

SUBJECT - CHEMISTRY

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CLASS - B.Sc (Hons) PART - II

PAPER - IV

TOPIC - The open chain structure of fructose

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Q. Discuss the open chain structure of fructose.

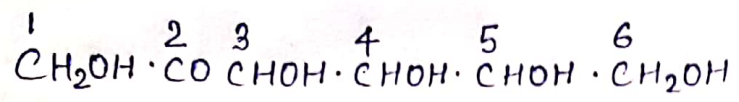
Ans Open chain structure of fructose:

on the basis of elemental analysis and molecular weight determination,

The molecular formula of fructose comes $C_6H_{12}O_6$.

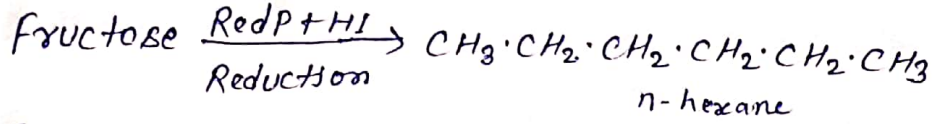
- (1) It forms *n*-hexane on complete reduction with red P + HI, therefore all the six C-atoms in fructose are present in a straight chain.
- (2) It forms a penta acetyl derivative which shows the presence of 5-OH groups. It does not dehydrate easily. Therefore each -OH group is attached to a separate C-atom.
- (3) It forms a cyanohydrin with HCN and an oxime with hydroxylamine and hence a $>C=O$ group.
- (4) It gives on oxidation with HNO_3 a mixture of trihydroxy glutaric acid tartaric acid and glycolic acid - all having fewer number of C-atoms than fructose. Therefore $>C=O$ group in fructose is ketonic and not aldehydic.
- (5) on hydrolysis and subsequent reduction with red P + HI fructose cyanohydrin gives 2-methyl hexanoic acid since the -COOH group has taken the place of -CN; naturally the latter is bonded to C-2 in cyanohydrin. Therefore, the keto group is present at C-2 in straight chain of six C atoms in fructose.

Considering the above facts and supplying necessary H-atoms, we can safely say that fructose has the following open chain structure.

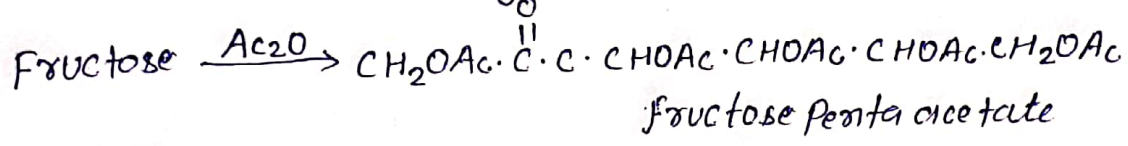


This structure explains very satisfactorily all the foregoing facts, as shown below:

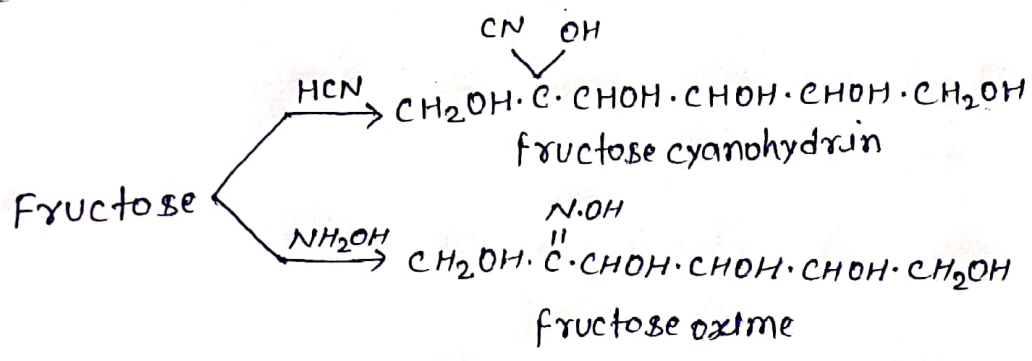
(1) Presence of straight chain of six C-atoms:



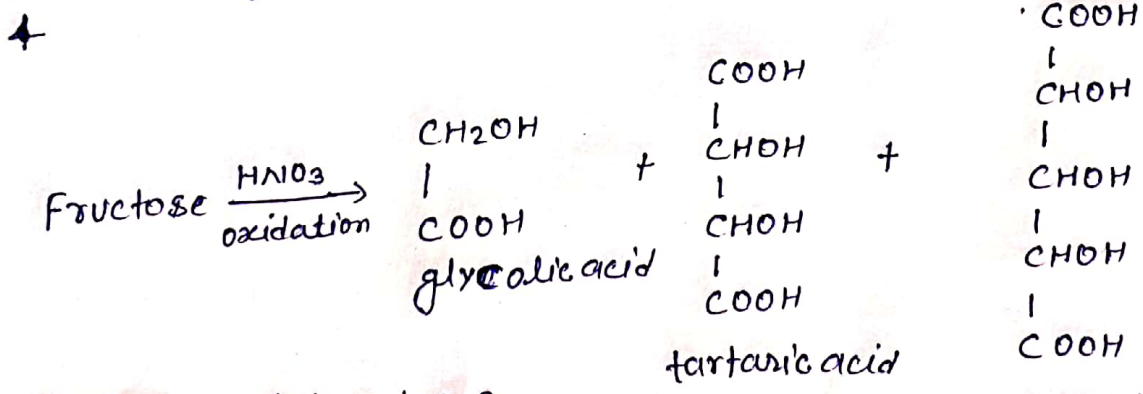
(2) Presence of 5-OH groups:



(3) Presence of a >C=O group:



(4) C=O group is ketone:



(5) >C=O group is act C-2

