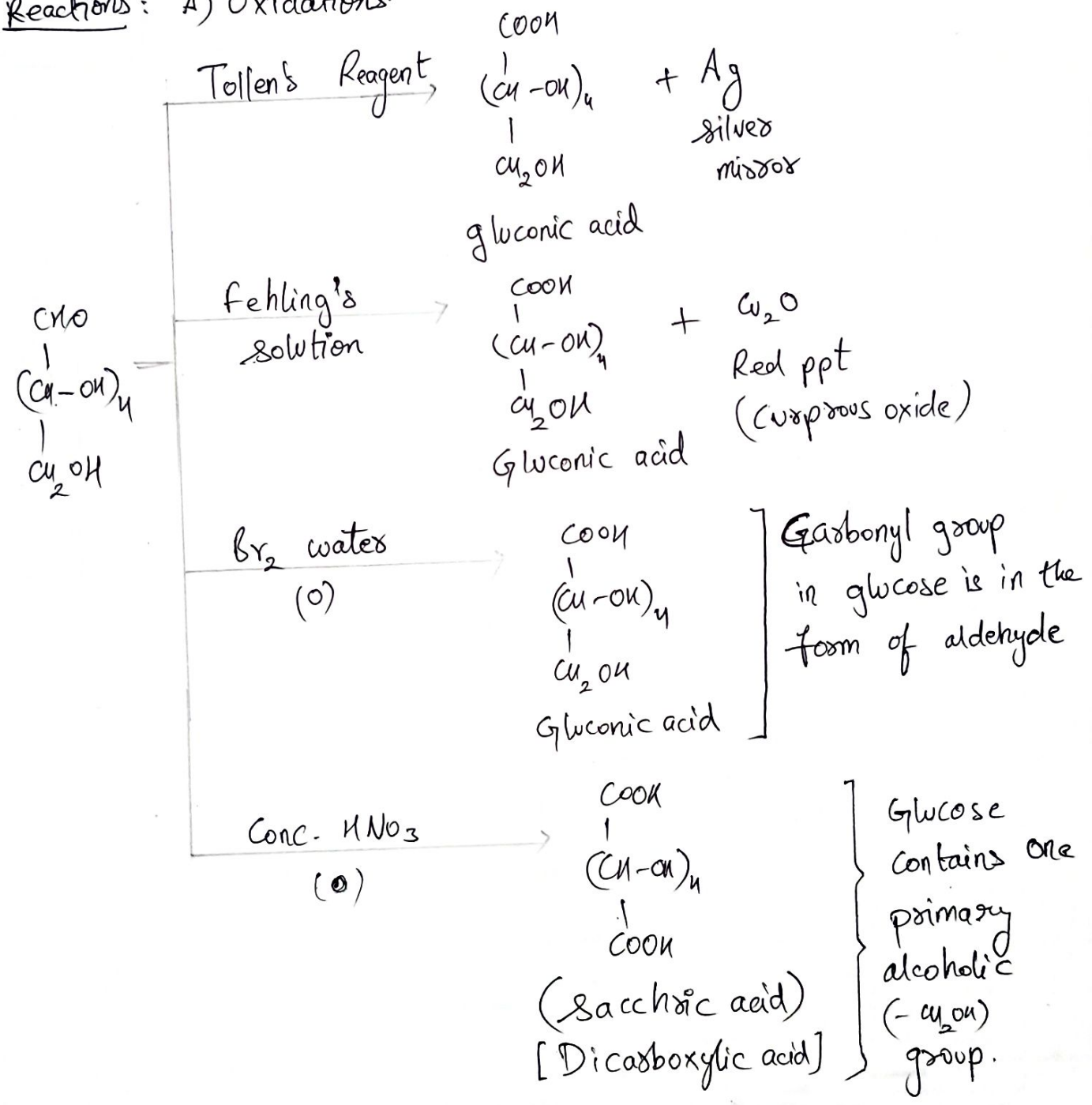
$$(C_6H_{10}O_5)_n + nH_2O \xrightarrow[393K,\ 2-3\ atm]{H^\oplus} n\,C_6H_{12}O_6$$

starch or cellulose

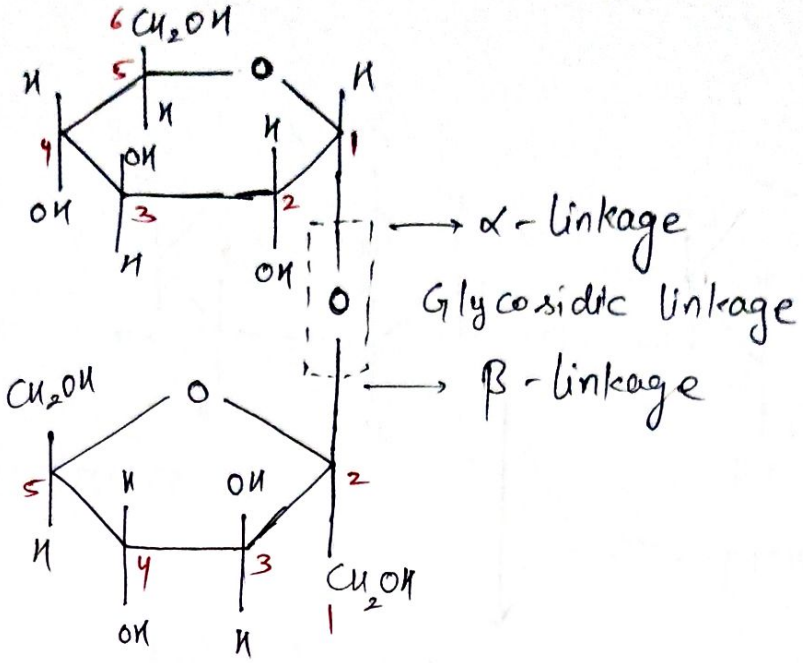
Glucose

} Commerical method

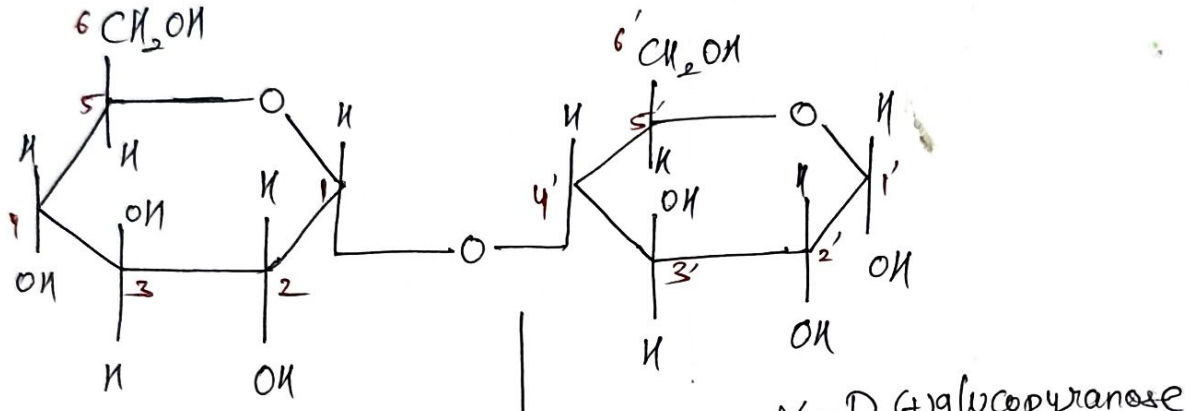
Reactions: A) Oxidations.



Sucrose :- [α-D(+) glucopyranose + β-D(-) fructofuranose]



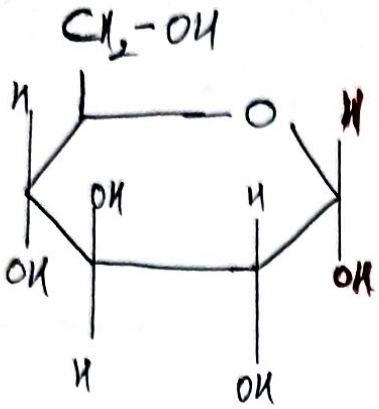
Maltose : [α-D(+) glucopyranose + α-D(+) glucopyranose]



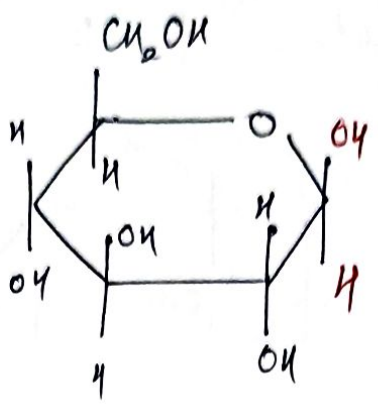
α-D(+) glucopyranose

α-D(+)glucopyranose

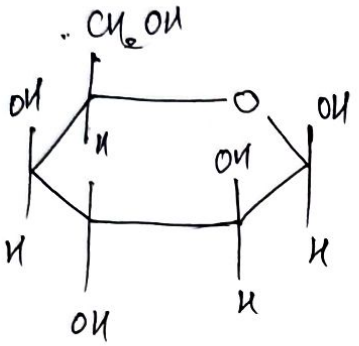
α-1,4'-glycosidic linkage.



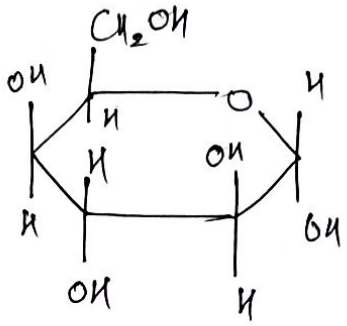
α – D (+) glucopyranose



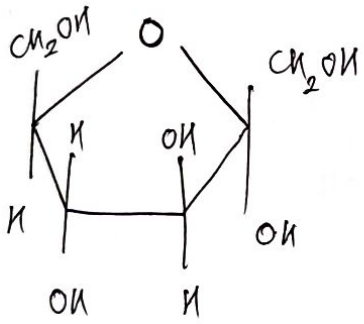
β – D (+) glucopyranose



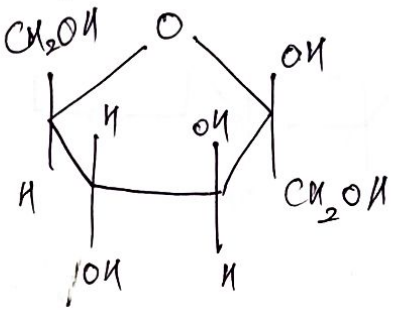
α – L (–) glucopyranose



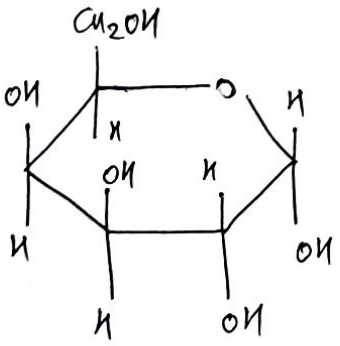
β – L (–) glucopyranose



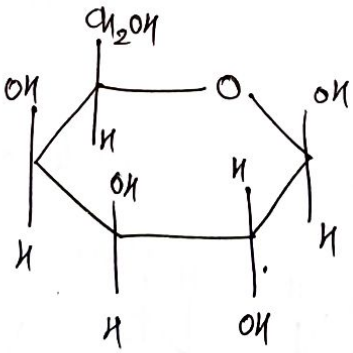
α – D (–) fructofuranose



β – (D) – fructofuranose



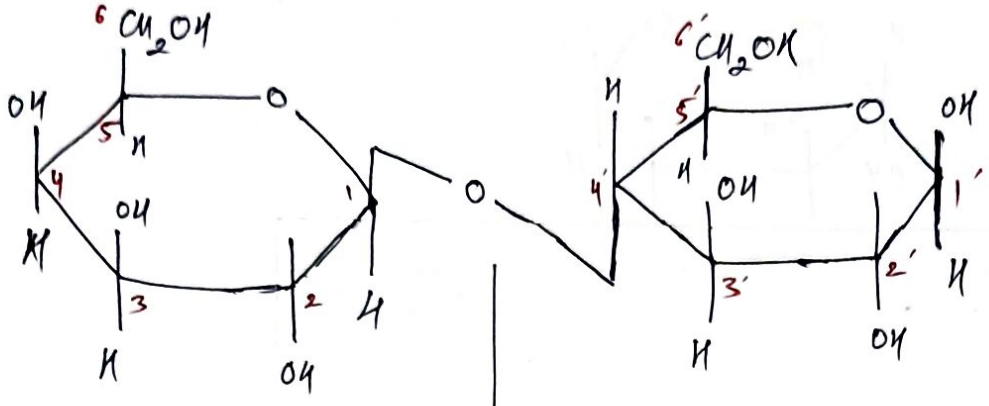
α – D – galactose



β – D – Galactose

Lactose : [β-D-Galactose + β-D-Glucose]

$[C_{12}H_{22}O_{11}]$



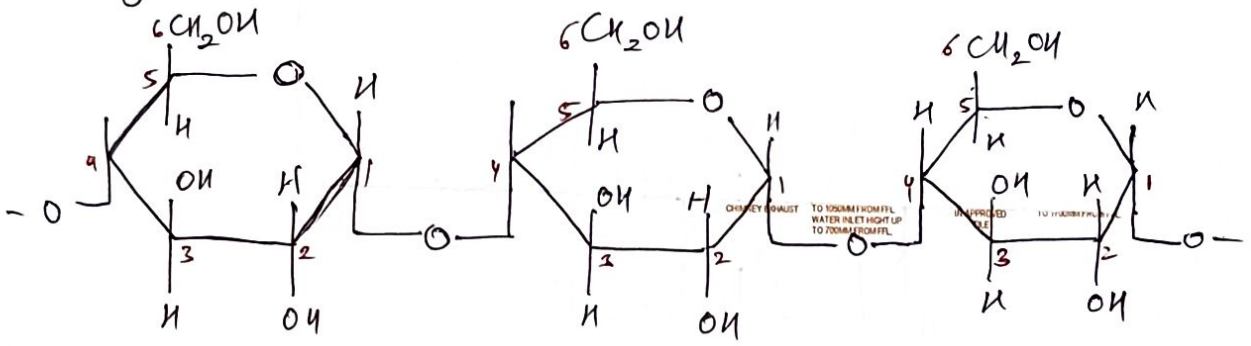
β-D-Galactose

β-D-Glucose

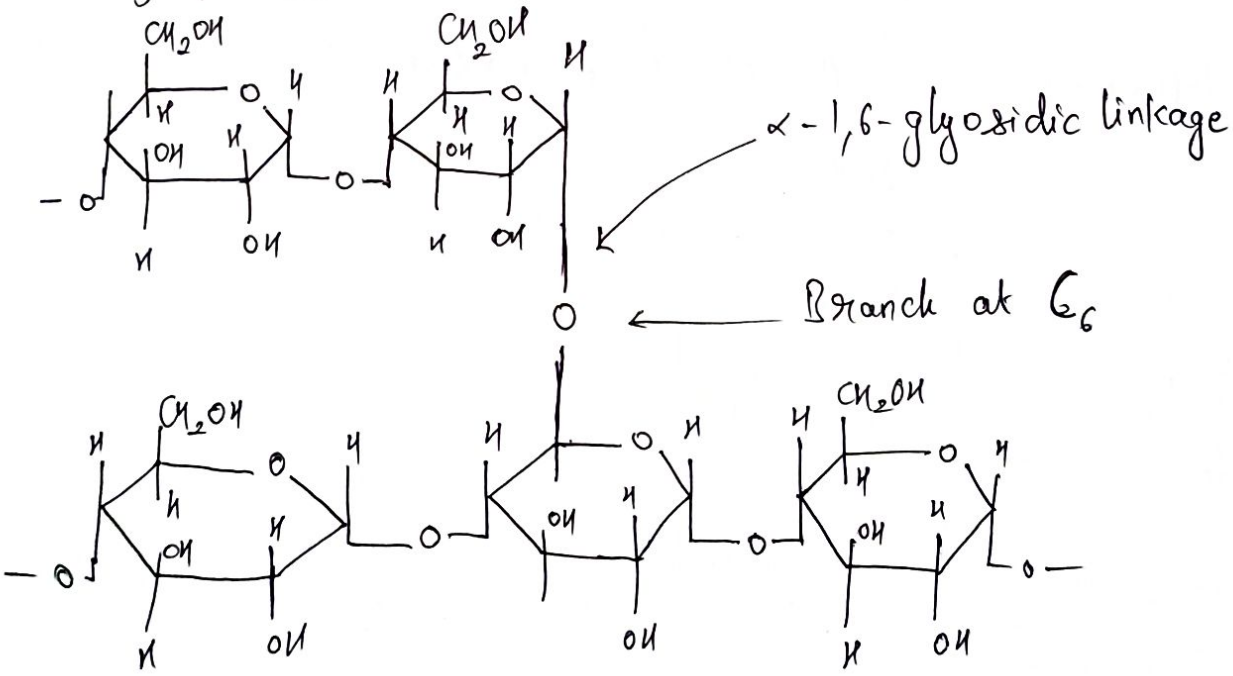
β-1,4'-glycosidic linkage

Polysaccharides

① Amylose



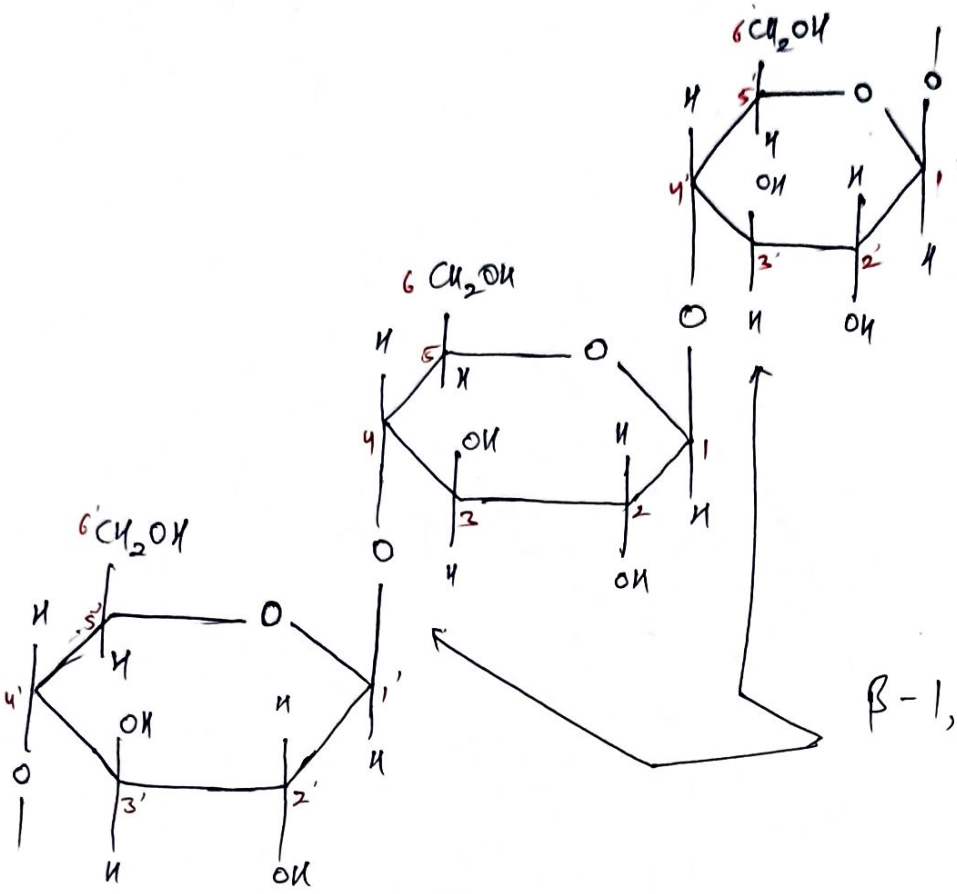
② Amylopectin



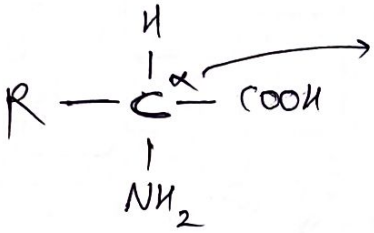
α-1,6-glycosidic linkage

Branch at C_6

Cellulose : (β-D-glucose + β-D glucose + ...



Proteins

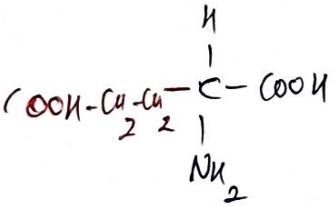


sp^3 → Tetrahedral.

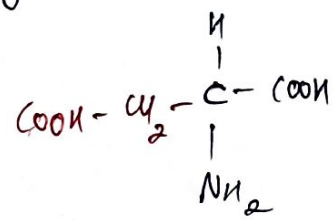
Acidic / Basic

Acidic

eg. Glutamic acid

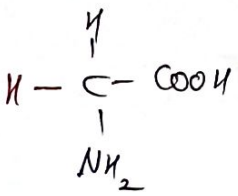


eg. Aspartic acid

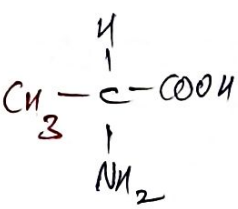


Neutral

eg. Glycine

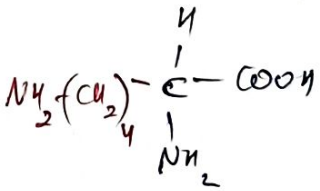


eg. Alanine



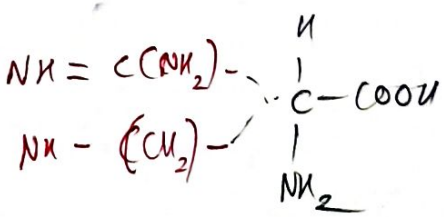
Basic

eg. Lysine



eg. Histidine

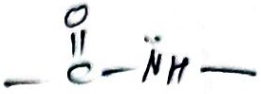
eg. Argenine



2 or more

α-amino acid $\xrightarrow[\text{peptide Bond}]{\text{via}}$ Peptide $\xrightarrow{>100}$ Protein

Peptide Bond

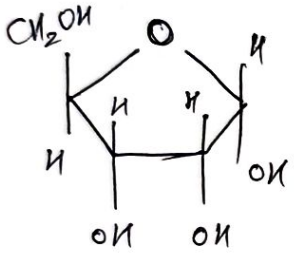


Nucleic Acids

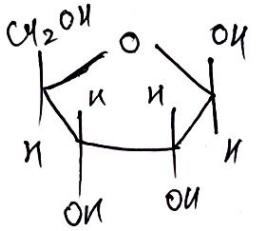
Human Body mai Human cell → Nucleus $\xrightarrow{\text{formed}}$ Chromosome $\xrightarrow{\text{formed}}$ Nuclei acid

Nuclei Acid

- Pentose Sugar ↓ Ribose, De-oxy Ribose
- Phosphoric Acid derivative
- Nitrogenous Base

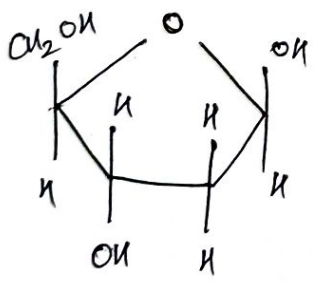


α- D- Ribofuranose



β - D - Ribofuranose

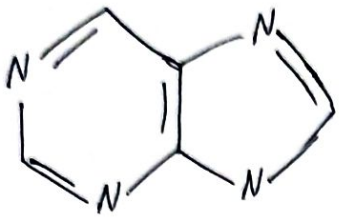
In Nuclei Acids, only β form is found.



β - D - DeoxyRibose

Nitrogen Base = 5

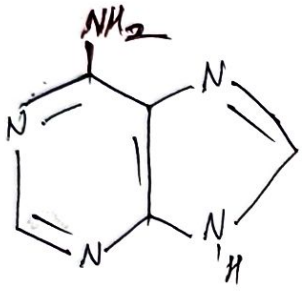
Derivative of purine & pyrimidine



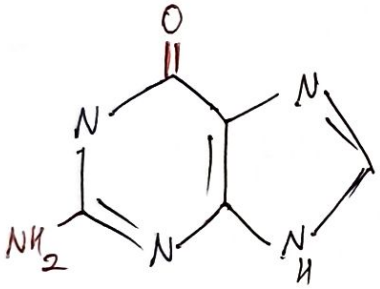
purine

pyrimidine

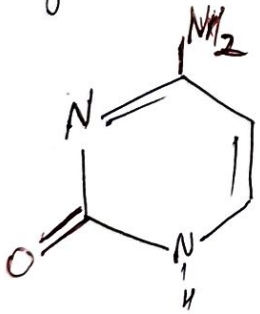
① Adenine → $C_5H_5N_5$



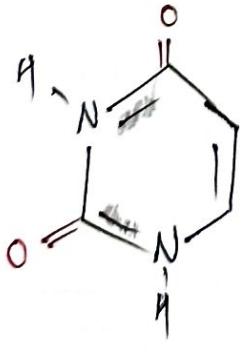
② Guanine → $C_5H_5N_5O$



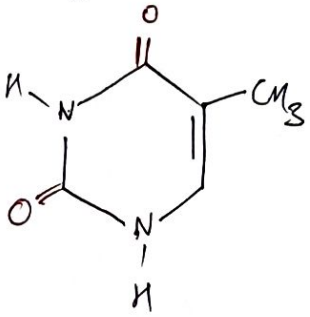
③ Cytosine $C_4H_5N_3O$



④ Uracil → $C_4H_4N_2O_2$



⑤ Thymine → $C_5H_6N_2O_2$



Nucleosides → Sugar + Base

Nucleotides → Sugar + Base + Phosphoester

RNA → D-ribose - A, C, G, U

DNA → D-2-deoxyribose - A, G, C, T

⇒ One mole of stachyose on hydrolysis yields →

1 mole of glucose + 1 mole of fructose + 2 mole of galactose.

⇒ On prolong Heating with HI glucose gives → n-hexane

Raffinose is trisaccharide → Grape sugar → Glucose

→ The term anomers of glucose refers to isomers of glucose that differe in configuration at carbon one (C-1)

→ Sweetest sugar → fructose

→ Amylose	Amylopectin
① water soluble	① Insoluble
② 15 - 20% of starch	② 80 - 85% of starch
③ long unbranched	③ long branched
④ C1 - C4 - glyosidic linkage	④ C1 - C4 glyosidic linkage & C1 - C6 for branching
⑤ α - D - glucopyranose	⑤ α - D - glucopyranose

Protein :

acidic	Basic	Neutral
① Glutamic acid	Lysine	Glycine
Aspartic acid	Argenine	Alanine
	Histidine	

→ Exception :- Only amino acid → optically Inactive is Glycine $H-\overset{H}{\underset{NH_2}{C}}-COOH$

→ Vitamin B complex is not fat soluble complex

→ Nudei acids, the sequence is base - sugar - phosphate

→ Nudei acids → polymer → nucleotides

→ Structure of DNA → double helix

→ DNA multiplication is called replication

→ stachyose → contains '24' C

→ Jo carbon two 'O' se attached hai wo anomeric carbon

→ Secondary structure → α-helix
→ β-pleated sheet

→ major source of energy → carbohydrates.

→ Ribose does not give monosaccharide unit on hydrolysis

→ During preparation of glucose from Starch, chalk powder is added to the reaction mixture to neutralise excess of sulphuric acid

→ Starch is NOT a sugar

→ Cellobiose obtained from partial hydrolysis of cellulose

→ Disaccharide present in milk is lactose

→ Essential constituent of plant cell wall is cellulose

→ Cellulose is used in manufactured of paper.

→ Proteins are high molecular weight polymers mainly containing the elements C, H, N, O, S

→ peptide linkage : $-\overset{O}{\overset{\|}{C}}-NH-$

→ Human insulin :- is Hexamer

→ #Exception :- Insulin is protein → having only 51 amino acid

→

	fibrous	Globular
eg	Keratin (hair)	Haemoglobin, Insulin
	collagen (skin & bo	Albumin, Enzymes
	Insoluble	Soluble

→ Proteins by action of heat & chemical reagents like alcohol form denatured proteins

→ Primary structure remains intact on Denaturation

→ Starch & cellulose have same empirical formula

→ Naturally occuring glucose is called dextrose

→ Carbohydrate consists of C, H & O

→ Carbohydrate which serves as reverse glucose in body is glycogen