

CARBOHYDRATES

1.

24/01/2022

Lecture-7

Deg-II Hons.

Paper-IV Group-B Ch-3

Occurrence, Preparation & Properties Of Fructose

Occurrence :-

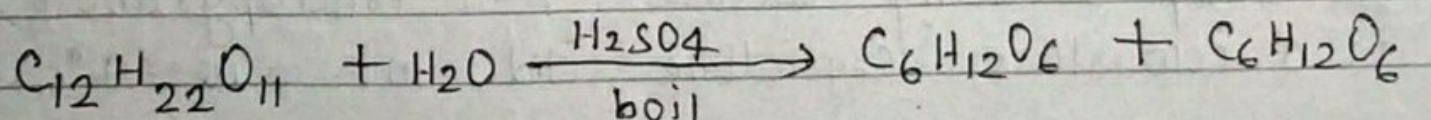
Fructose occurs naturally both in a combined and free state. In the free state it is present along with glucose in most sweet fruit and honey.

In the combined state, it forms a major component of many oligosaccharides (eg. sucrose).

PREPARATION

1. From sucrose (cane sugar)

In the laboratory, fructose is prepared by hydrolysis of sucrose by boiling with dilute sulphuric acid.



Sucrose

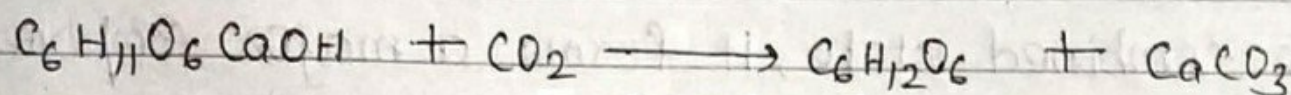
Fructose

Glucose

On completion of the hydrolysis, the excess of H_2SO_4 is neutralized with barium carbonate and the filtrate concentrated.

It is cooled in ice then $Ca(OH)_2$ is added to precipitate calcium fructosate.

The calcium fructosate is removed by filtration and converted to fructose by passing CO_2 through its suspension in water.



Calcium D-fructosate

Fructose

After removal of the $CaCO_3$ by filtration, the solution is evaporated to a syrup.

Properties Of Fructose

Physical Properties

- * Naturally occurring fructose (β -D-fructopyranose) is a colourless, crystalline solid, m.p = $102.4^\circ C$.
- * It is very soluble in water, sparingly soluble in alcohol.
- * An aqueous solution of fructose is laevorotatory.

Chemical Properties

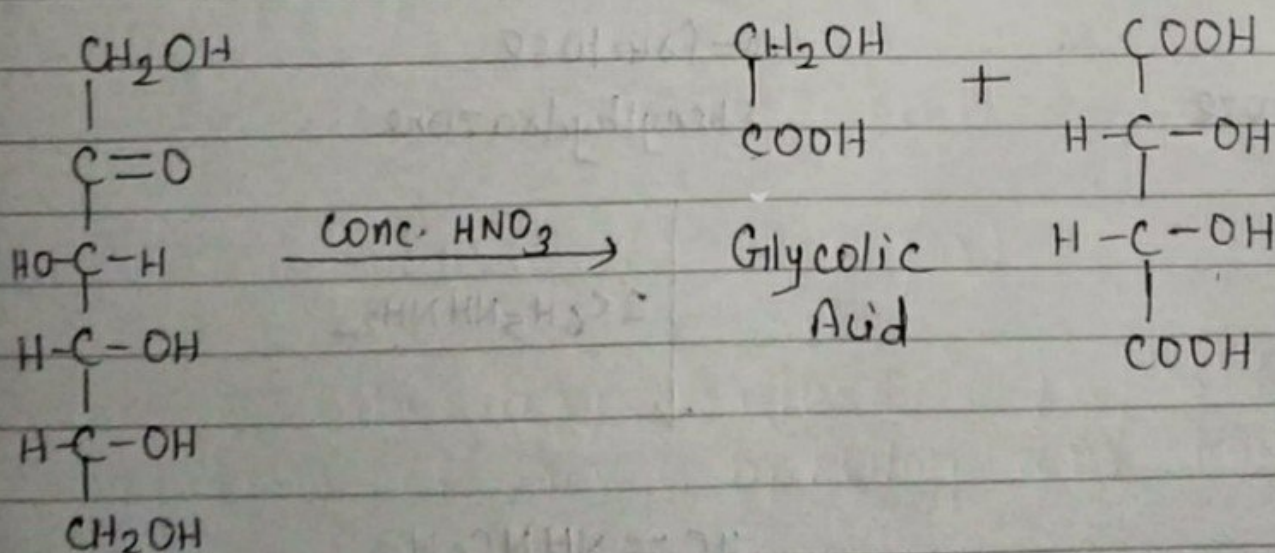
3.

A. Reactions of the open-chain keto form of D-fructose.

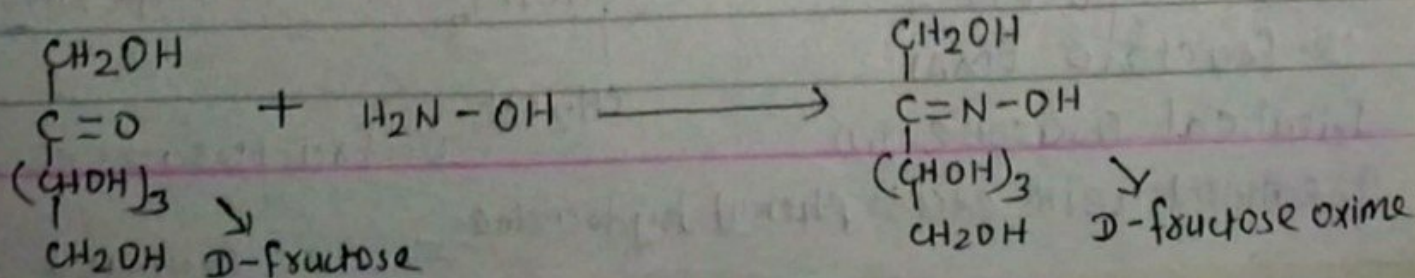
1. Oxidation :-

D-fructose does not react with mild O.A such as bromine water.

With stronger oxidising agents, such as concentrated nitric acid, the carbon chain is ruptured and a mixture of glycolic acid and tartaric acid is obtained.



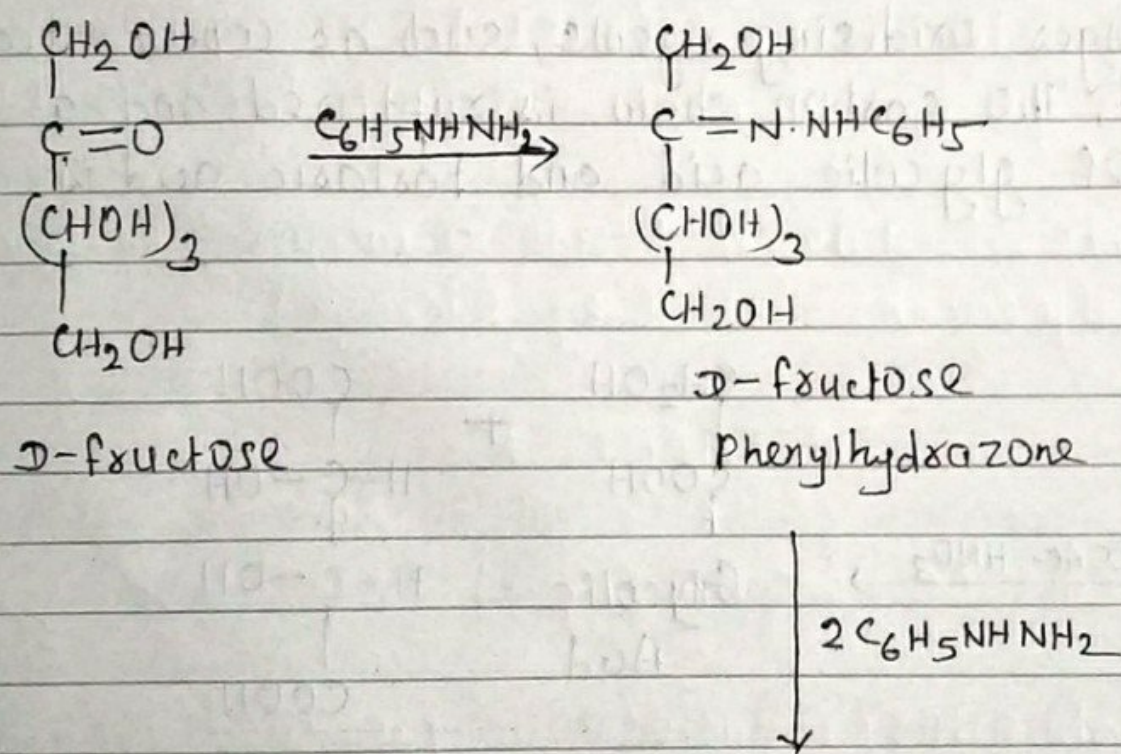
2. Reaction with Hydroxyl amine ($\text{H}_2\text{N}-\text{OH}$)



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3. Reaction with Phenylhydrazine:-

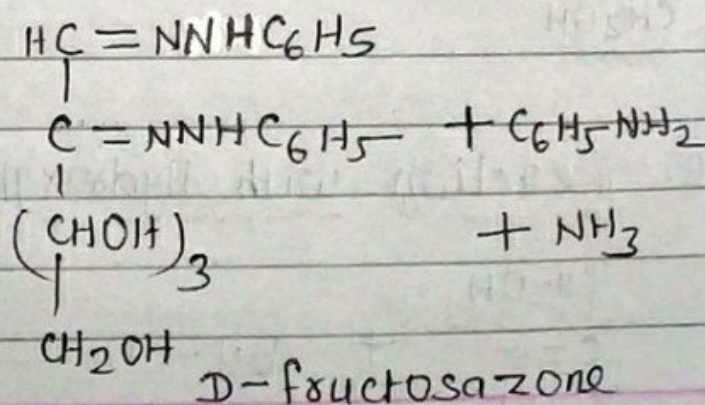
D-fructose undergoes a condensation reaction with phenylhydrazine to give D-fructose phenylhydrazone. However, in the presence of excess phenylhydrazine the phenylhydrazone reacts further to form D-fructosazone, aniline and ammonia.



Note :-

Both D-glucose & D-fructose form identical osazone on

treatment with excess phenylhydrazine.



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