

Reactions of Monosaccharides

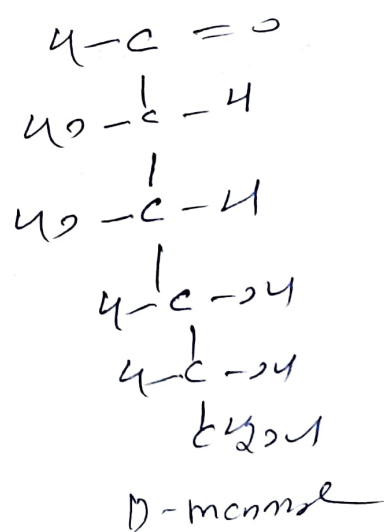
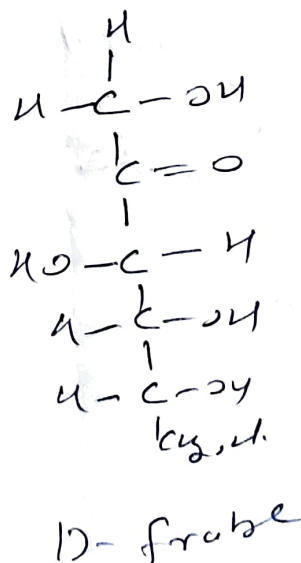
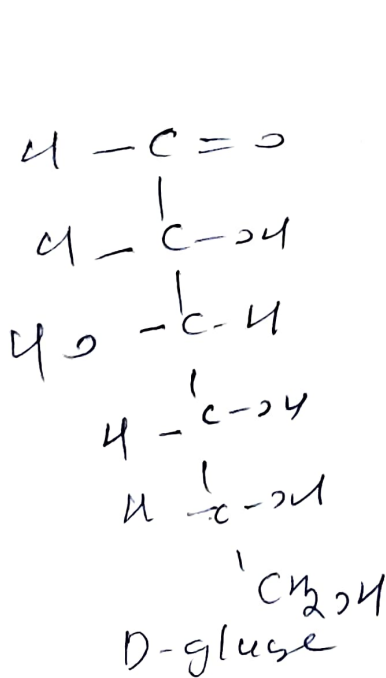
(1)

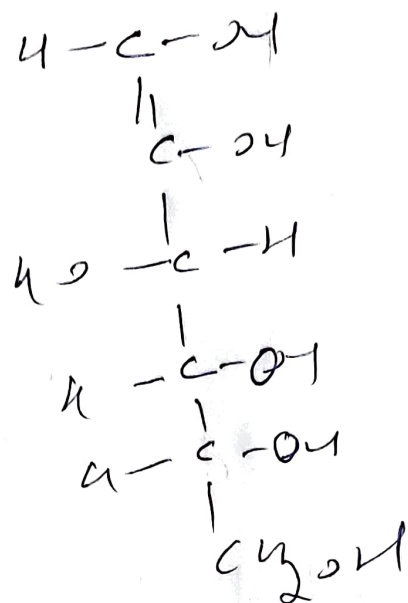
① Tautomerization or enolization

→ The process of shifting a hydrogen atom from one carbon atom to another to produce enediols is known as tautomerization.

→ Sugars possessing enomeric carbon atom undergo tautomerization in alkaline solution.

→ When glucose is kept in alkaline solution for several hours, it undergoes isomerization to form D-fructose and D-mannose.





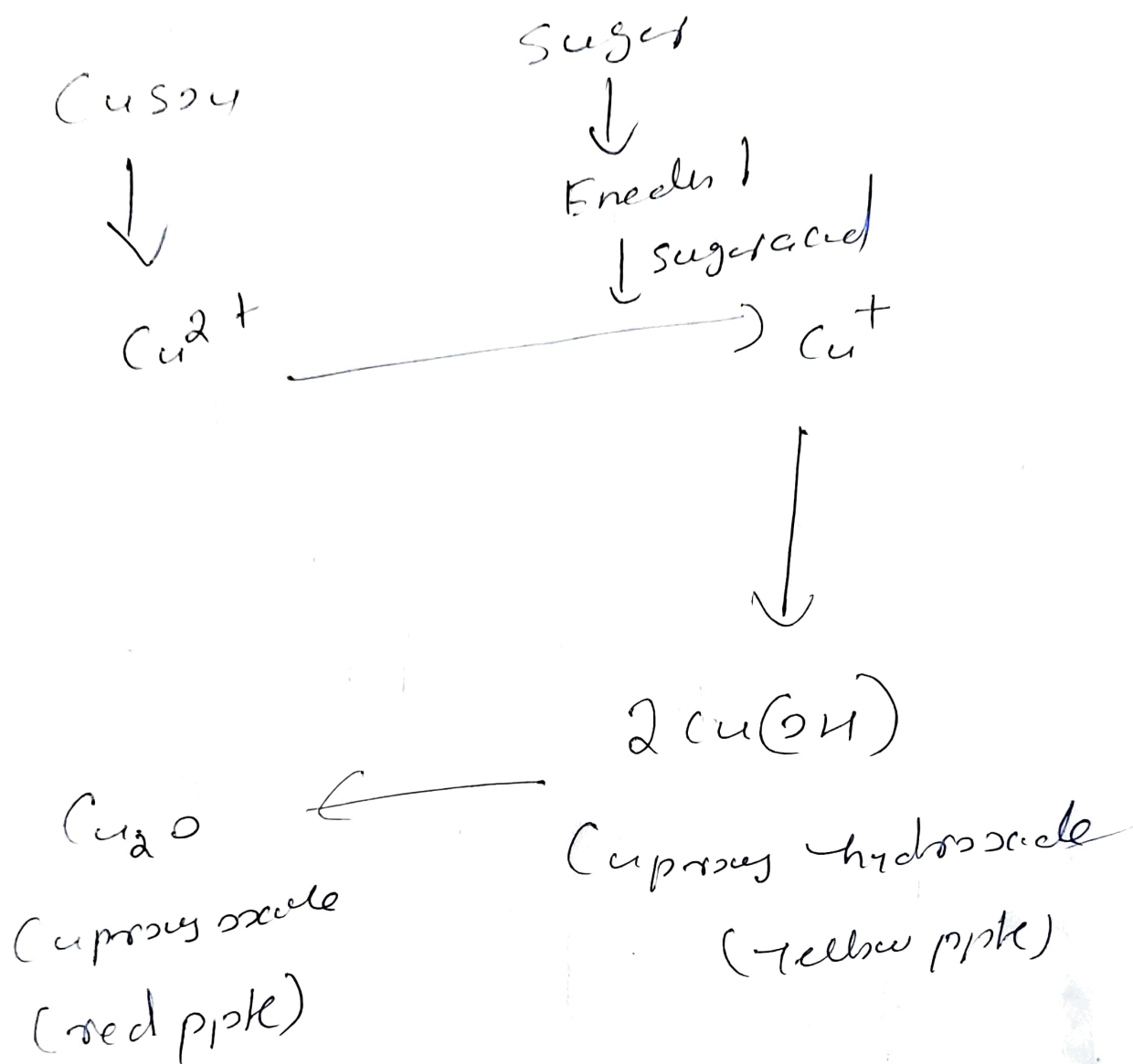
Fischer's form.

2) Reducing properties

→ The sugars are classified as reducing or non-reducing

→ The reducing property is attributed to the free aldehyde or keto group of anomeric carbon

(2)



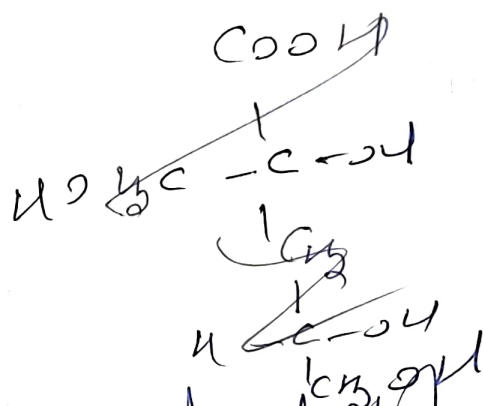
3.) Oxidation

→ Depending on the oxidizing agent used, the terminal aldehyde (or ket) or the terminal alcohol or both the groups may be oxidized

1. Oxidation of aldehyde group

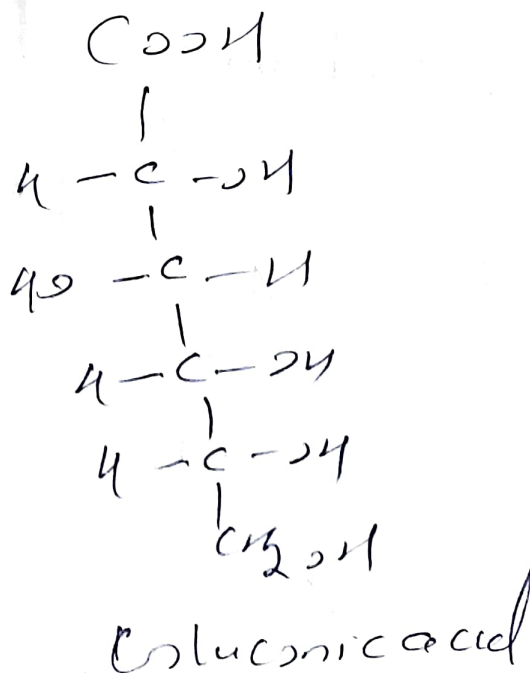
$\text{CHO} \rightarrow \text{COOH}$ results in the formation of gluconic acid

D



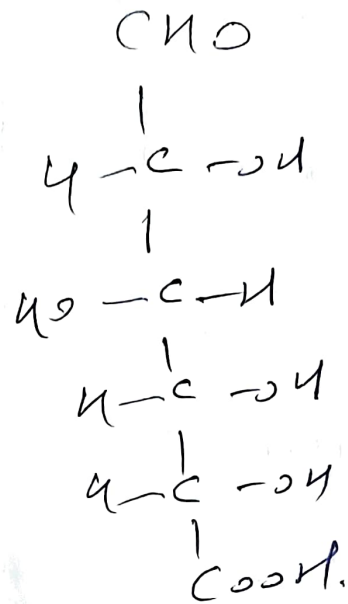
2) Oxidation of terminal alcohol group
 $\text{CH}_2\text{OH} \rightarrow \text{COOH}$ leads to the production of glucaric acid

D-glucose



(3)

a.

D-glucose $\longrightarrow$

D-gluconic acid

B) Reduction

 $\longrightarrow$ when treated with reducing agents

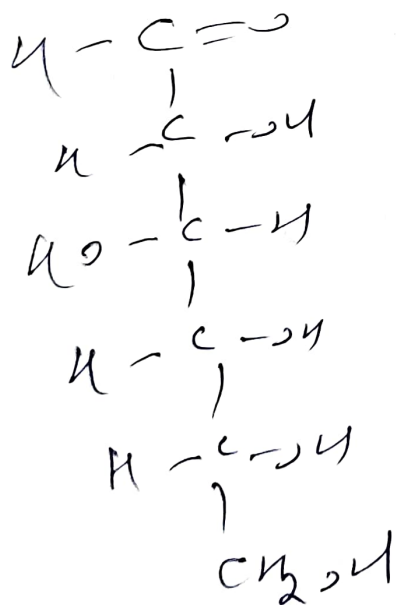
Such as Sodium amalgam, the aldehyde or ketogroup of monosaccharide is reduced to corresponding alcohol

a. D-glucose $\longrightarrow$ D-sorbitol
 D-galactose $\longrightarrow$ D-Dulcitol
 D-mannose $\longrightarrow$ D-Mannitol
 D-fructose $\longrightarrow$ D-mannitol + D-sorbitol

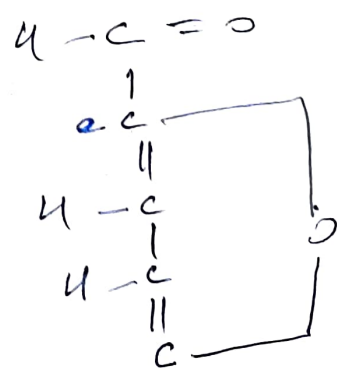
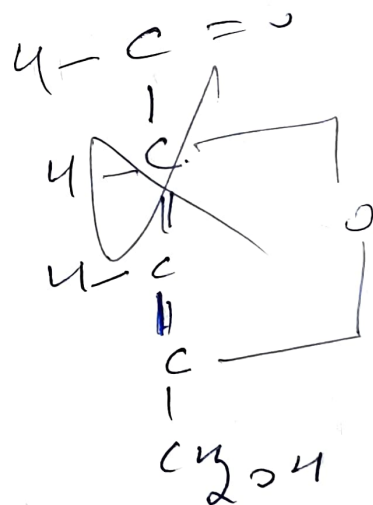
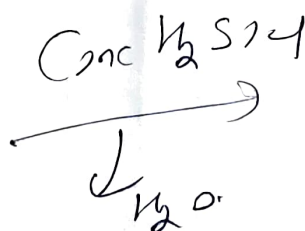
5) Dehydration

When treated with conc sulphuric acid monosaccharides undergo dehydration with elimination of 3 water molecules

→ Thus hexoses give hydroxymethyl fural while pentoses give fural on hydration

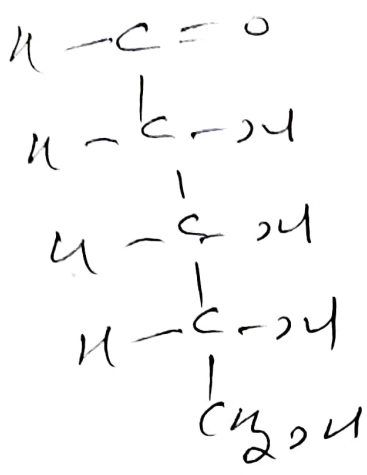


D-glucose

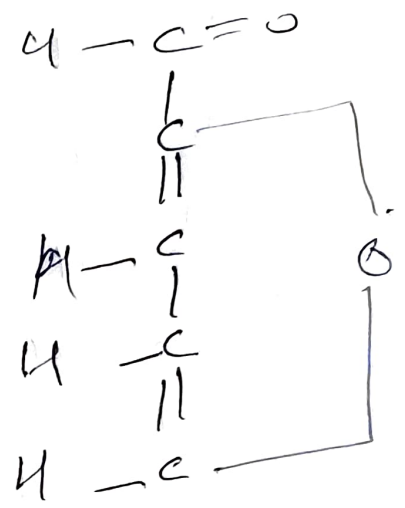
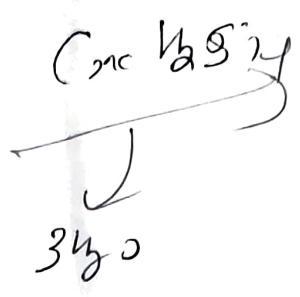


Hydroxymethyl fural

4



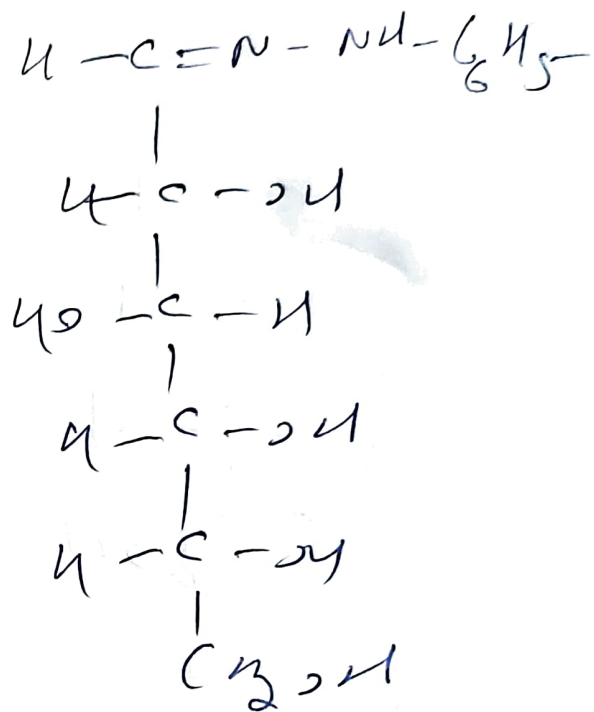
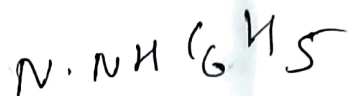
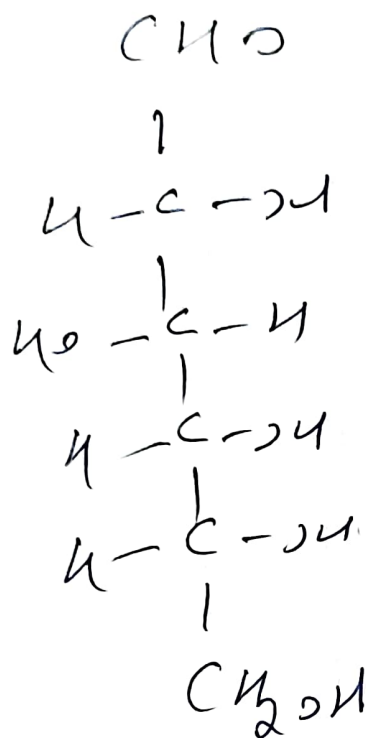
D-Ribose



furfural

Osaone formation

→ phenyl hydrazine in acetic acid, when boiled with reducing sugars forms osazones i.e.



phenyl hydrazine