

Important Question 1.

(From Previous Year)

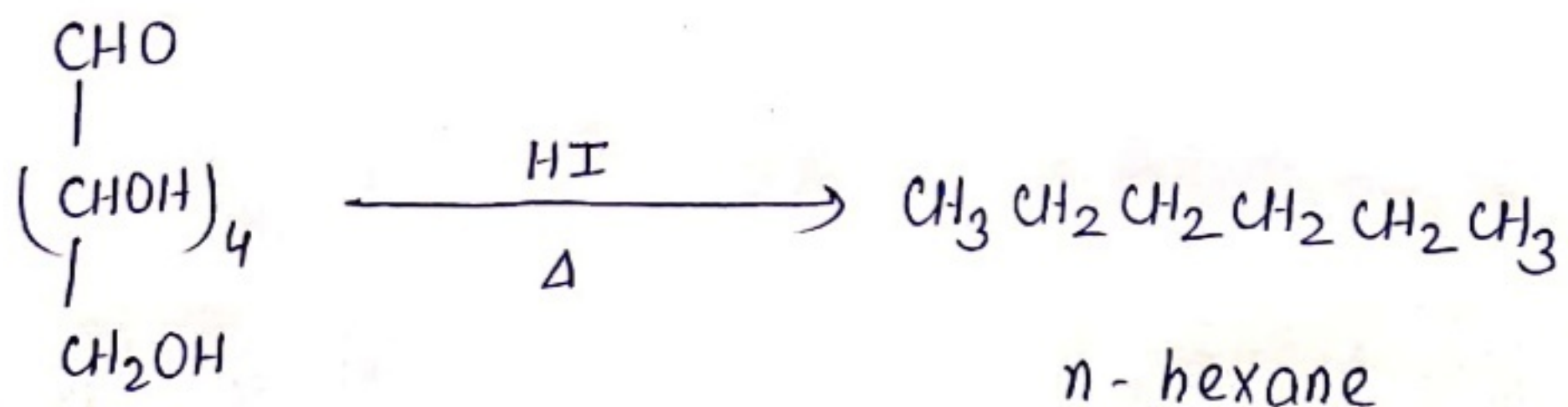
Degree-II (H) 28/08/2020

Q. Established open chain structure of Glucose.

Ans. **STRUCTURE OF D-GLUCOSE**

* The structure of glucose has been derived from a consideration of facts and conclusions such as the following:

1. Elemental analysis and molecular weight determination show that the molecular formula of glucose is $C_6H_{12}O_6$.
2. Reduction of Glucose with conc. HI, produces n-hexane (C_6H_{14}). This indicates that the six carbon atoms in the glucose molecule form a straight-chain.

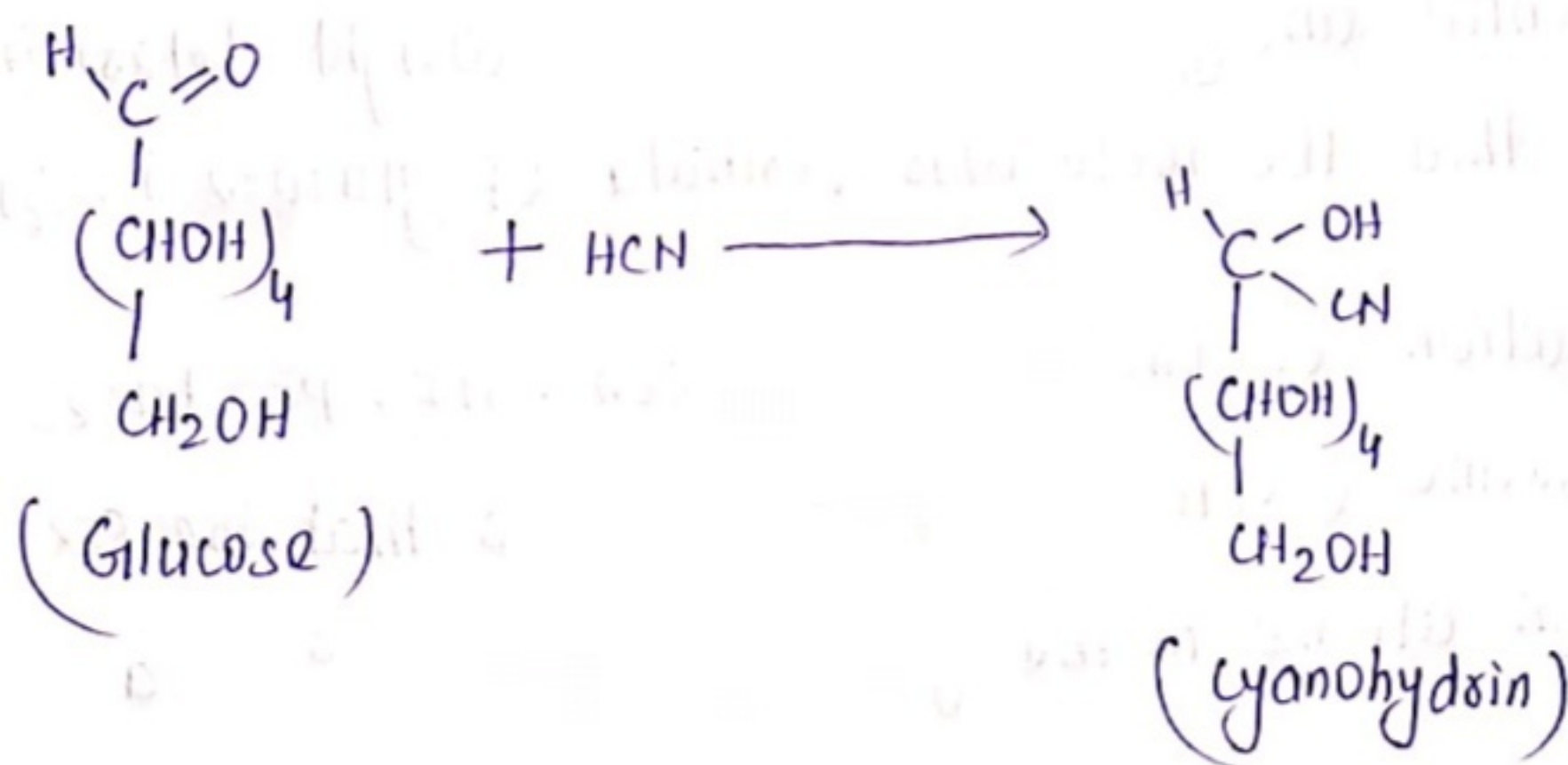
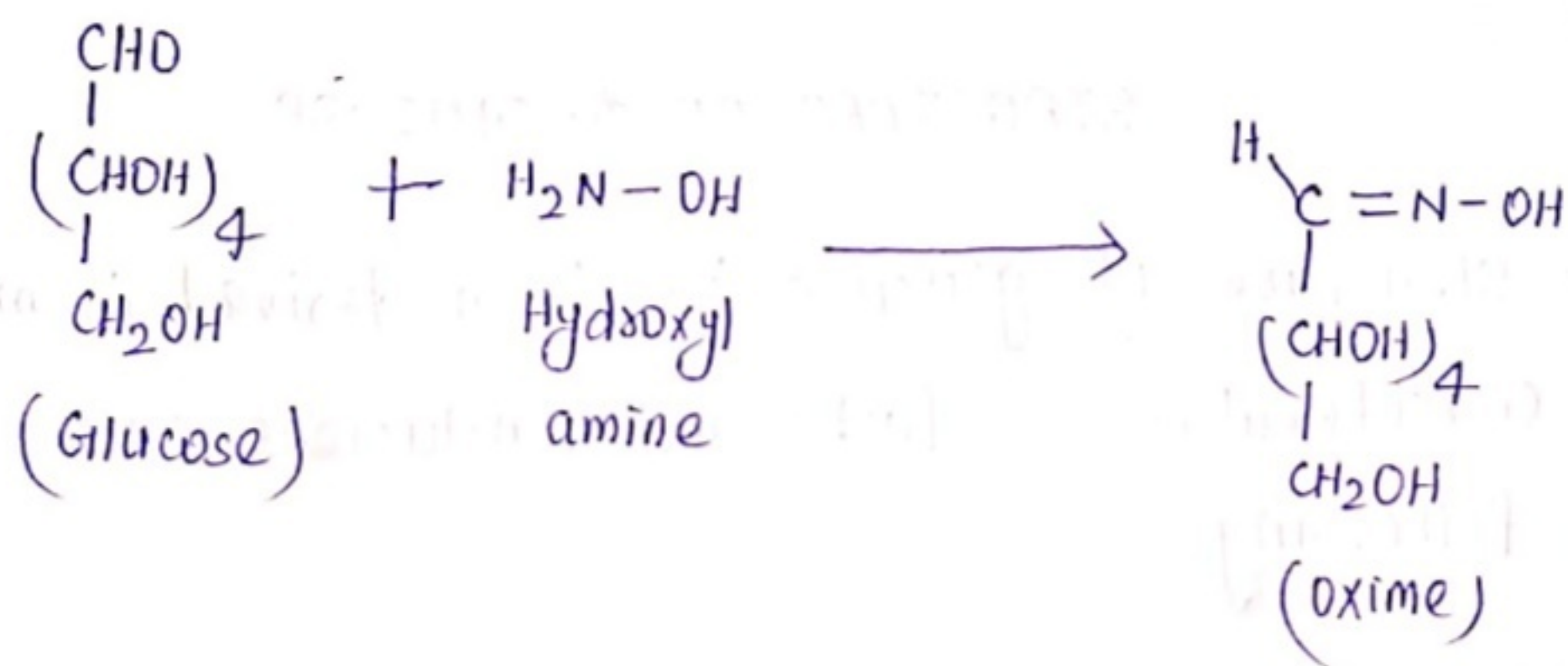


Glucose

n-hexane

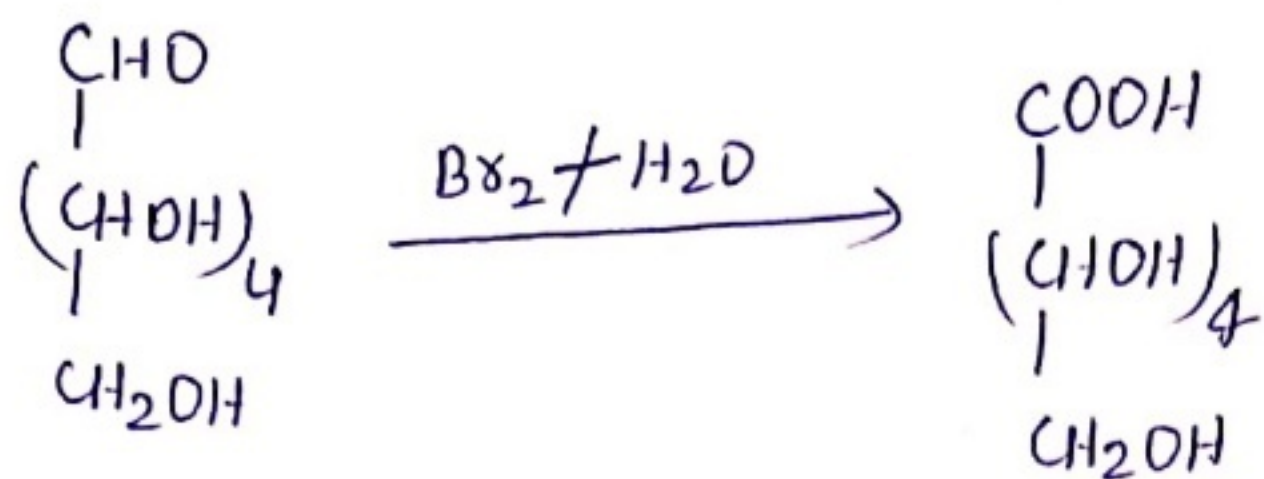
By-Dr.Rinky

3. Glucose reacts with hydroxyl amine to form mono oxime, and on addition of HCN give cyanohydrin. These reaction indicates the presence of either an aldehyde or a ketone group.



4. Mild oxidation of glucose with Bromine water gives gluconic acid, a monocarboxylic acid.

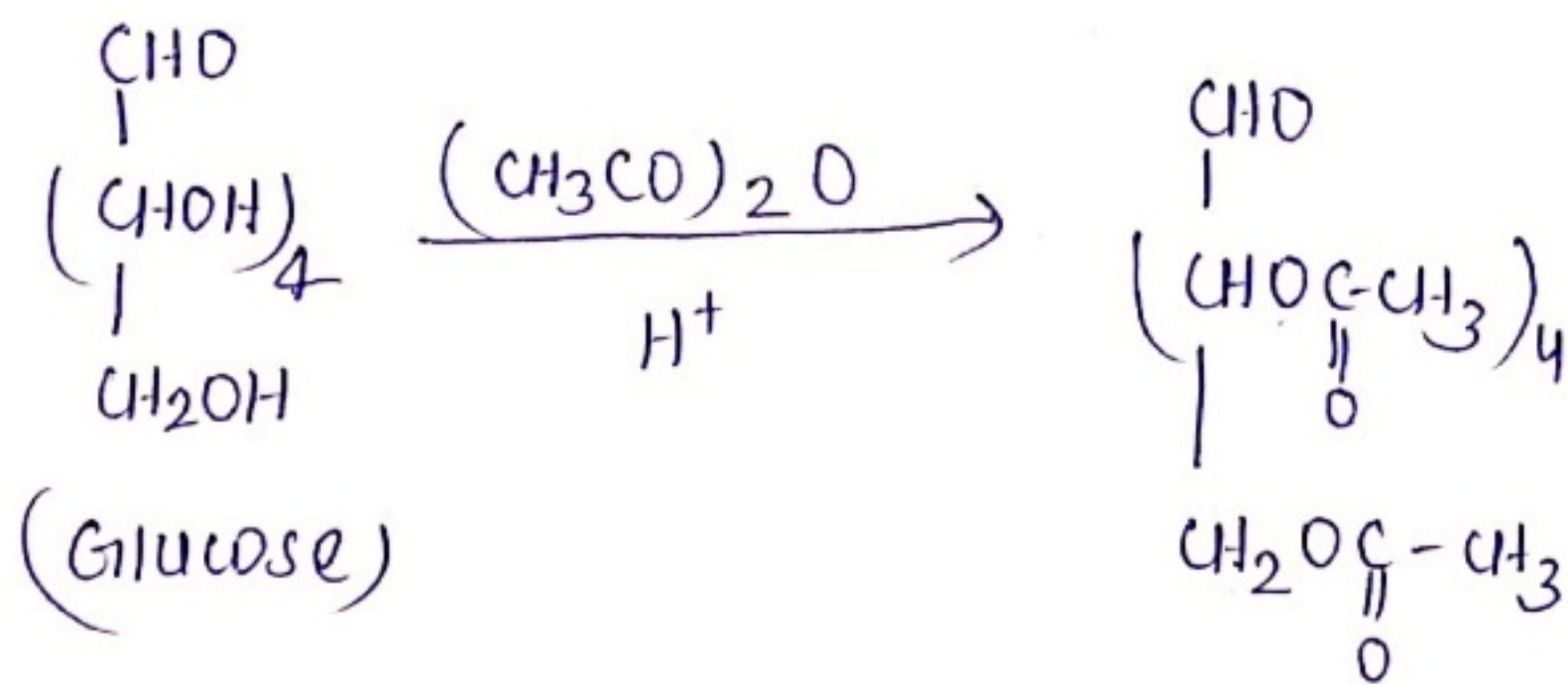
This indicates the presence of an aldehyde group since, only the aldehyde group can be oxidised to acid with mild O.A.



Gluconic Acid

Since, the six carbon atoms in glucose are in straight chain, hence, aldehyde group, must occupy one end of this chain.

5. Glucose reacts with acetic anhydride in the presence of H^+ and give Glucose pentaacetate. This reaction indicates that five $(-\text{OH})$ group is present in glucose molecules.

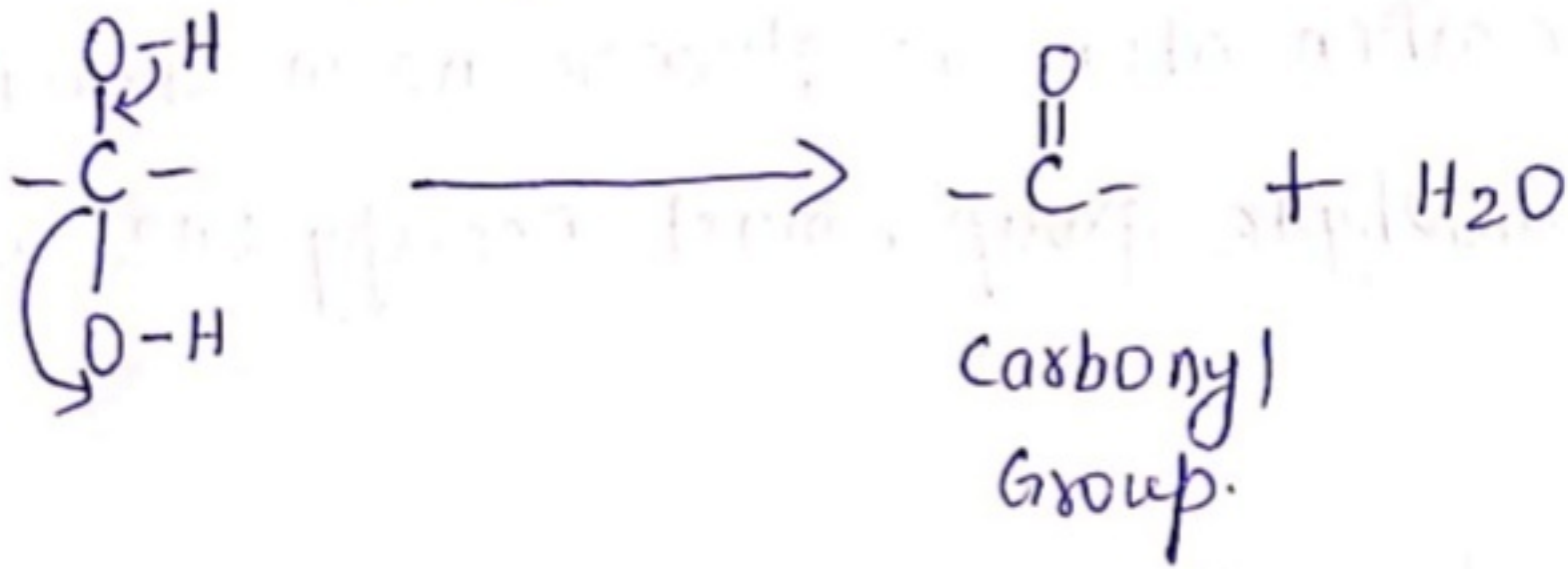


Glucose pentaacetate

6. Oxidation of Gluconic acid with HNO_3 gives Saccharic acid.

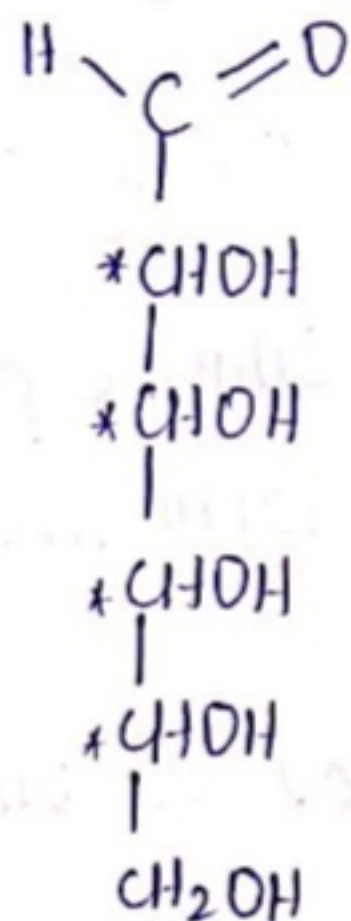
This indicates the presence of one primary alcohol group in glucose.

7. Organic compounds with two hydroxyl group (-OH) attached to a single carbon atom are rare, and those which are known usually lose water to produce a carbonyl group.



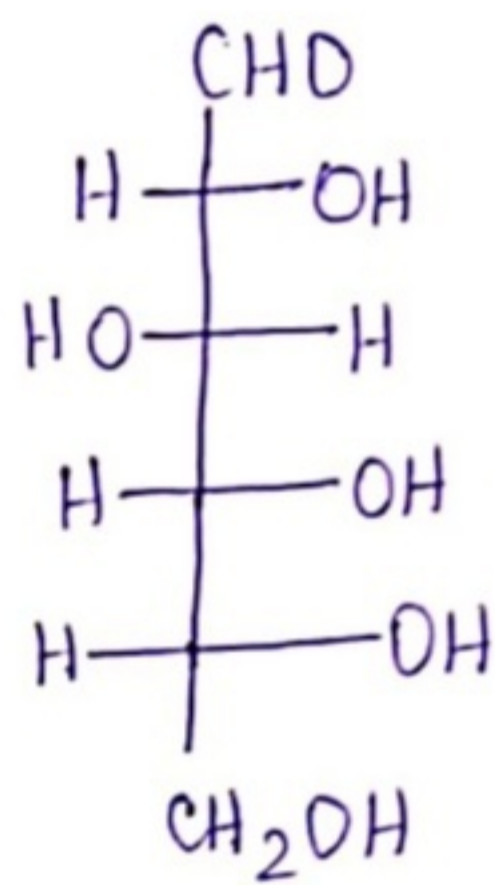
This suggests that in glucose molecule, each one of the five hydroxyl group is attached to different carbon atom.

From the above evidence we conclude that glucose is a pentahydroxyhexanal and can be represented by the following gross structure.

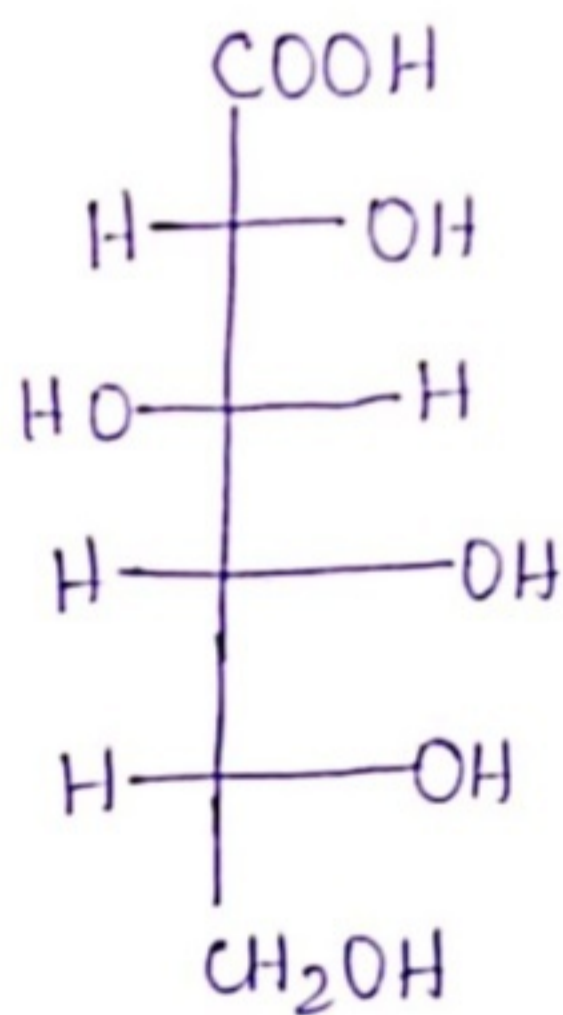


All star marked carbon is asymmetric carbon atom.

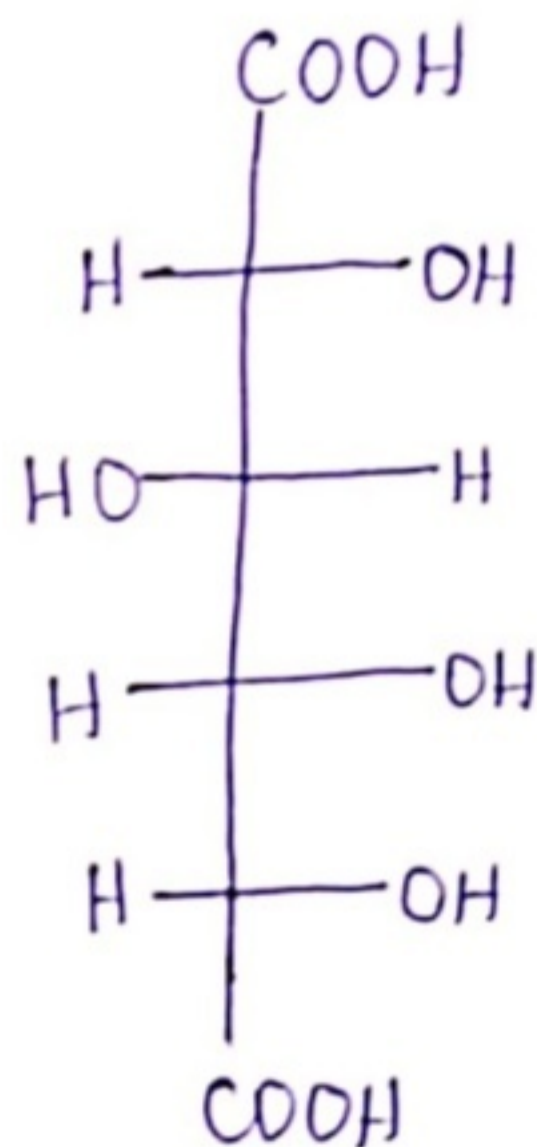
* The exact spatial arrangement of different -OH groups was given by Fischer after studying many other properties. Its configuration is correctly represented as I. So gluconic acid is represented as II, and saccharic acid as III.



I



II



III

~Completed~