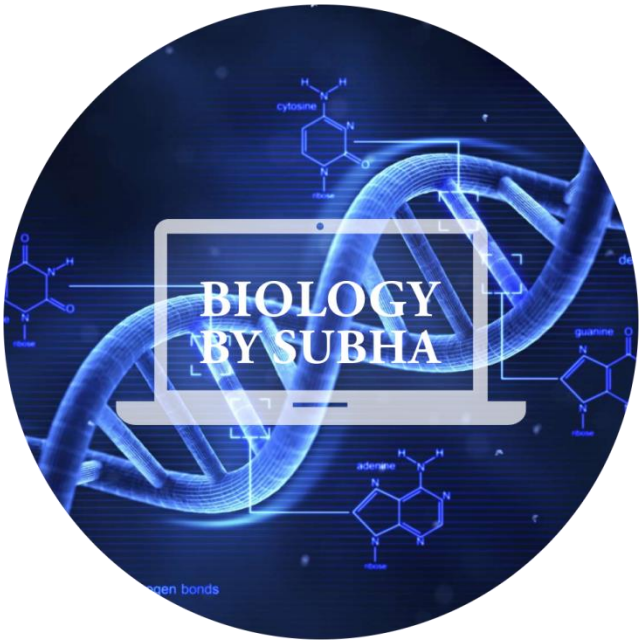


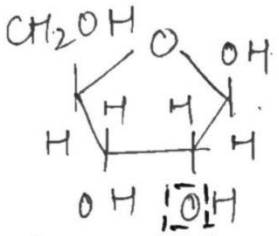
BIOMOLECULES

Topic-3: Carbohydrate Part-2

=> Pentoses :- Second most abundant monosaccharide.

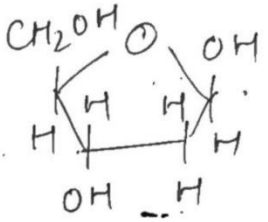
Modified or derived Monosaccharides.

(i) Deoxy sugars :-



β-D Ribose

Deoxygenation →



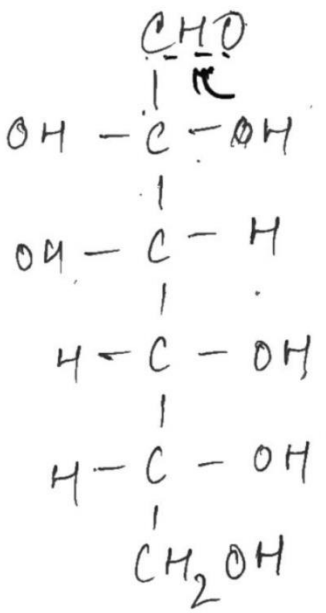
β-D Deoxyribose.

Example :- β, D Ribose (In RNA) &
β-D Deoxyribose (In DNA)

(ii) Sugar alchohol :-

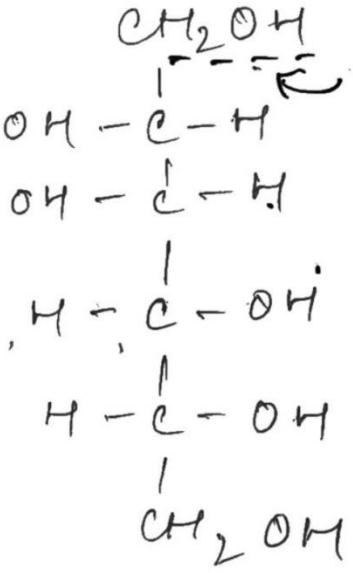
Produced by reduction of sugar.

Example :- Mannitol :- Found in brownalgae, sorbitol, etc.



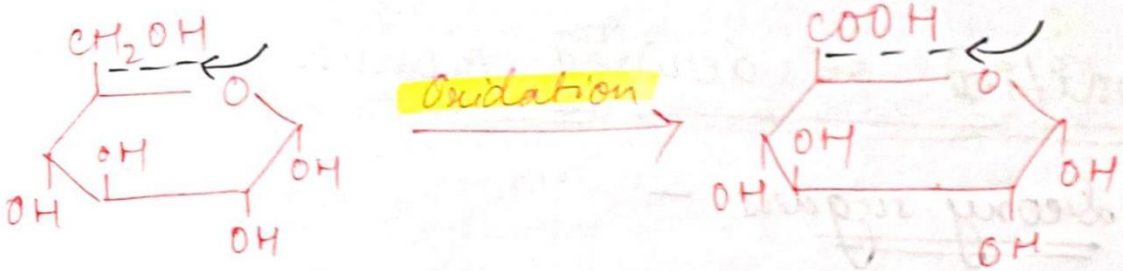
D- Mannose.

Reduction →



D- Mannitol.

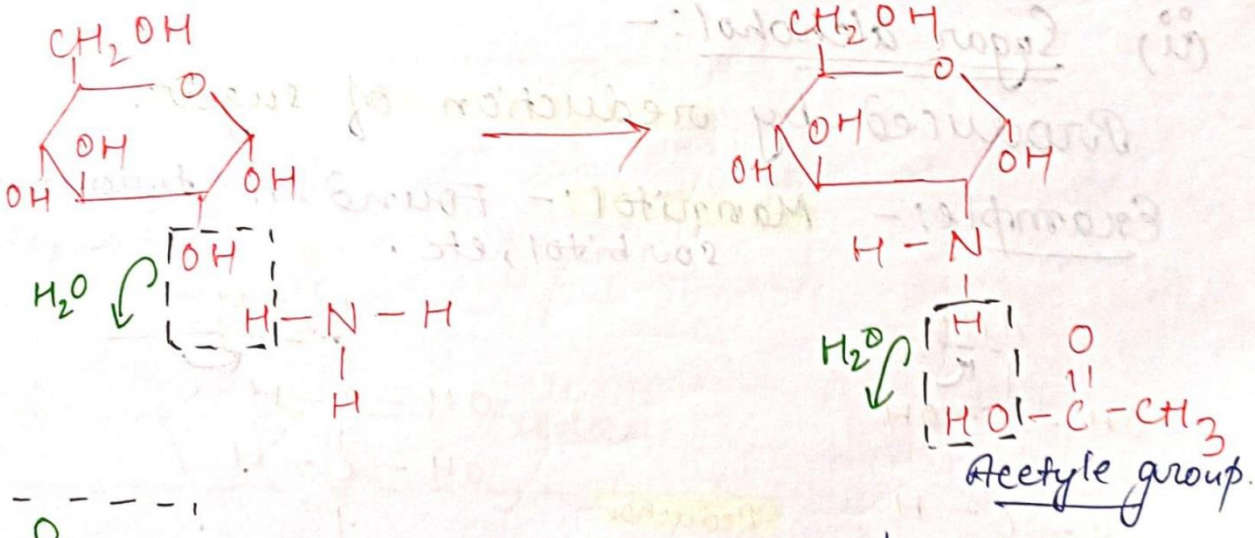
(iii) Sugar acids:- Produced by oxidation.

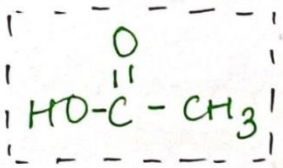


Example:- Glucuronic acids, Ascorbic acid, Vitamin-C, etc.

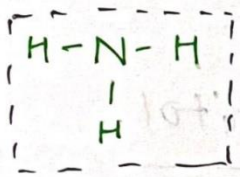
(iv) Amino Sugar:- Produced by addition of amino group (Amination).

Example:- N-acetyle glucosamine (NAG) / N-acetile muramic acid (NAM).



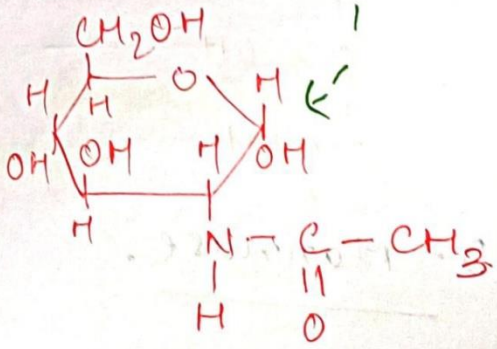


→ Acetyle group.



→

(Final)

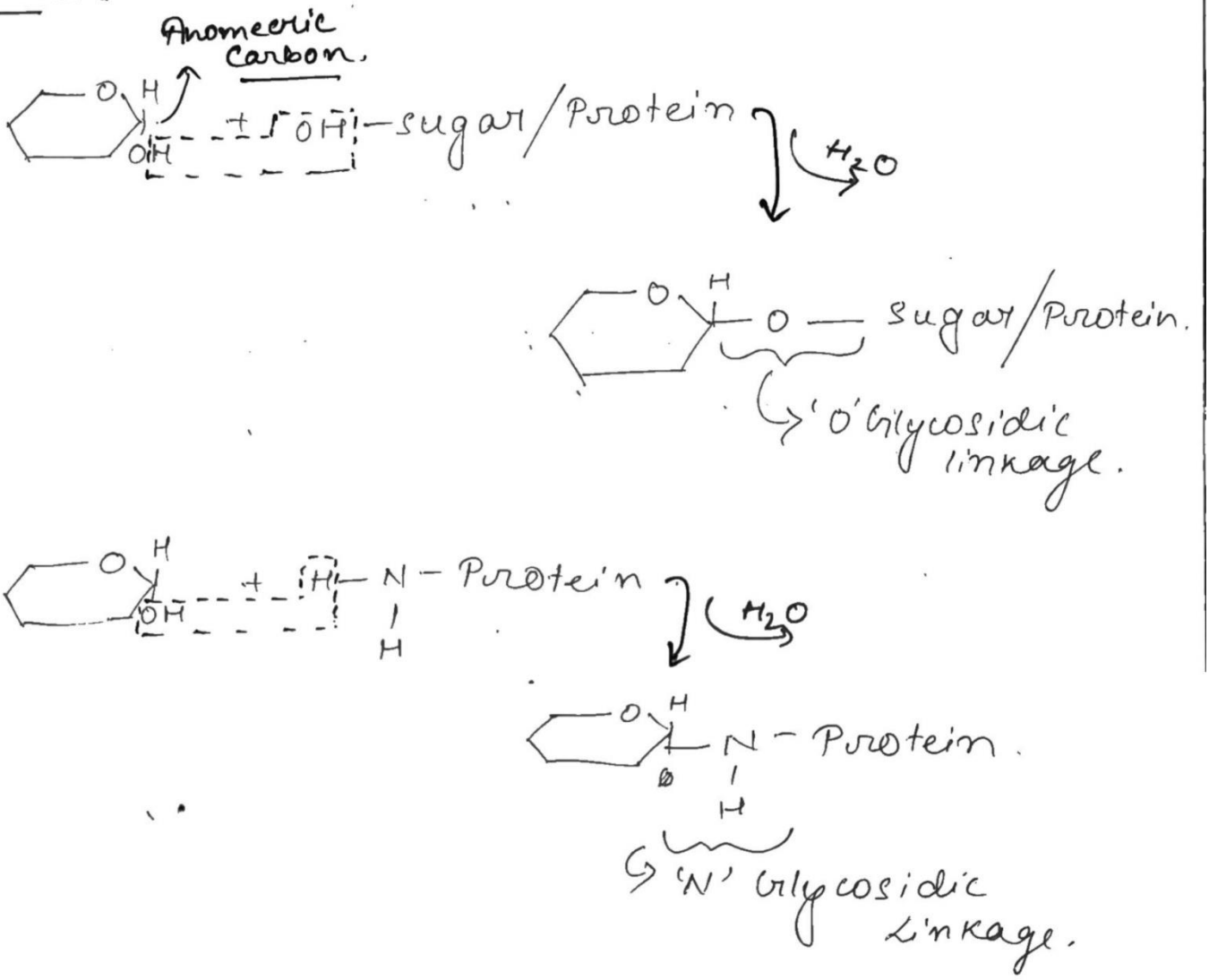


NAG.

ii) Oligosaccharides :-

→ Consists few (2-9) monosaccharides linked by glycosidic linkage. (Connects monosaccharide together) ↳ (Formed by dehydration syntheoic i.e. removal of water)

#Extra.



Types :-

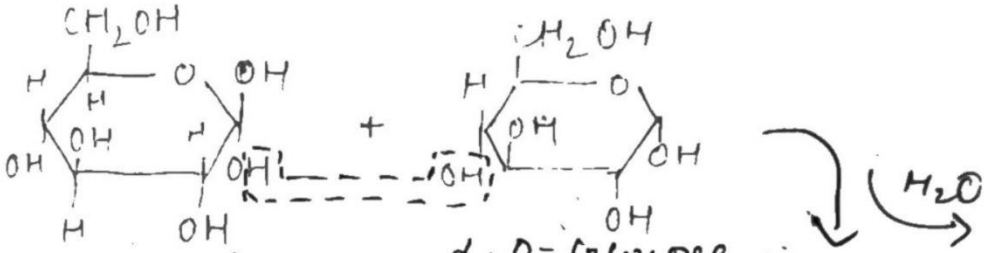
i) Disaccharides :-

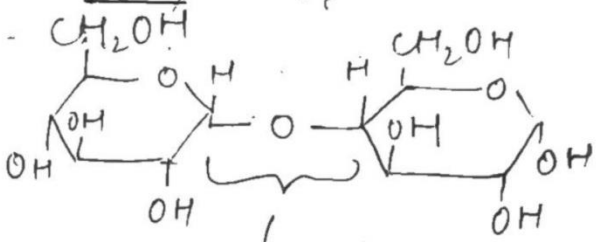
→ Two monosaccharides
→ Linked by one glycosidic linkage.

Example :-

a) Maltose :-

→ Malt sugar containing two α-D-Glucose.
→ Linked by α-1-4 linkage.



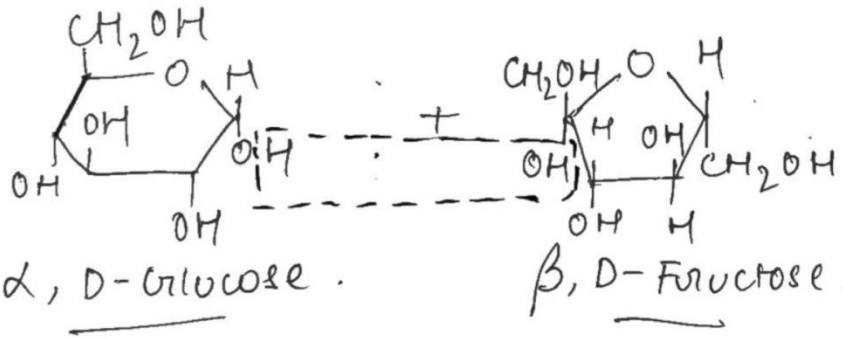


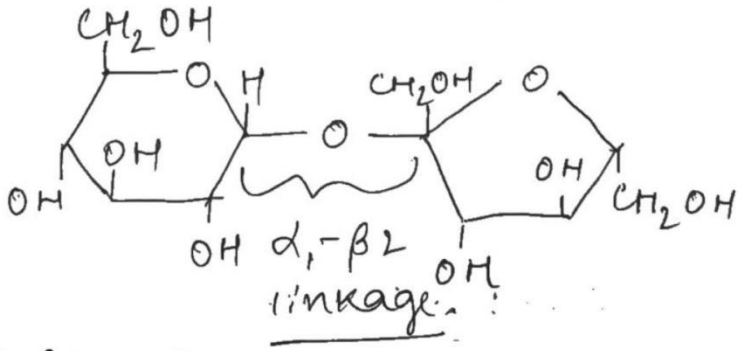
Maltose.

b) Sucrose:-

→ Cane sugar, Table sugar & Invert sugar.

→ contains α, D-Glucose & β, D-Fructose linked by $\alpha_1 - \beta_2$ linkage.

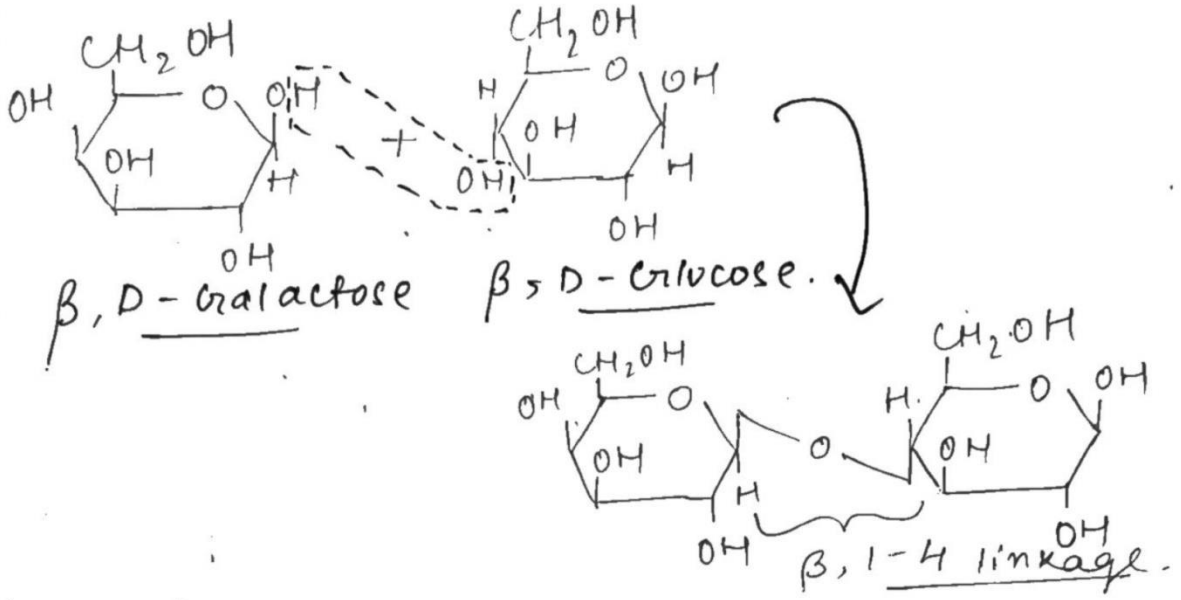




c) Lactose:- → Milk sugar.

→ contains β, D-Galactose & β, D-Glucose, linked by β, 1-4 linkage.

P.T.O →



Lactose

ii) Trisaccharides :-

→ 3 monosaccharides.

→ Linked by 2 glycosidic linkage.

Eg:- Raffinose (Glucose - Fructose - Galactose)

iii) Tetrasaccharides :-

→ 4 monosaccharides.

→ Linked by 3 glycosidic linkage.

Eg:- Stachyose (Glucose - Fructose - Galactose - Galactose)

iii) Polyasccharides :-

→ Polymer of monosaccharides.

- Homopolysaccharides :- Polymer of only one type of monosaccharides.
- Heteropolysaccharides :- Polymer of different monosaccharides.

a) Homopolysaccharides -

Example:-

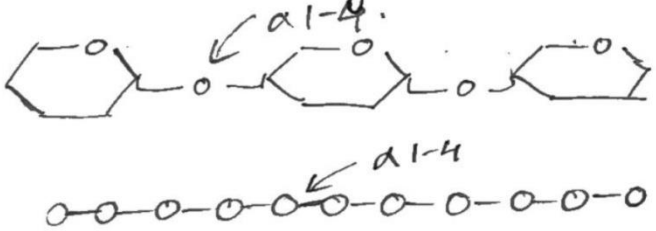
a) Starch →

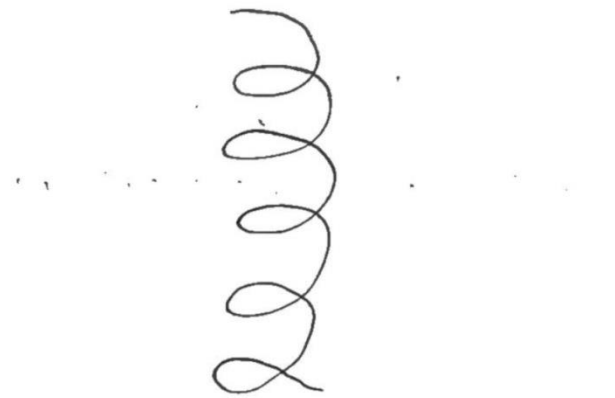
→ storage carbohydrate/polysaccharide in plants.

→ Contains two types of polymers.

Amylose

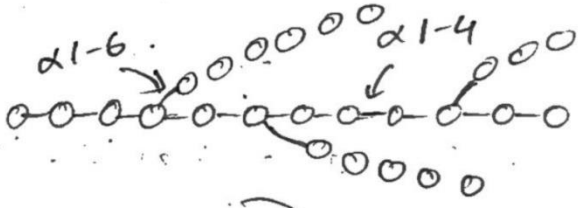
- Unbranched and helical ~~structo~~ polymer of α, D-glucose units, linked by α, 1-4 linkage.

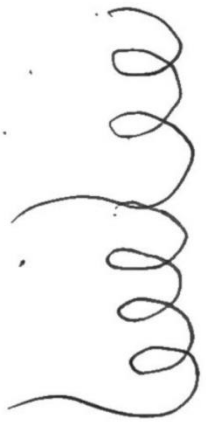




Amylopectin's.

- Branched and helical polymer of α, D-glucose unit linked by α 1-4 linkage and α, 1-6 linkage at the branches.





→ Starch as helical secondary structure.

↓

It can hold Iodine in helices.

↓

Gives blue colour with Iodine.

b) Glycogen :-

→ Storage carbohydrate in animals.
Found in liver & and skeletal muscles.

→ Branched polymer of α-D-Glucose unit linked by α-1-4 linkage but at the branches α 1-6 linkage.

→ More branched than amylopectin.

c) Cellulose :-

→ Structural carbohydrate in plants.

→ Most abundant carbohydrate as well as organic compound in the biosphere.

→ Unbranched and extended polymer of β-D-Glucose.

→ Paper → Plant Pulp → cellulose.

→ cotton fibre → 90 % cellulose.

→ Rayon / Artificial silk → cellulose.

d) Chitin :-

→ Polymer of modified sugar i.e. NAG.

→ Second most abundant carbohydrate after cellulose.

→ Structural carbohydrate in Fungi, arthropods, etc.

v) Inulin: -

→ Storage carbohydrate in some plants like dalhia.
↳ Found in roots & tubers.

→ Polymer of Fructose

→ Can't be metabolised by humans, hence used to measure kidney function test / Measure

b) Heteropolysaccharides:-

Example:-

a) Hyaluronic acid:-

→ Polymer of Glucuronic acid and N-acetyle-glukamine.

→ Present in matrix of tissue and synovial fluid.

b) Peptidoglycan:-

→ Polymer of N-acetyle glucosamine and N-acetyle muramic acid.

→ Structural carbohydrate in bacteria (Forms cell wall)

→ Digested by Lisozyme.
↳ Present in saliva & tears.

c) Agarose :-

→ Mucopolysaccharides.

→ Obtained from red algae.

→ Used in cosmetics, ice creams, microbial culture medium.

Reducing Sugars.

→ All monosaccharides are reducing.

→ Most of disaccharides except sucrose.

→ Polysaccharides are non reducing (As overall polymer are non-reducing)

Cu^{2+} (Fehling's/ Benedict's solution) —Reduce→ Cu^{+} (Brick red colour)

=> Properties of polysaccharides to be used as storage carbohydrates;—

→ Osmotically inactive

→ Chemically less reactive

→ Can be stored in bulk.