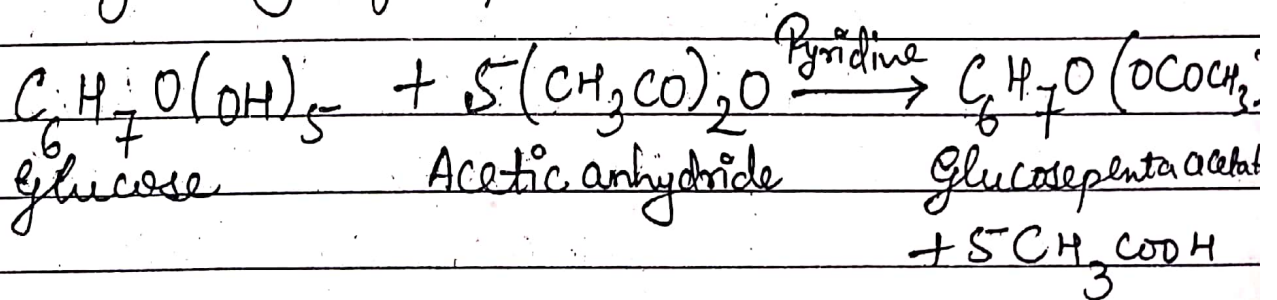


Constitution Or Structure of Glucose :-

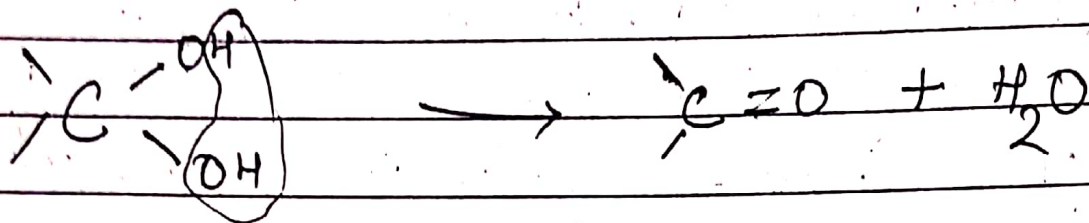
* Open Chain Structure → The open chain structure of glucose has been derived from a consideration of facts and conclusions which are as follows-

① Molecular formula : From elemental analysis and molecular weight determination, the molecular formula of Glucose has been found to be $C_6H_{12}O_6$.

② Presence of 5th -OH group : When glucose is treated with acetic anhydride in presence of pyridine, glucose pentaacetate is formed showing the presence of 5 hydroxyl groups.



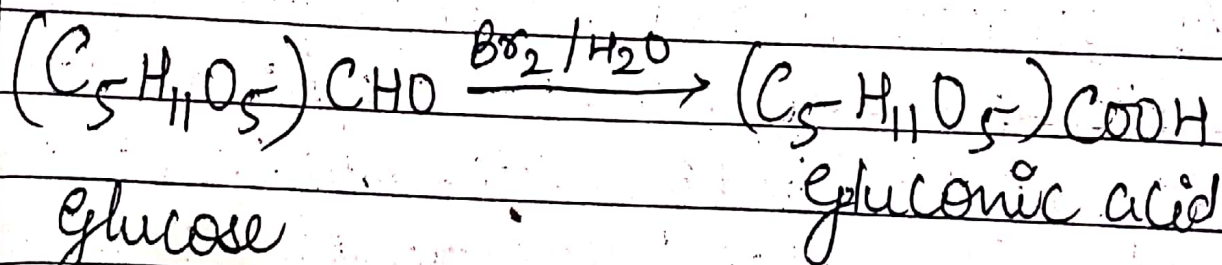
As Glucose is not easily dehydrated, therefore each -OH group must be bonded to different Carbon atoms because water is eliminated in case of more than one -OH group at same Carbon atom.



(3) Presence of an aldehyde group :-

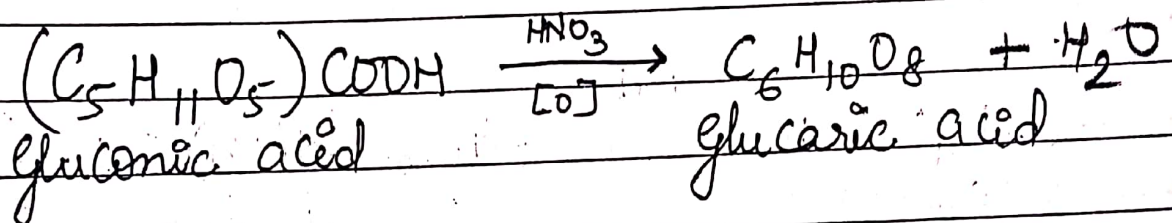
(a) ~~the~~ reaction with hydroxyl amine to form monoxime and adds only one mole of H^+CN^- to produce cyanohydrin. These reactions reveal ~~that~~ the presence of either aldehyde or ketone group but not both.

(b) On mild oxidation of glucose with bromine water gives gluconic acid, a monocarboxylic acid with molecular formula $\text{C}_6\text{H}_{12}\text{O}_7$. This indicates the presence of an aldehyde group because an aldehyde group can be oxidised to carboxylic acid by gain of one oxygen atom without losing any hydrogen and carbon atoms.



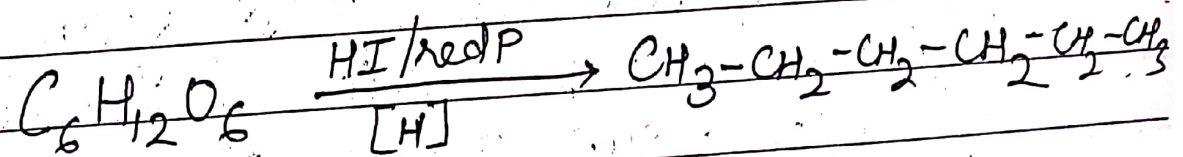
④ Presence of a primary alcoholic group :-

✓ Further oxidation of Gluconic acid with HNO_3 gives Glucaric acid, a dicarboxylic acid with molecular formula $\text{C}_6\text{H}_{10}\text{O}_8$. This indicates the presence of a primary alcohol group, since oxidation occurs with the loss of two hydrogen and gain of one oxygen atom.



⑤ Presence of straight Carbon Chain :-

(a) Complete reduction of Glucose with Concentrated HI in presence of Red Phosphorus produces n-Hexane as major product. This indicates that the six carbon atom in the Glucose molecule form a consecutive unbranched chain.



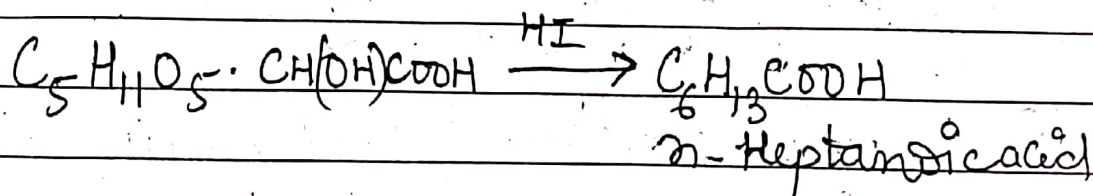
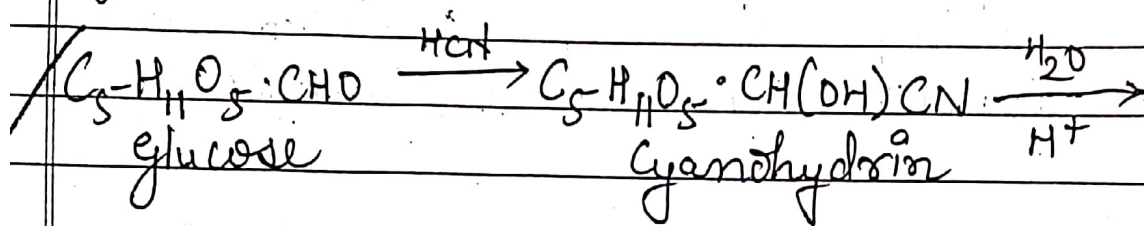
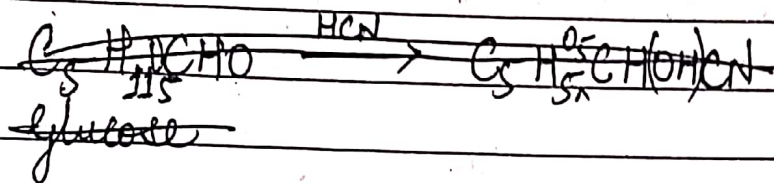
glucose

n-Hexane

(b) Glucose when treated with HCN yields

Cyanohydrin which on hydrolysis followed by reduction in presence of red phosphorus yields n-heptanoic acid.

The formation of n-heptanoic acid from glucose indicates that glucose has a straight chain of six carbon atoms.

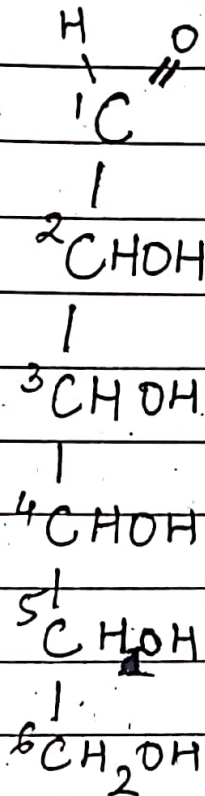


2) Position of -CHO group :-

Glucose reduces Tollen's reagent to metallic silver and Fehling solution to red cuprous oxide. These reductions confirm the presence of terminal aldehyde group. Further more, an aldehyde group being a monovalent group which must be present at the end of the straight chain.

⑦ Open chain structure of Glucose :-

From the above evidences we conclude that glucose is a pentahydroxyhexanal and can be represented by the following structure -



Open Chain structure of Glucose