CARBO HYDRATES

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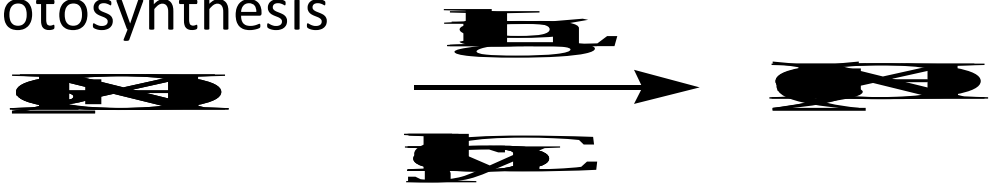
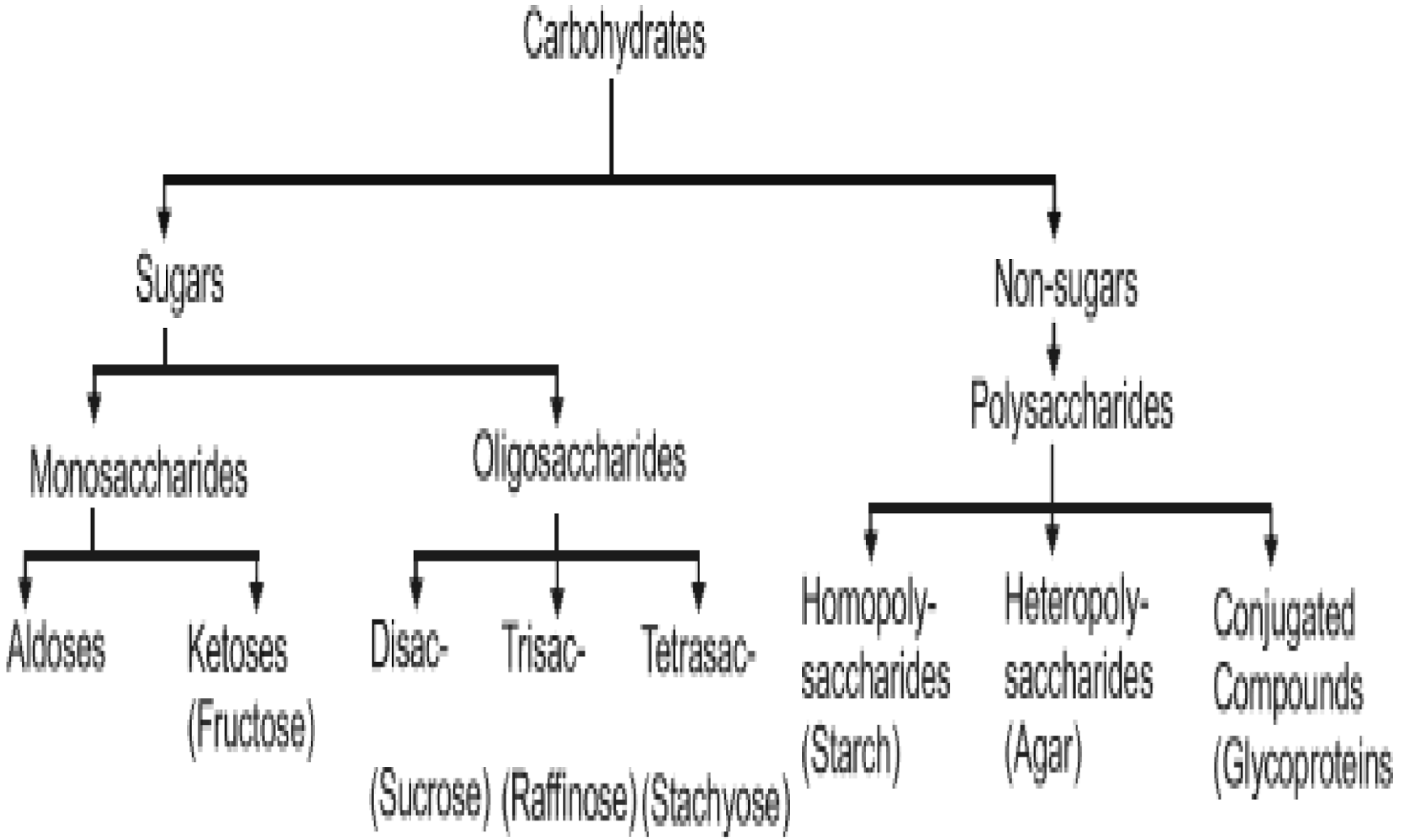
Introduction

- Carbohydrates constitute one of the most importantgroups of natural products.
- Carbohydrates are widely distributed in plants andanimals.
- They serve as source of energy (e.g.sugars), and also as storeof energy.(e.g.Starch and Glycogen)
- The basic formulaforcarbohydrates is $C_X(H_2O)_Y$
- Ex: Glucose,Fructose $(C_6H_{12}O_6)$
- Carbohydrates are defined as the optically active polyhydroxy aldehydes or ketones or substances that can be hydrolysedto either ofthem.
- Carbohydrates produced by green plantsduring photosynthesis




Carbohydrates
Sugars
Non-sugars
Monosaccharides
Oligosaccharides
Polysaccharides
Aldoses
Ketoses
(Fructose)
Disac-
Trisac-
Tetrasac-
(Sucrose)
(Raffinose)
(Stachyose)
Homopoly-
saccharides
(Starch)
Heteropoly-
saccharides
(Agar)
Conjugated
Compounds
(Glycoproteins

GlglipiAt)

thenomenclatureandfunctionalgroupfor rnonosaccharides

Number of Carbons (Gu neric munosa.ccharide name)	A) dose Functional Gnoup	Ketone Functional Gr 0L	Relevant examples.
3 (lose)	Aldatlose	Ketotriose Triulose	Glyceraldehyde, Dihydroxyacetone
4 (Tetrase}	Aldotetrase	Ketotetrose Tetrulase	Erythrose
5 Penrose)	Akioynose	Ketoentase Pentulose	Riboso,Rlbulee, XtUloso
6 (Hexase)	Aldohexase	Ketohemse Hexulase	ci x ase,Galactoso, Ma nn0sa,FruCosa

GLUCOSE

- Glucose occurs in many plants in the free as well ascombined state.
- Glucose is aldose sugarhaving–CHO funtionalgroup.
- It is found in grapes in abundant quantity so it is also knownas "Grape sugar".
- Glucose is the main – respiratory substrate in thebody.
- Other types of hexoses are converted into glucose inliver.
- It is alsocalledas Blood sugar ,Cornsugar.

Preparation:

- 1.Fromsucrose

$$\underset{\text{Sucrose}}{C_{12}H_{22}O_{11}+H_20} \xrightarrow[\text{W arm}]{\text{D il. } H_2SO_4} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

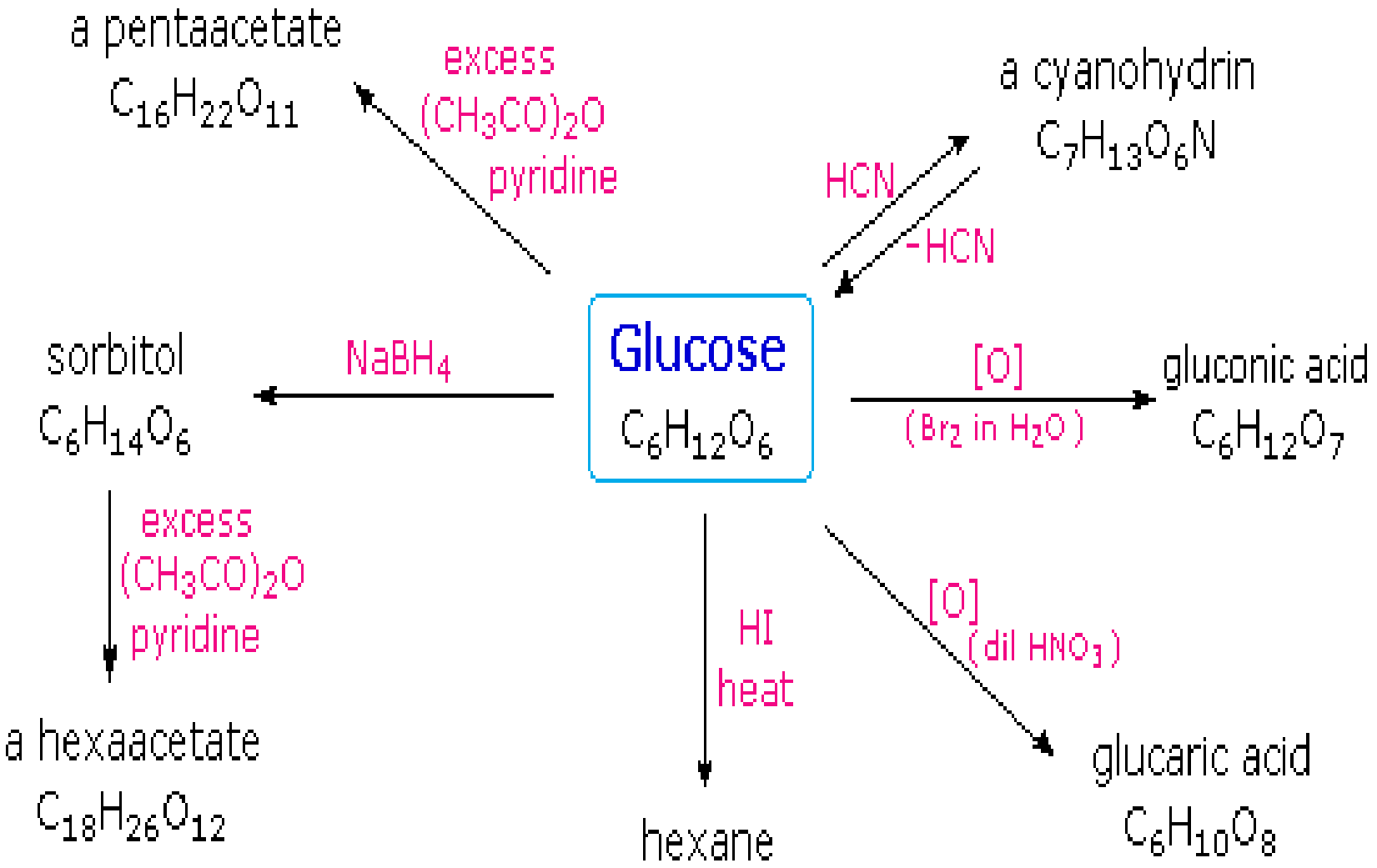
- 2.Fromstarch

$$(C_6H_{10}O_5)_n + nH_2O \rightarrow nC_6H_{12}O_6$$

Physical Properties ofGlucose

- Glucose is a White Crystalline solid. m.p(146^{o}C)
- It is extremely soluble in water ,sparingly soluble in alcohol and insoluble inether.
- It isOpticallyactive and dextrorotatory carbohydrate. So it is called as“dextrose”.
- Glucose shows Mutarotation. Itexistin both α-D glucoseand β -D glucoseform.

Chemical Properties of Glucose



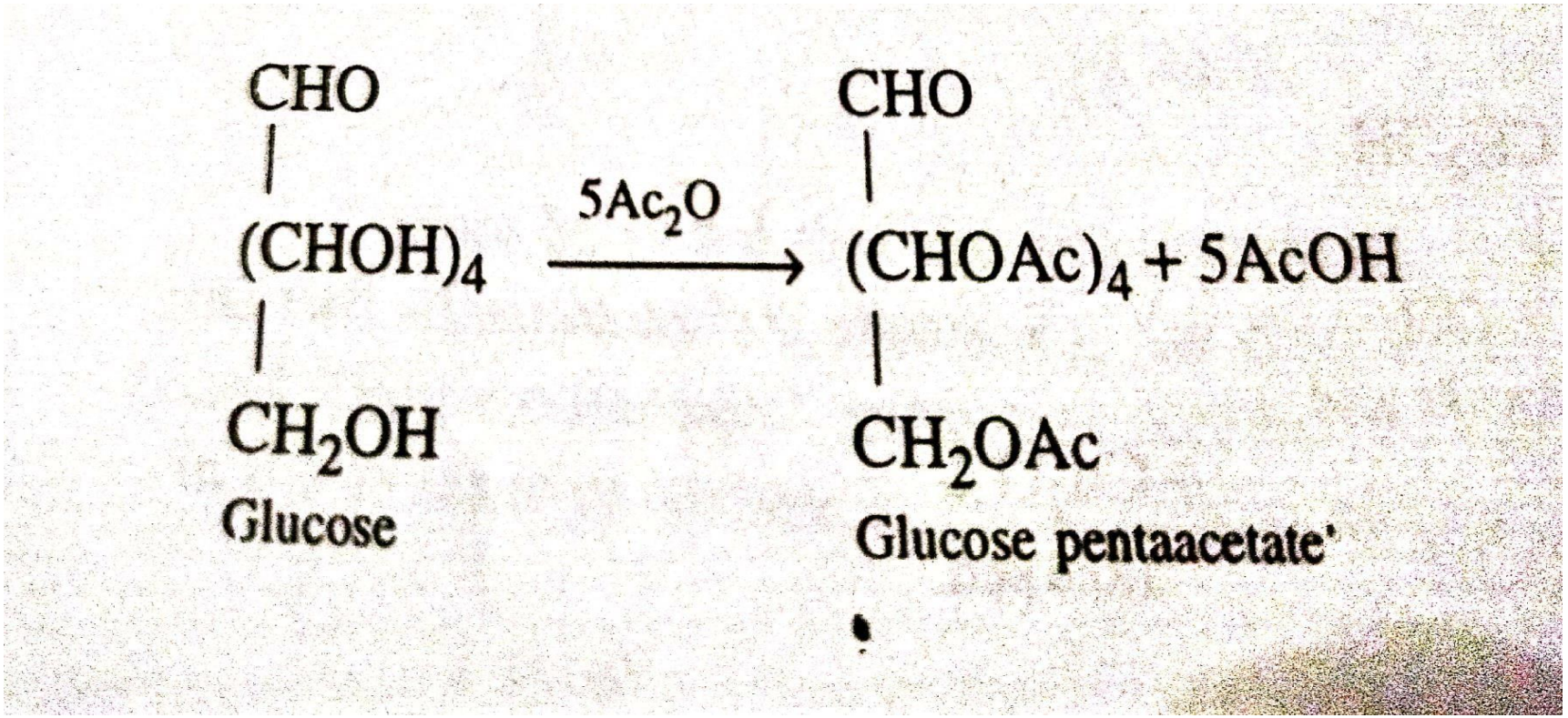
CONSTITUTION OF GLUCOSE

1.Molecular formula :

$C_6H_{12}O_6$2.Presence of five hydroxyl groups 3.Straightchain of six carbon atom 4.Presence of an aldehydic group 5.Open chainstructure

2. Presence of five hydroxylgroups

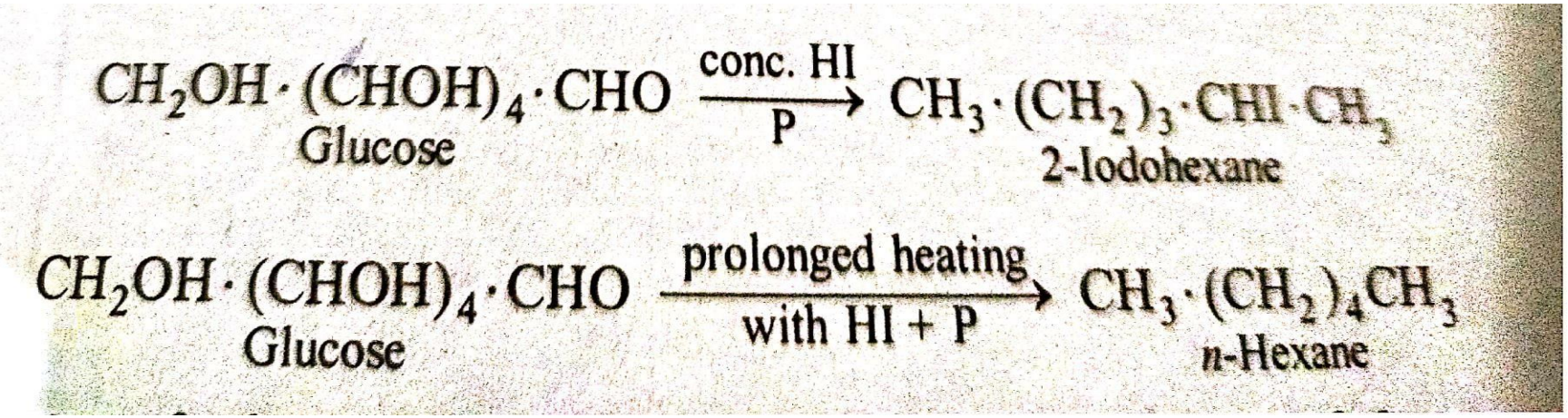
Reaction with AC_2O



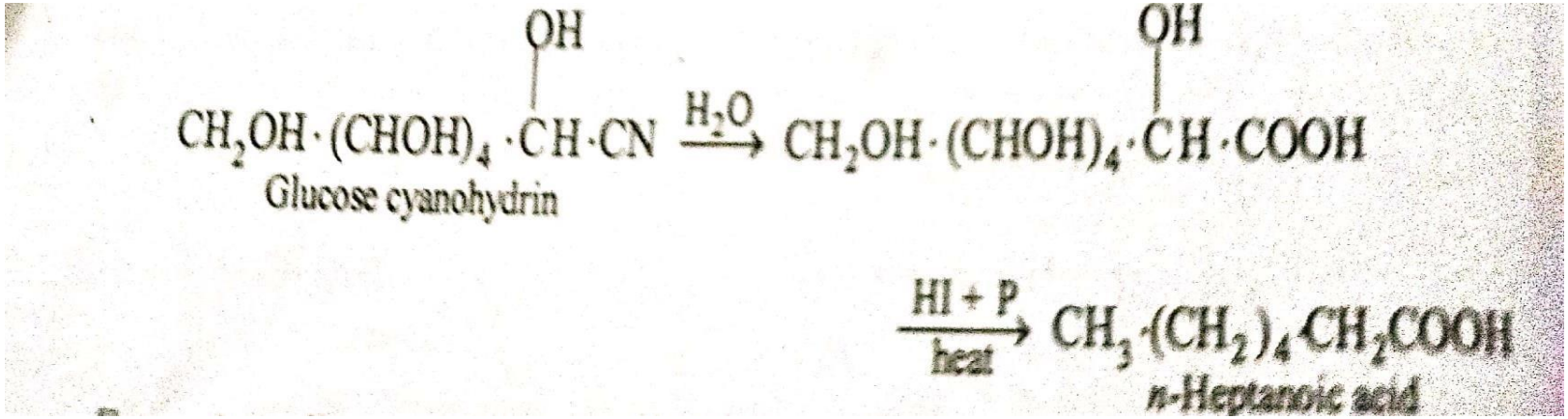
3.Straightchain of six carbonatoms

Reduction Reactions

1 . Reaction withHI

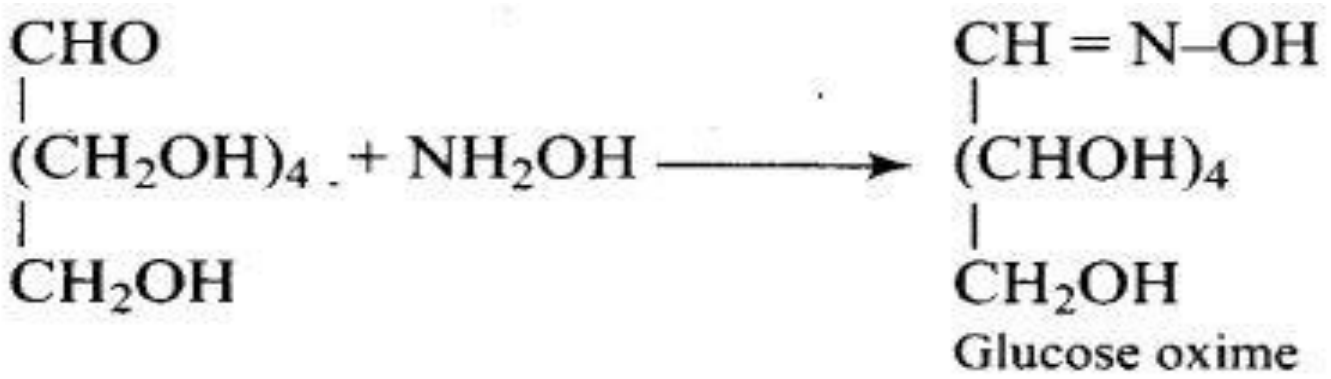


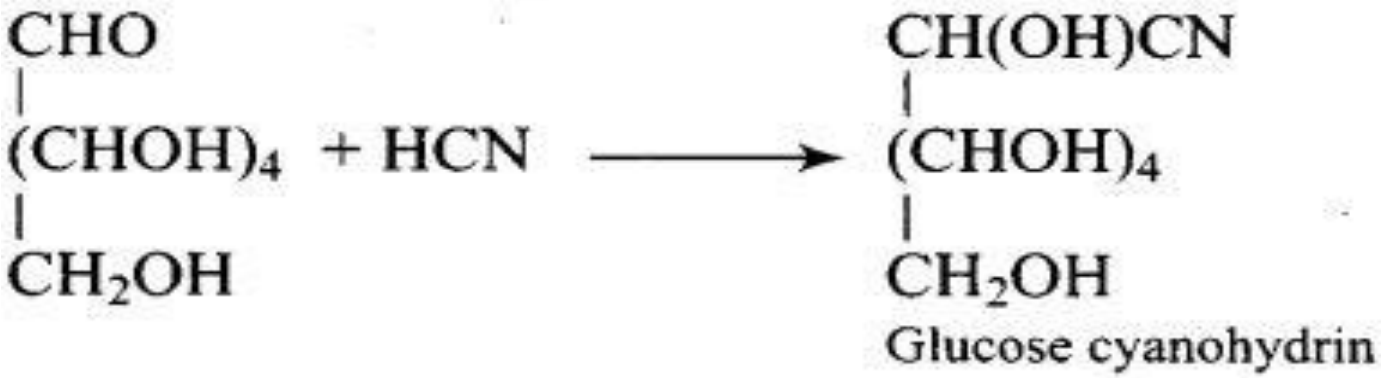
2.Reaction withHCN



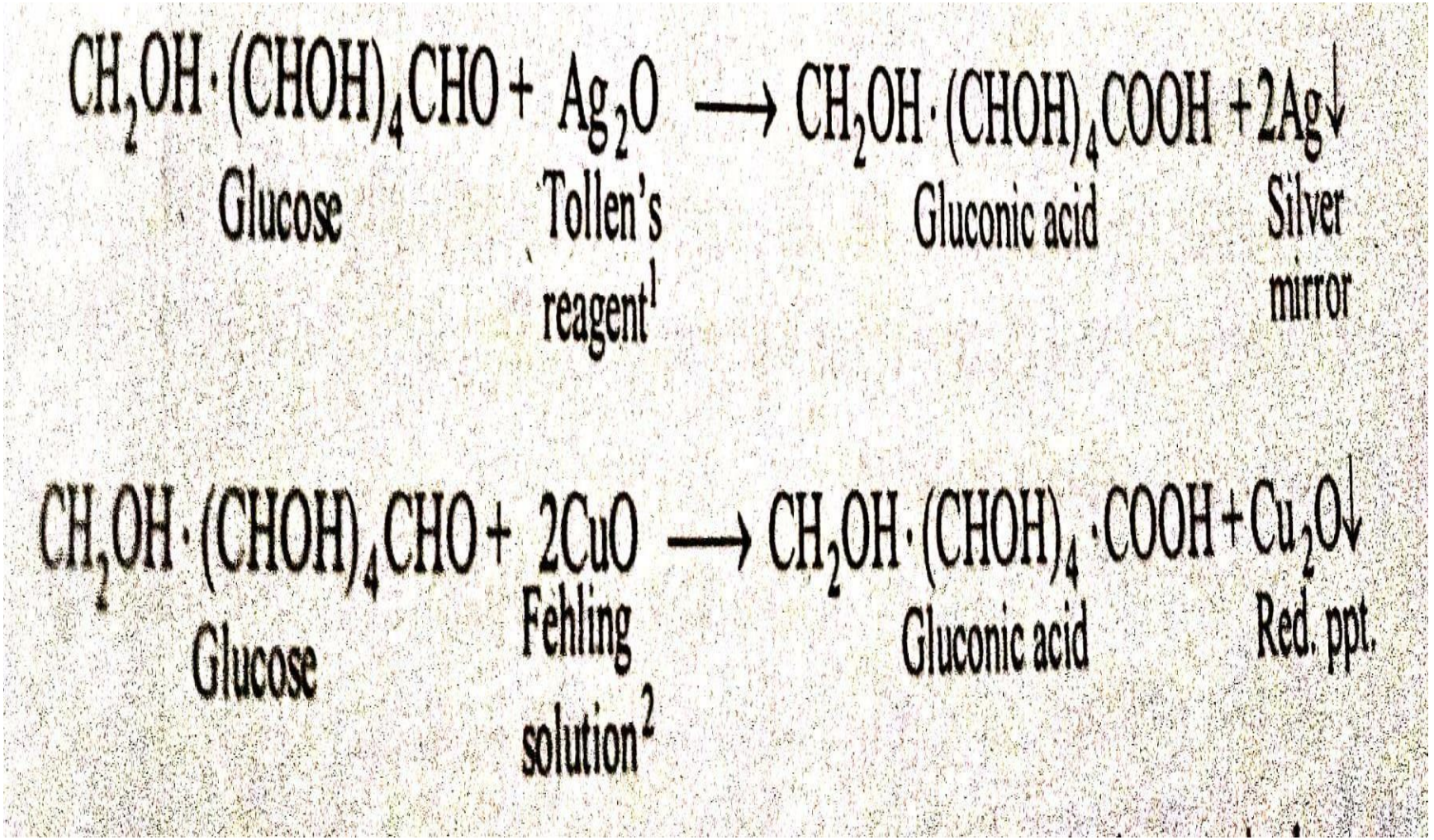
4.Presence of an aldehydicgroup

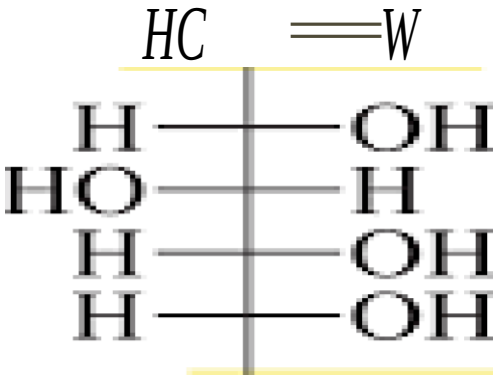
III.Reaction with NH_2OH & HCN





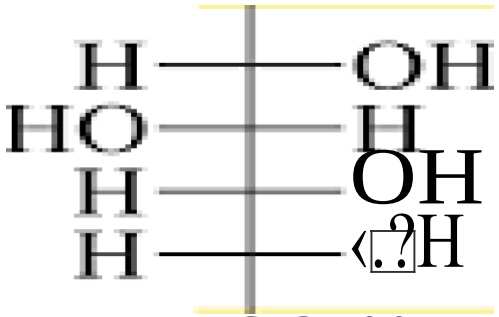
Oxidation Reactions





GT2qClH

D-glucose



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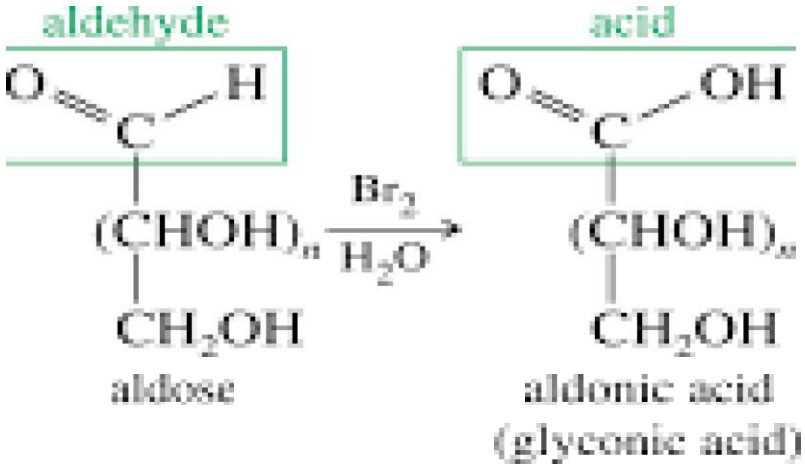

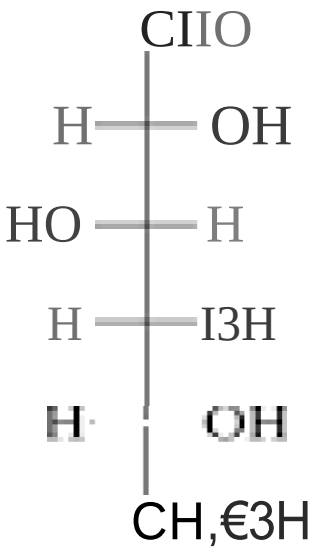

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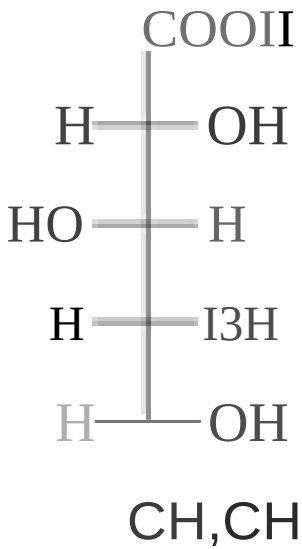

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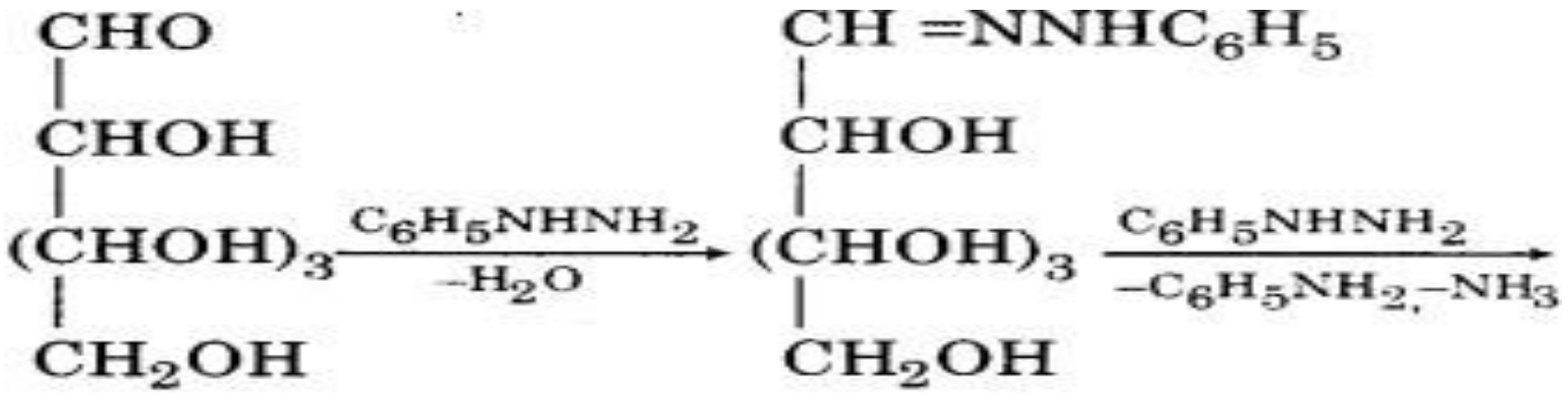
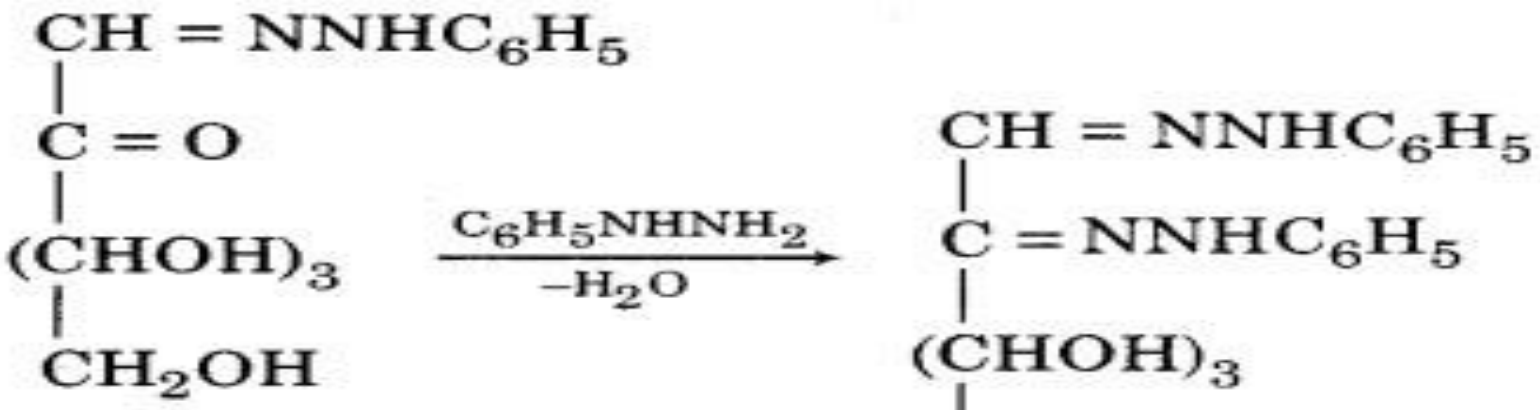
Reaction with PhenylHydrazene



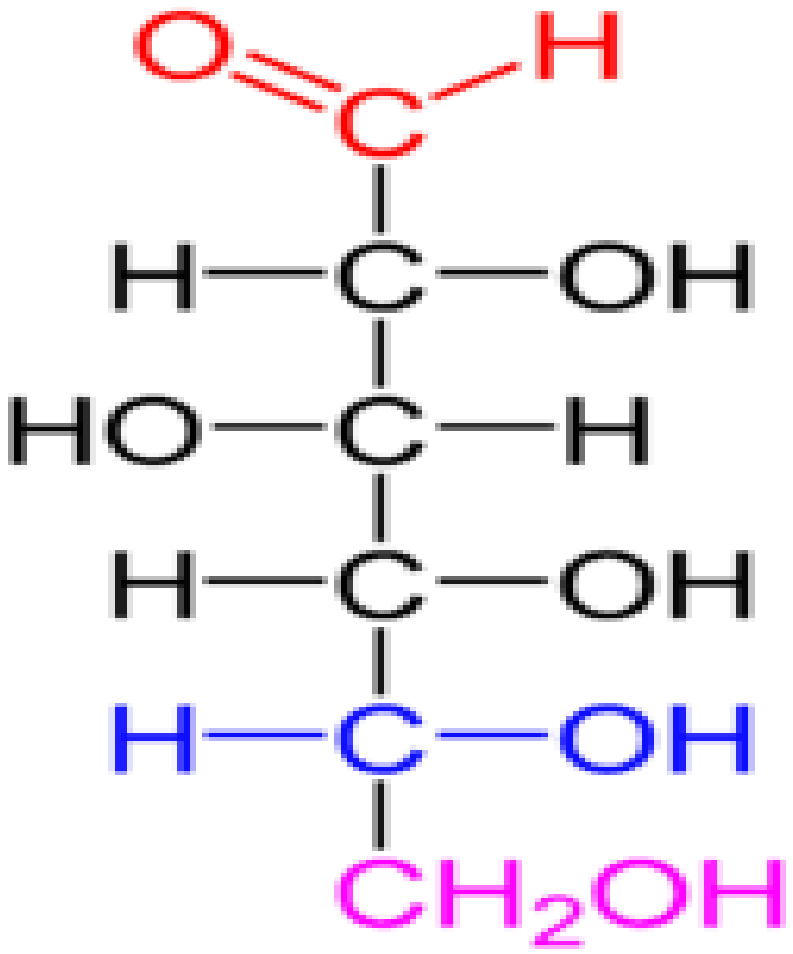
Glucose

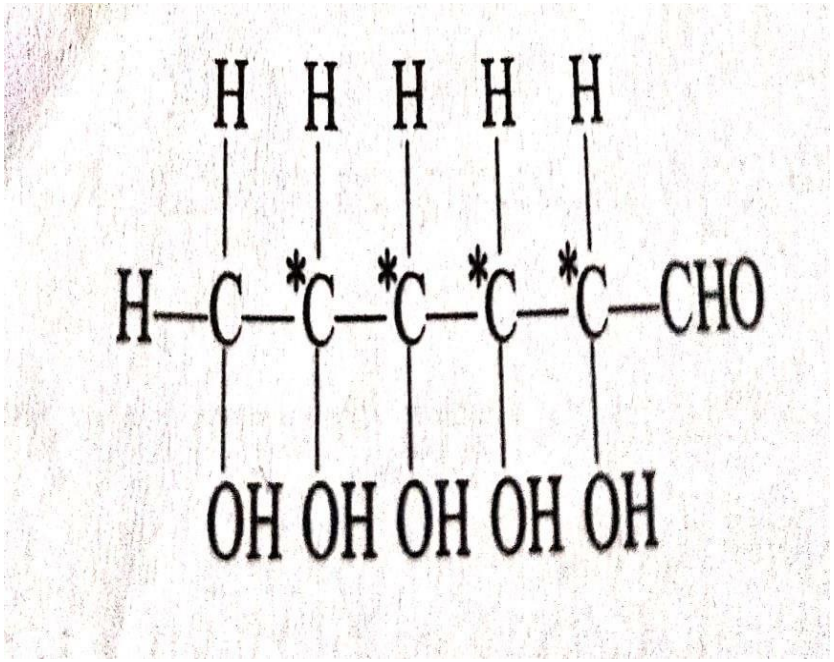
phenyl hydrazone
Glucose



Glucosazone

OPEN CHAIN STRUCTURE OFGLUCOSE

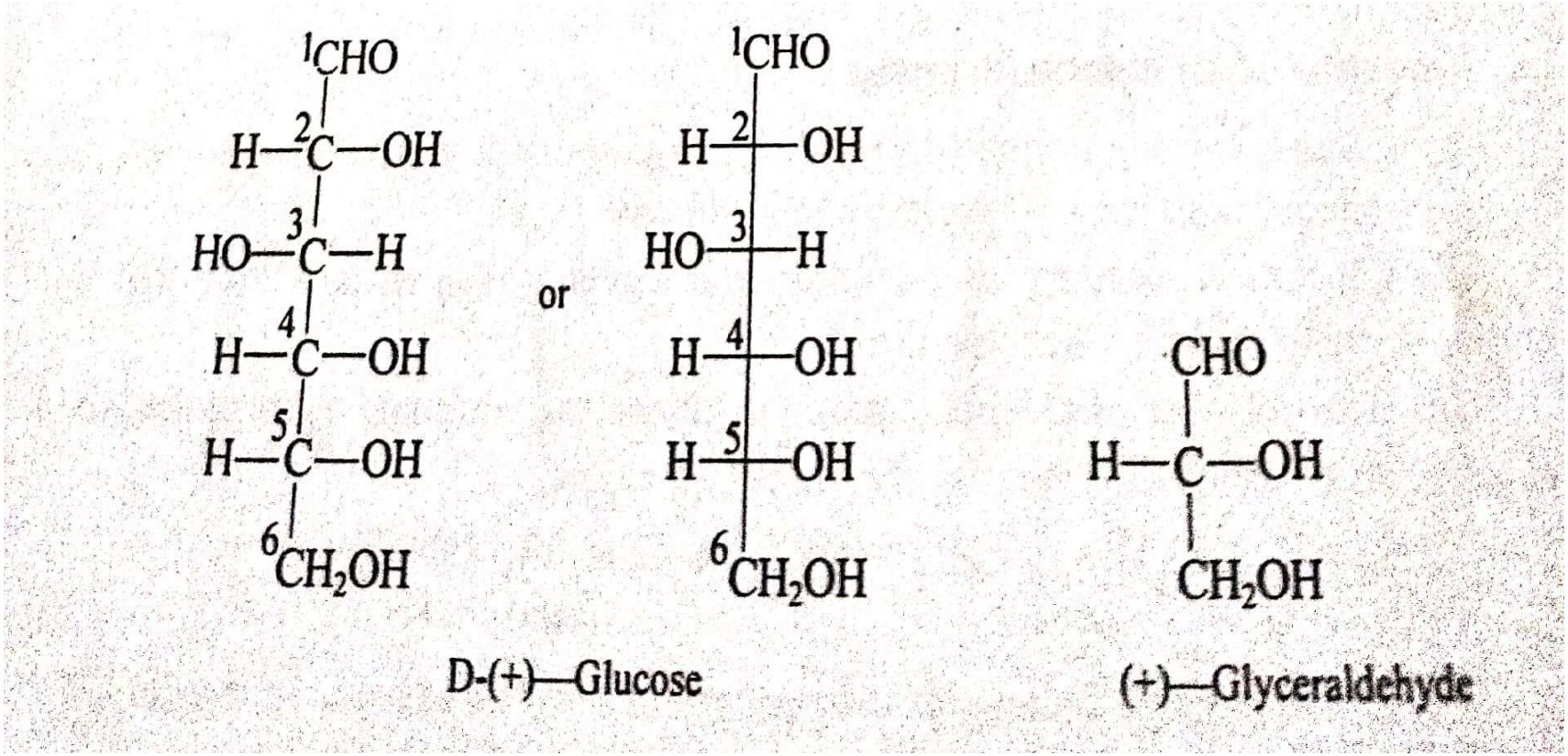




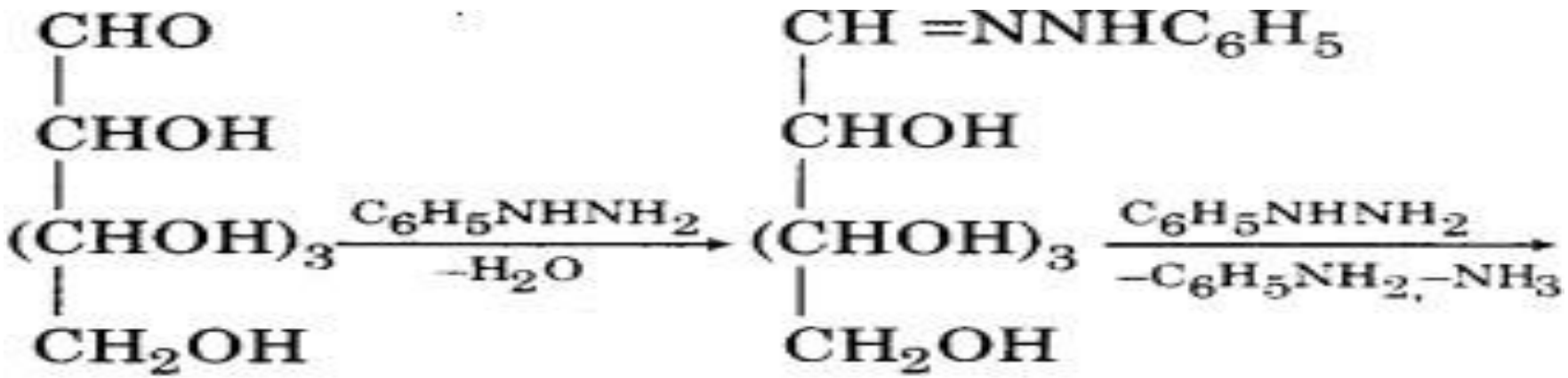
CONFIGURATION OFD-(+)-GLUCOSE

Asymmetric carbon atoms:4

2^4=16 optically active forms, i.e., 8 pairs of enantiomers

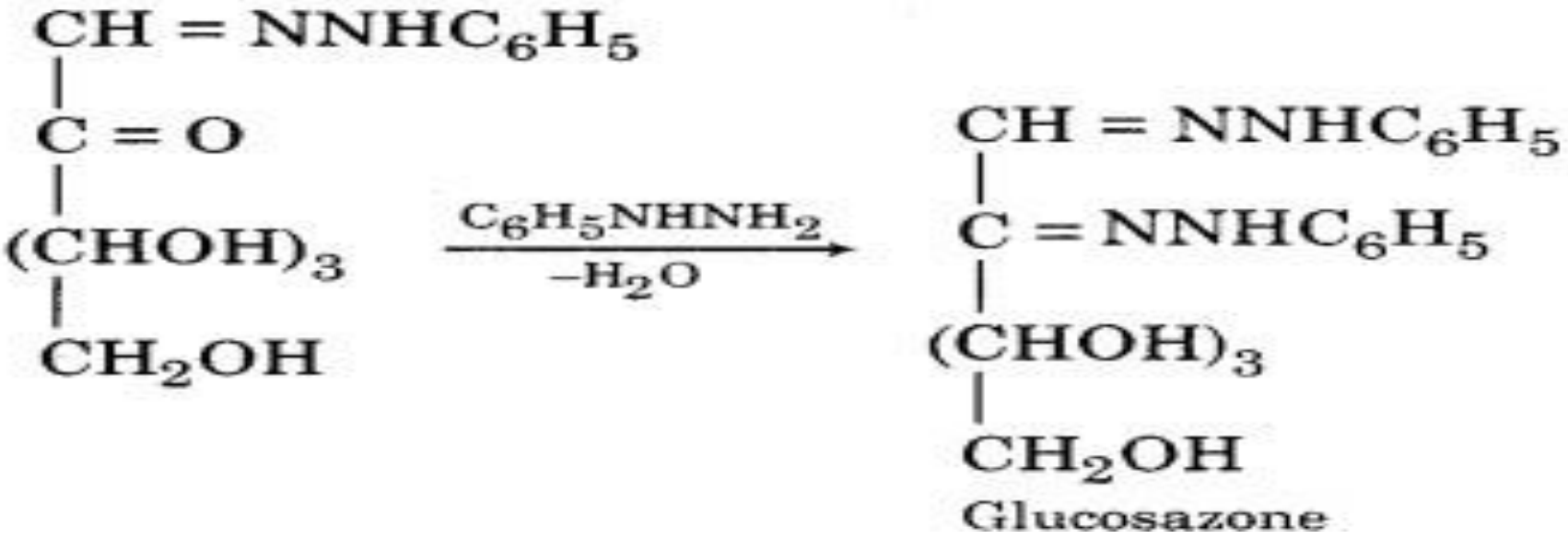


Reaction with PhenylHydrazene



Glucose

phenyl hydrazone
Glucose

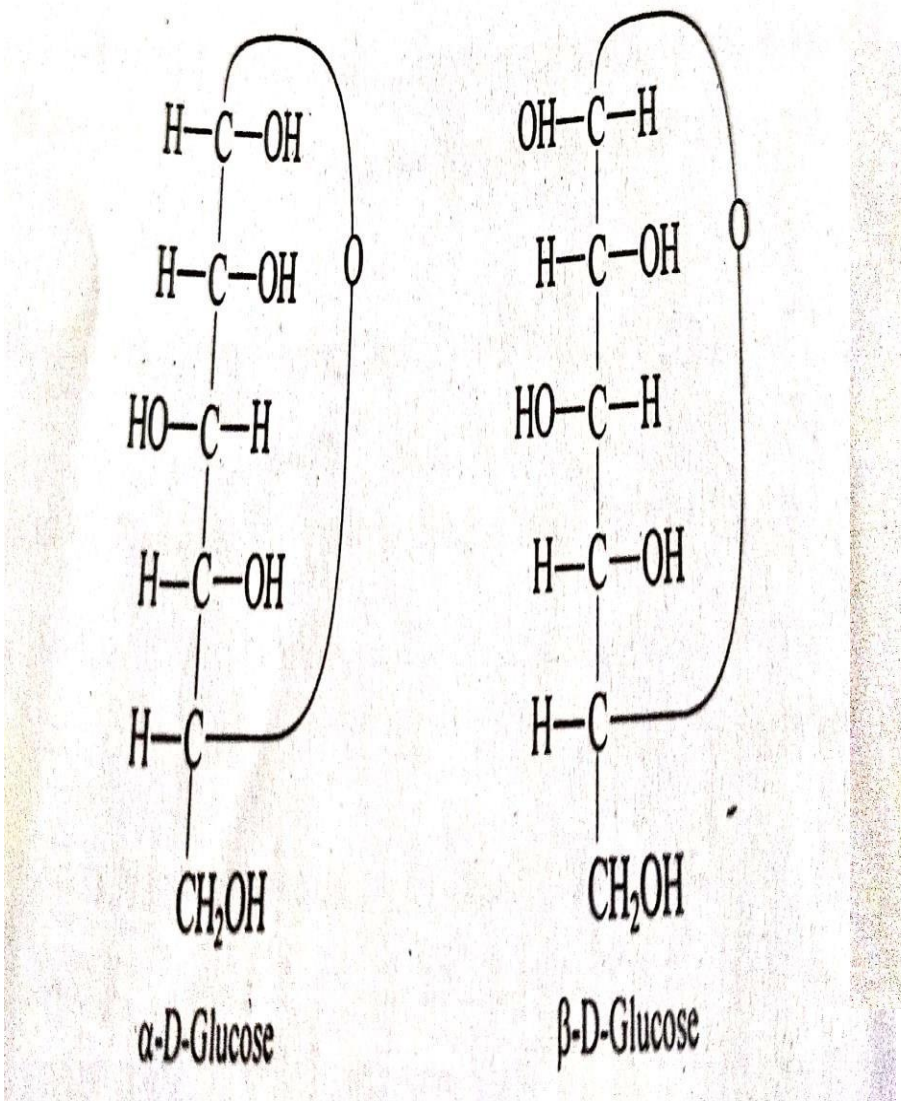


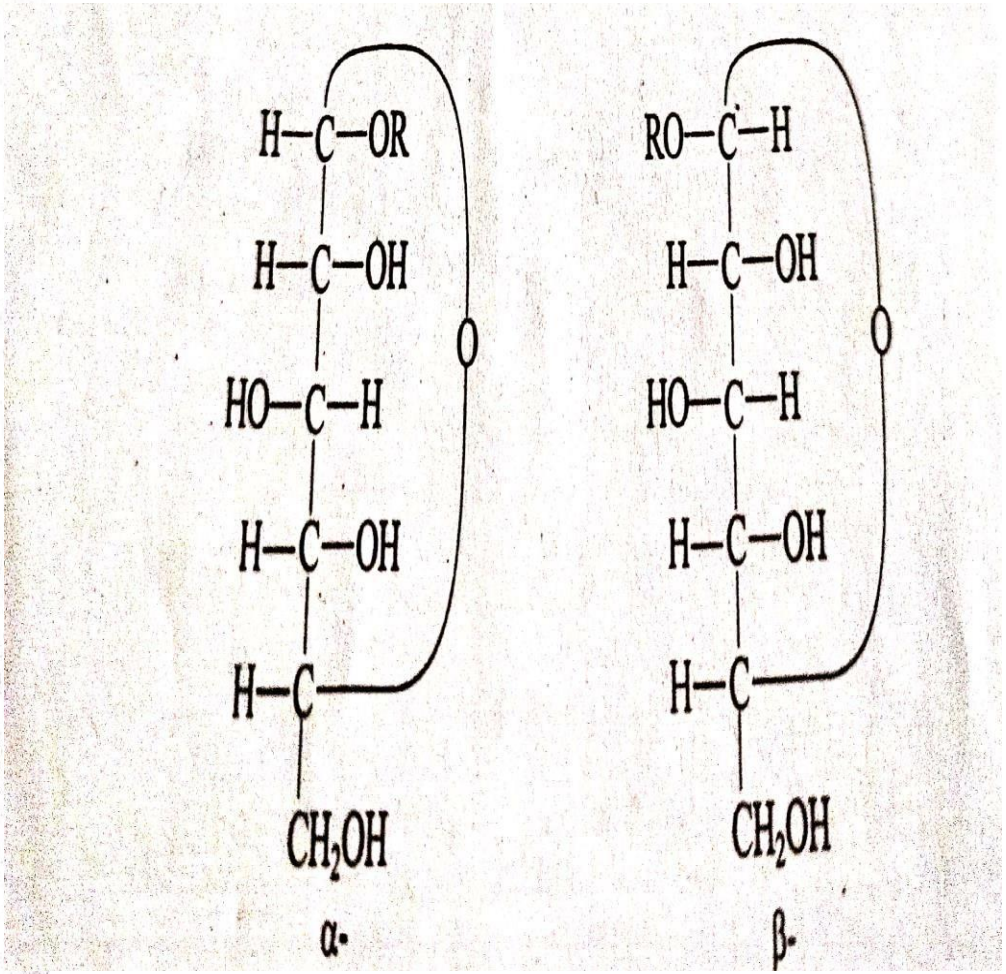
Glucosazone

OBJECTIONS TO OPEN CHAIN STRUCTURE OF GLUCOSE

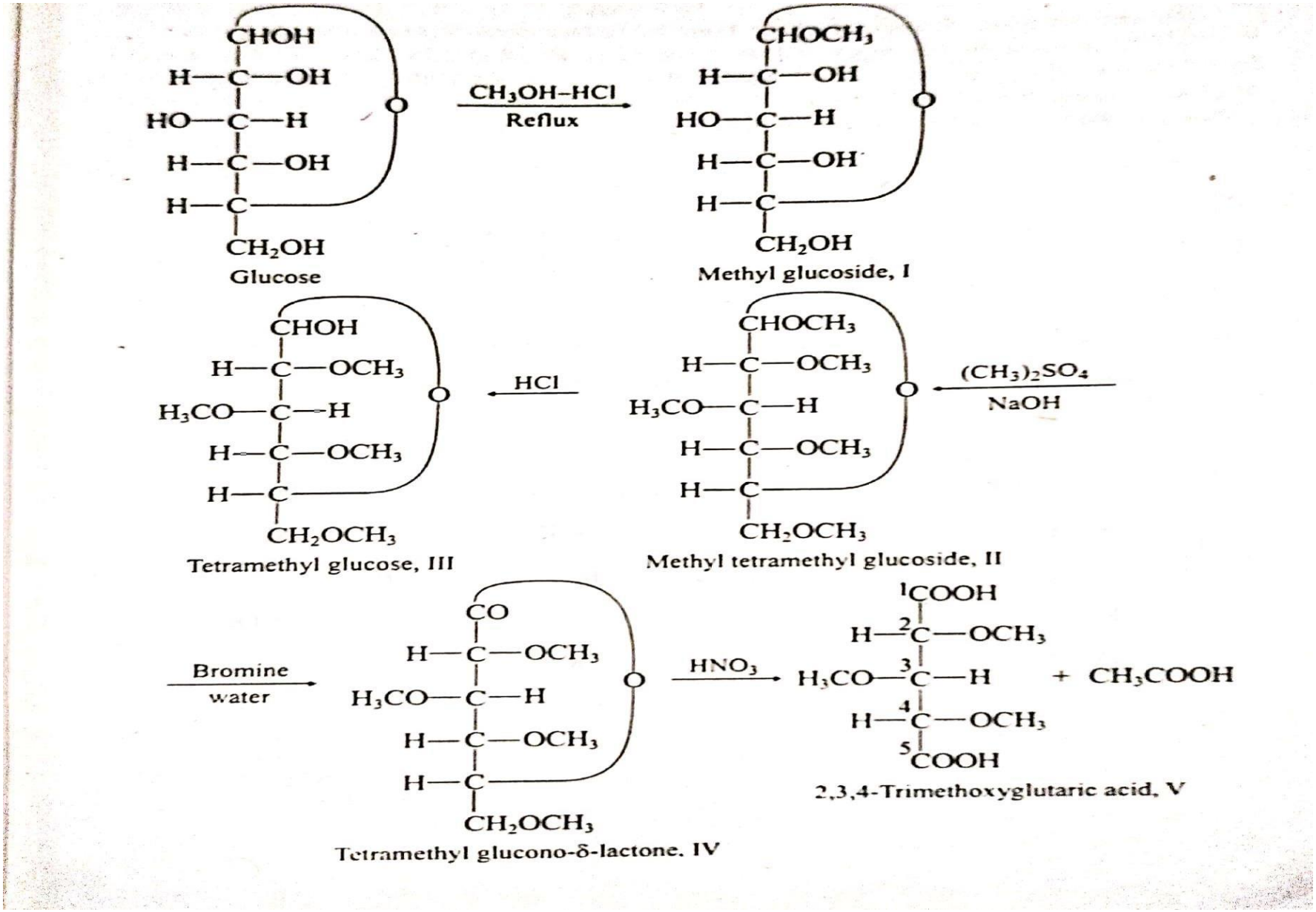
- 1.Glucose does not restoreSchiffs reagentcolour.
- 2.It does not formabisulphite and aldehyde-ammoniacompound.
- 3.It forms two isomeric penta acetates neither of which reacts with carbonylreagents.
- 4.The existence of two isomeric glucoses and the change in specific rotation (mutarotation) is not explained.
- 5.Glucose reacts with methanol in presence of dryHCl to form two isomericglucosides.

RING STRUCTURE OF GLUCOSE



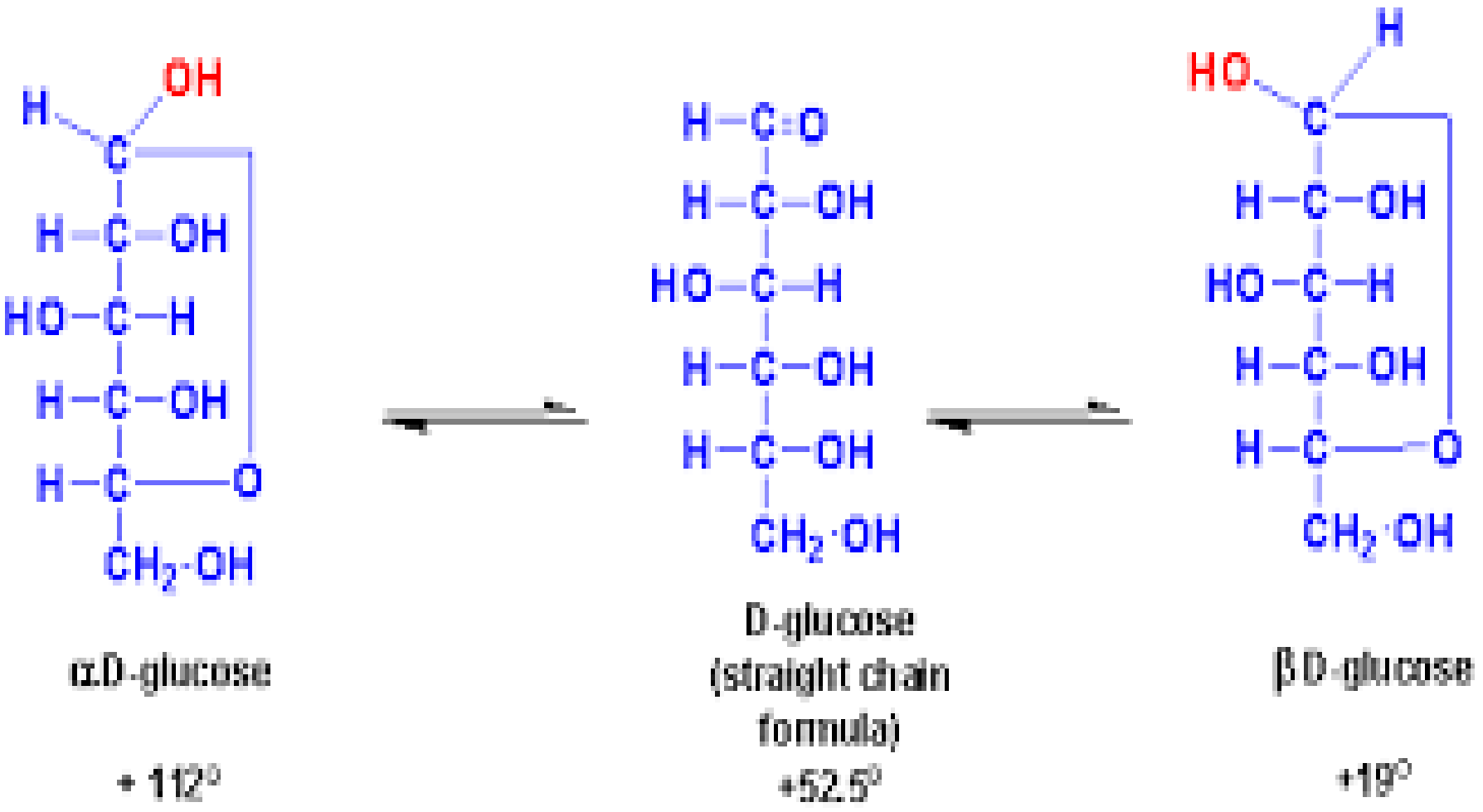


DETERMINATION OF RING SIZE

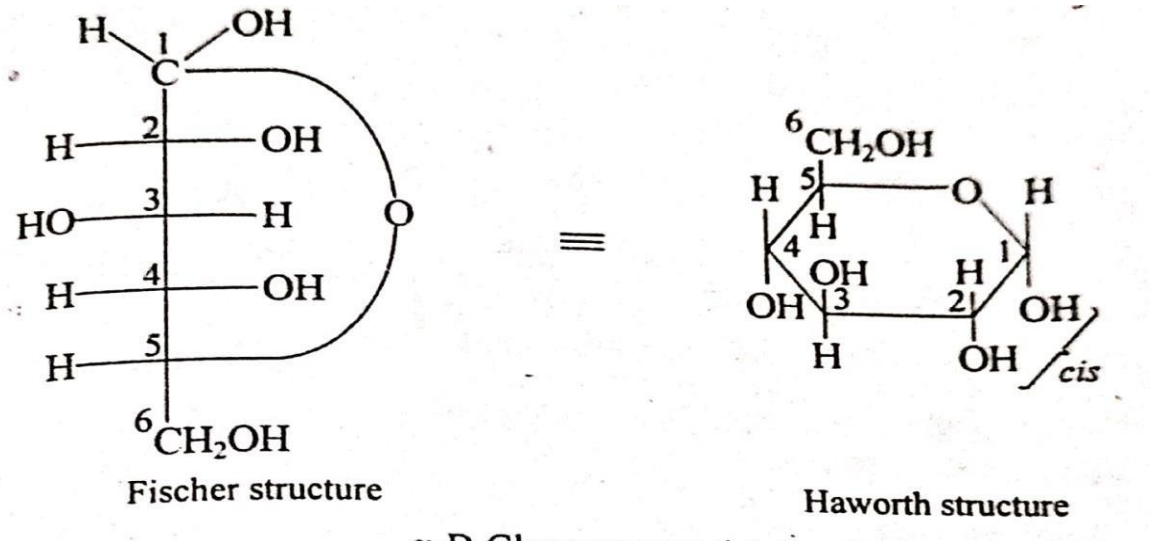


Mutarotation ofD-Glucose

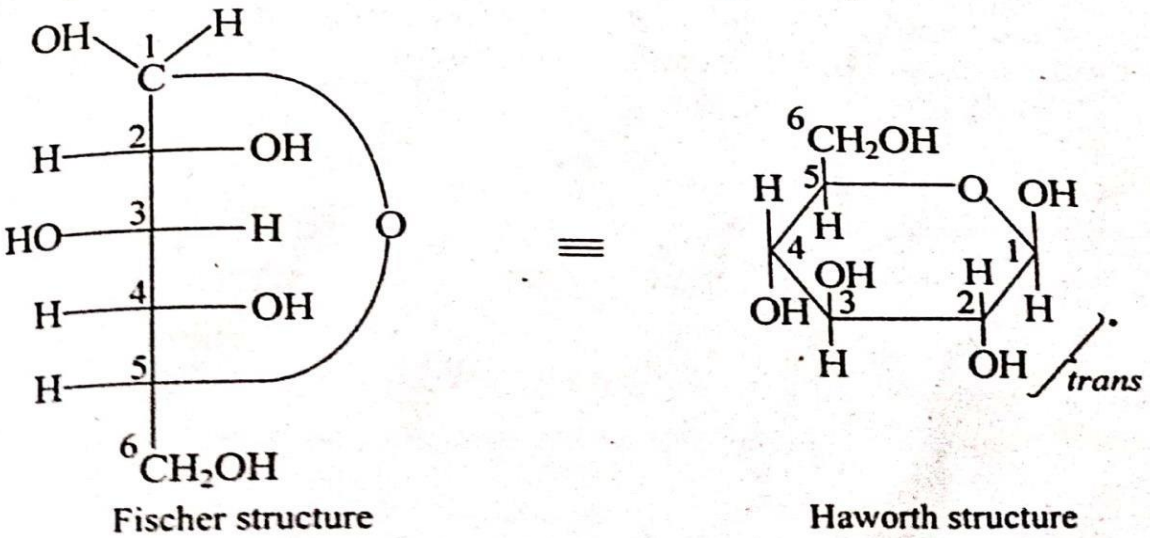
Mutarotation:The optical rotation of a solution is changes gradually until a constant rotation is attained.This is called as Mutarotation.



CONFIRMATIONS OF D-(+)-GLUCOSE

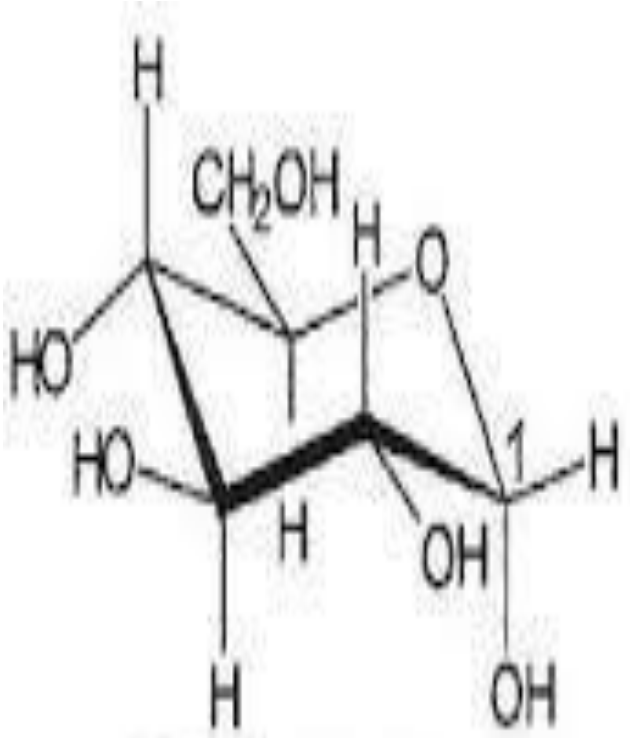


α-D-Glucopyranose (*cis* form)

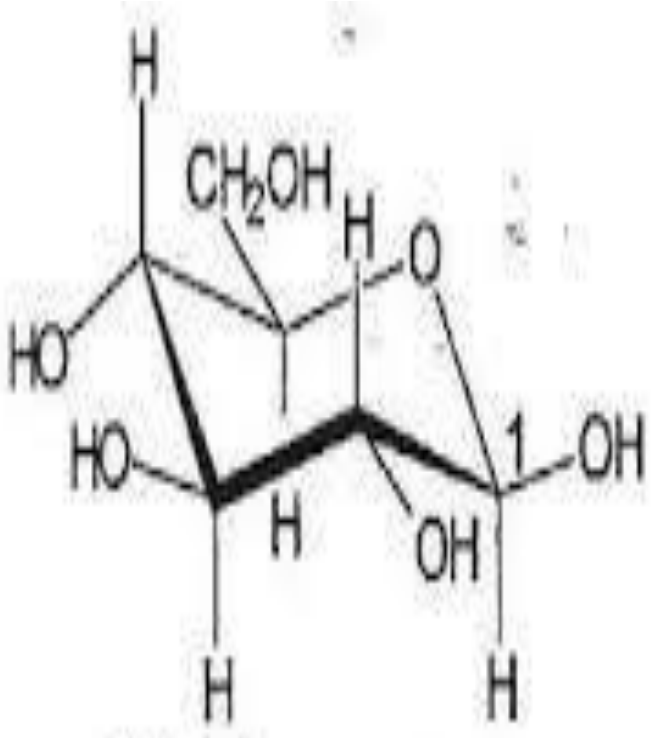


β-D-Glucopyranose (*trans*-form)

CHAIR CONFIRMATIONAL STRUCTURES OF D-(+)-GLUCOSE



α-(D)-glucopyrannose



β-(D)-glucopyrannose

CONCLUSION

- Glucosehas six memberedAldohexose.
- Glusose has a openchairstructure but some objections are their for open chainstructure.
- Glucose has a ring structure. In glucose cyclic ring is formed between C_1 and C_5 Carbonatoms.
- Glucose exist in Fisher, Howarth structures and Chair conformationalstructures.

THANK YOU