

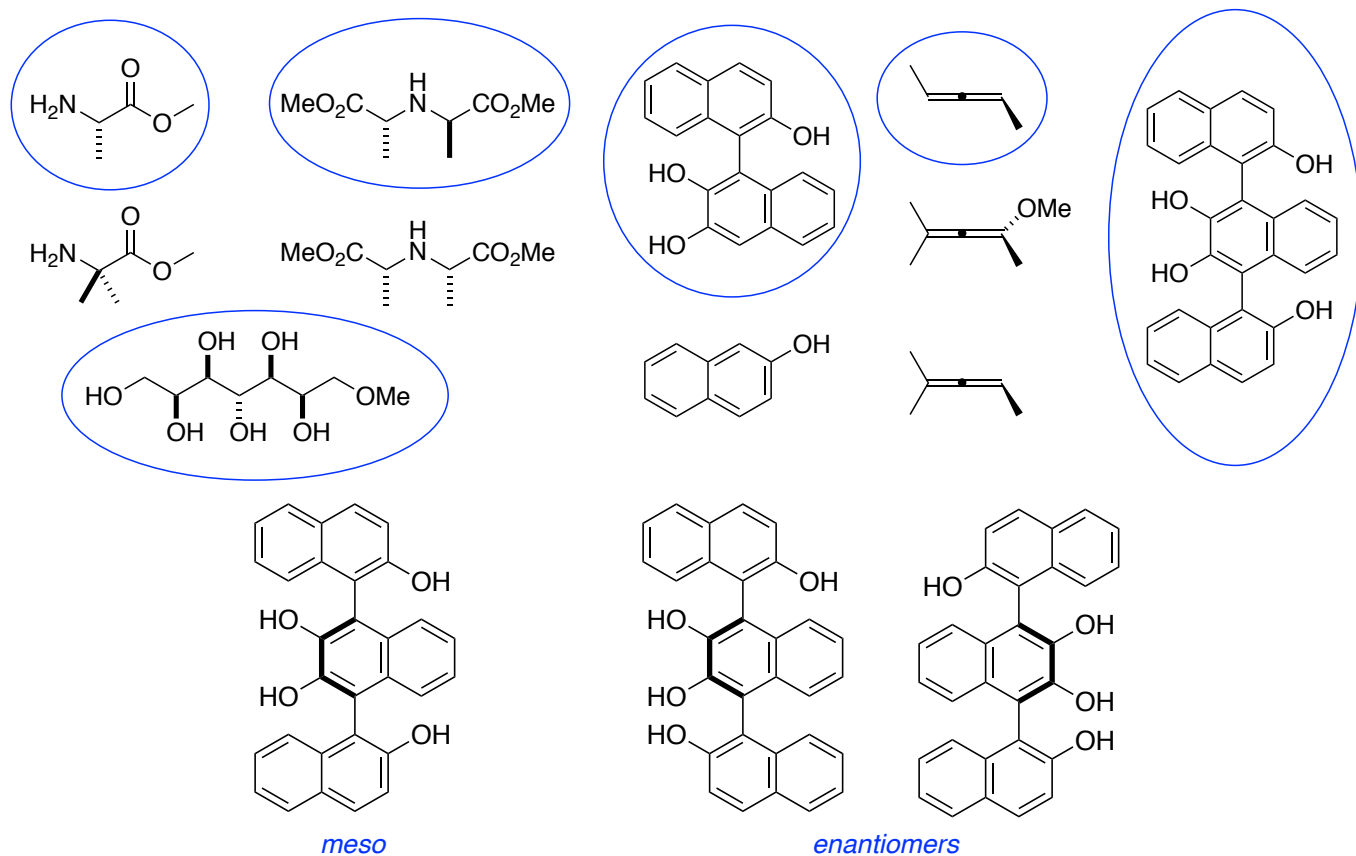
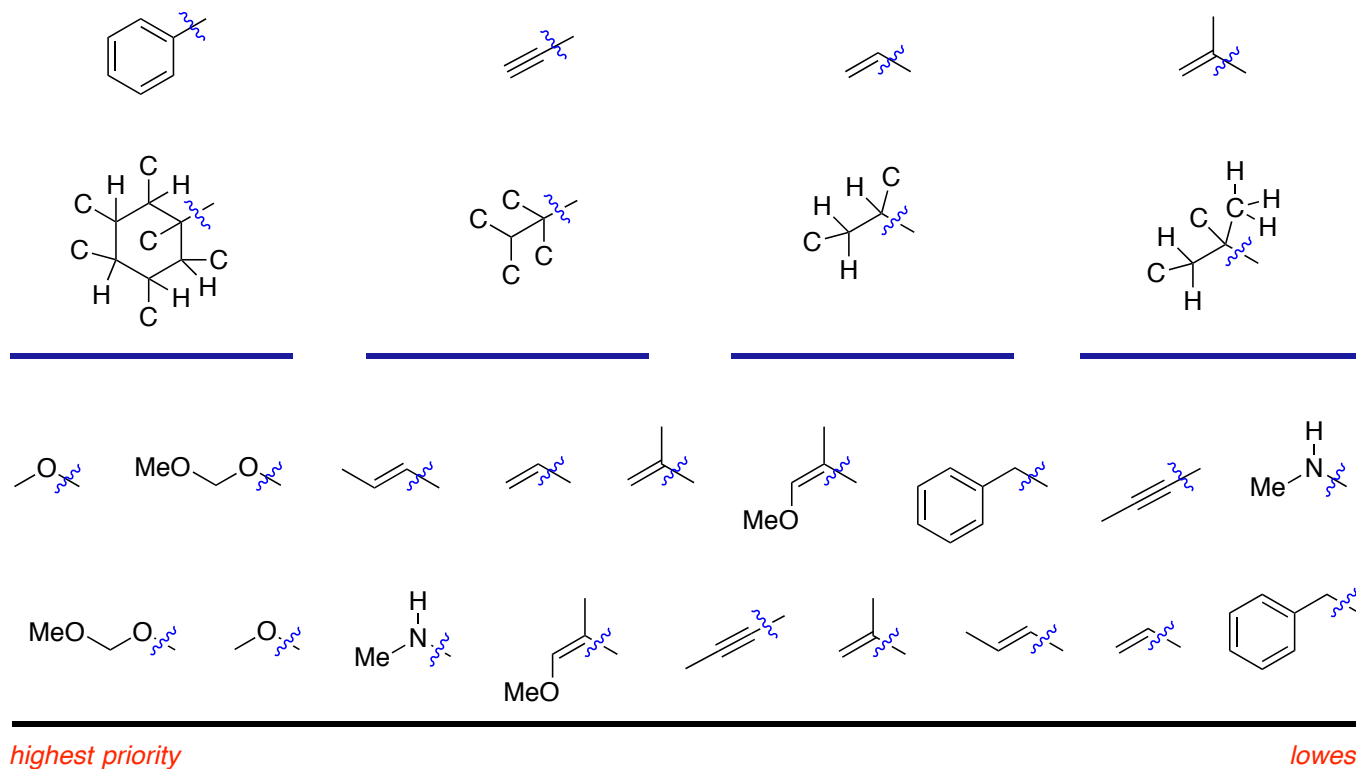
# Stereochemistry Illustrated By Carbohydrates

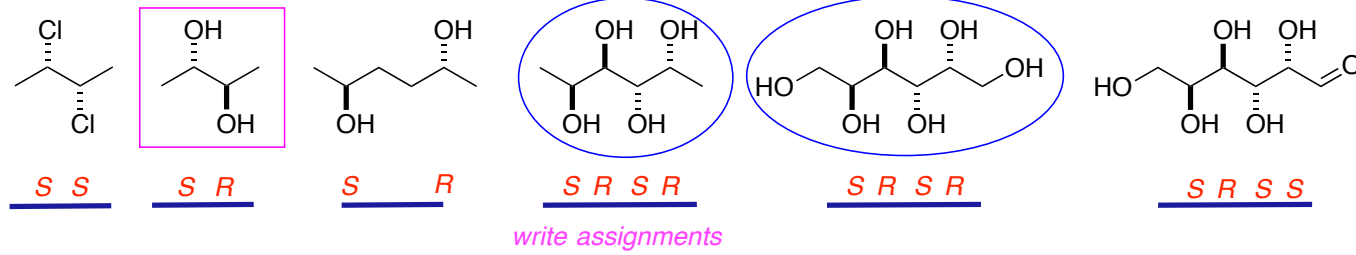
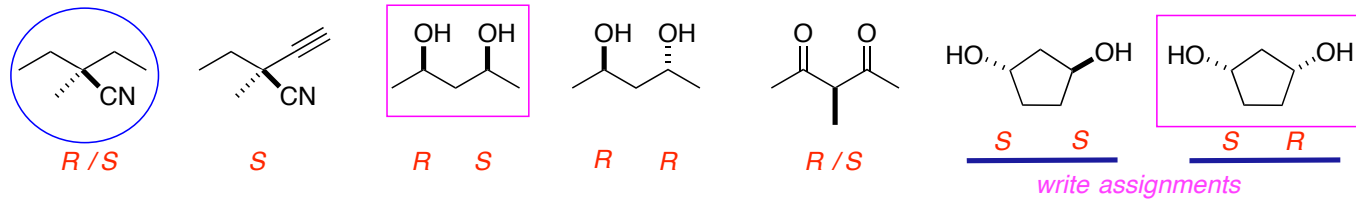
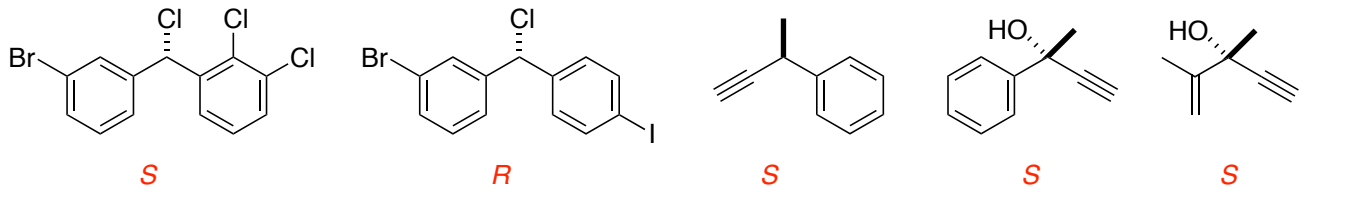
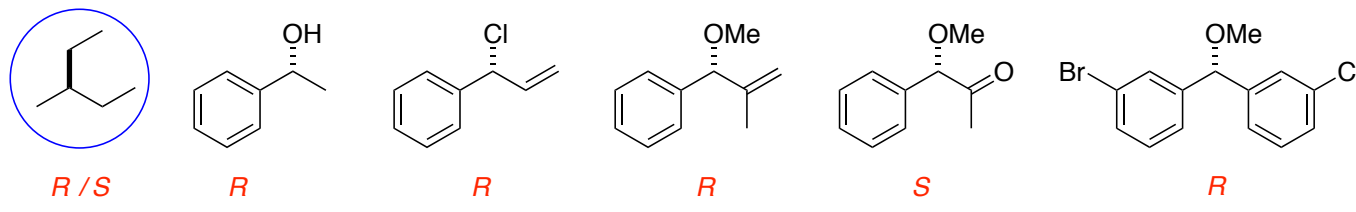
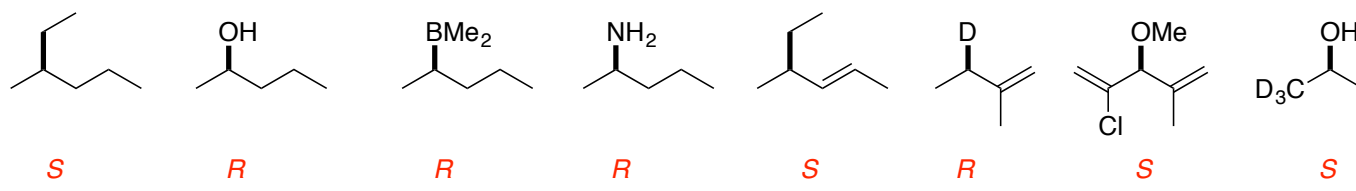
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from chapter(s) \_\_\_\_\_ in the recommended text

## A. Introduction

## B. Assigning *R*- and *S*-Configurations

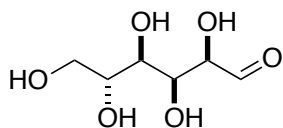




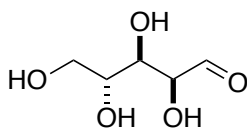
## C. Stereochemical Representations Of Carbohydrates

are all used to describe compounds in this series.

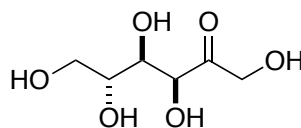
(eg **glucose**): if they contain an aldehyde they are called **aldoses**  
**ketoses**.



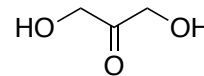
*D-glucose*  
aldose



*D-ribose*  
aldose

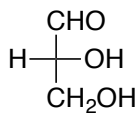


*D-fructose*  
ketose

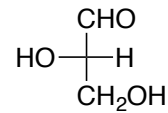


*dihydroxyacetone*  
ketose

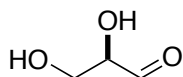
*top*



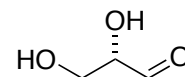
*D-glyceraldehyde Fischer projection*



*L-glyceraldehyde Fischer projection*

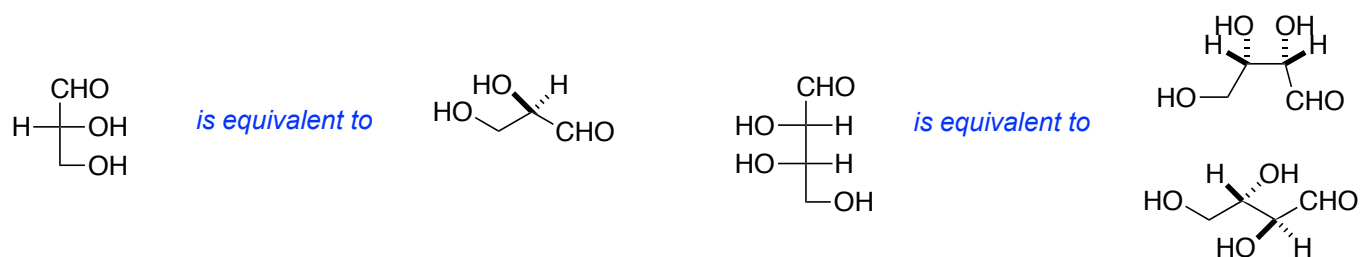


*D-glyceraldehyde zig-zag*

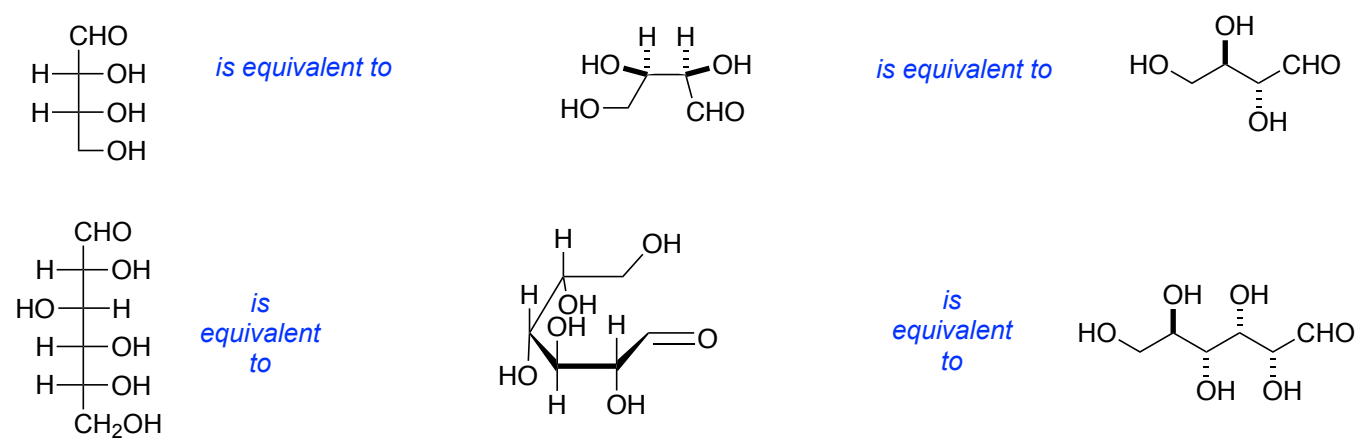


*L-glyceraldehyde zig-zag*

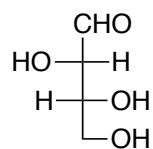


be *D*-.are *D*-.

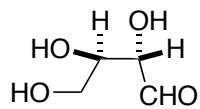
THESE ANSWERS ARE FOR THE UPDATED SECOND EDITION.



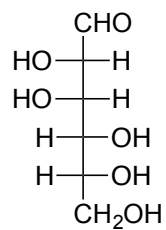
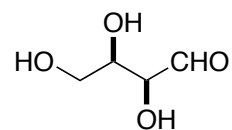
Extra examples:



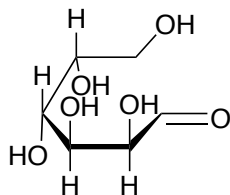
*is equivalent to*



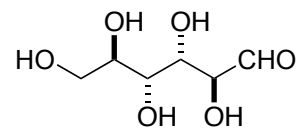
*is equivalent to*



*is  
equivalent  
to*



*is  
equivalent  
to*



## D. Carbohydrates Can Cyclize To Hemiacetals Or Hemiketals



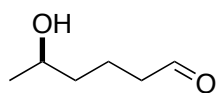
THF



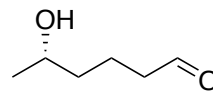
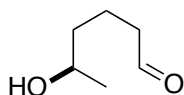
4H-pyran



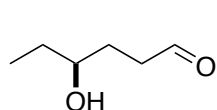
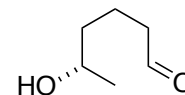
tetrahydropyran



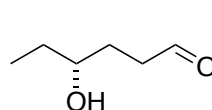
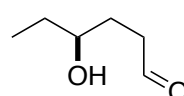
is the  
same  
as



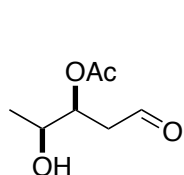
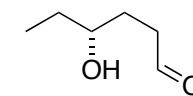
is the  
same  
as



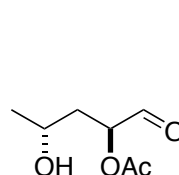
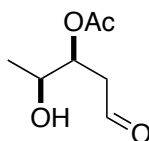
is the  
same  
as



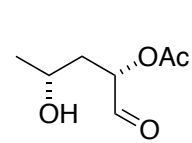
is the  
same  
as



is the  
same  
as



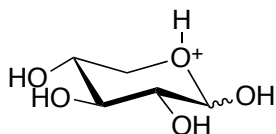
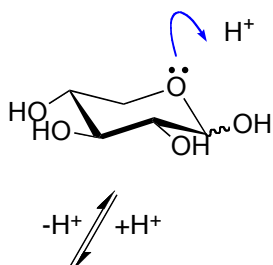
is the  
same  
as



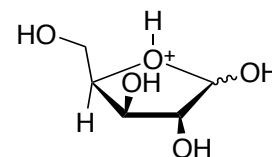
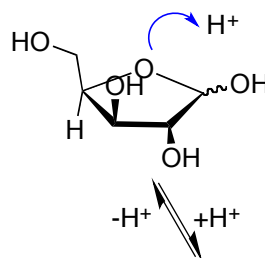


(*six*-membered ring)

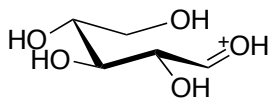
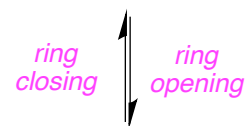
(*five*-membered ring)



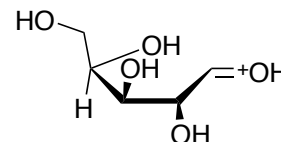
*protonated pyranose form*



*protonated furanose form*

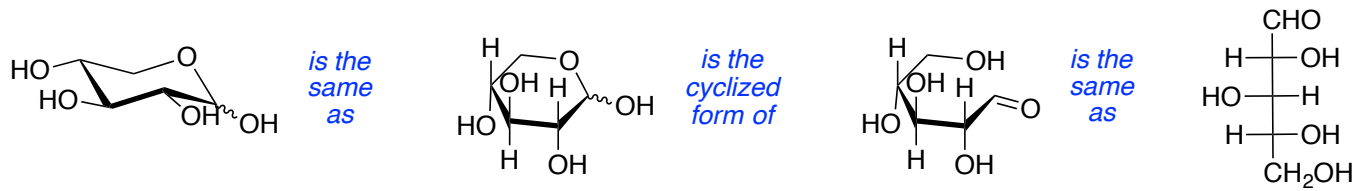
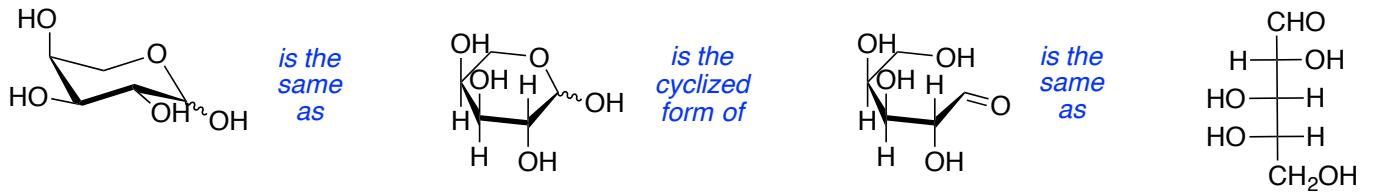


*protonated aldehyde*

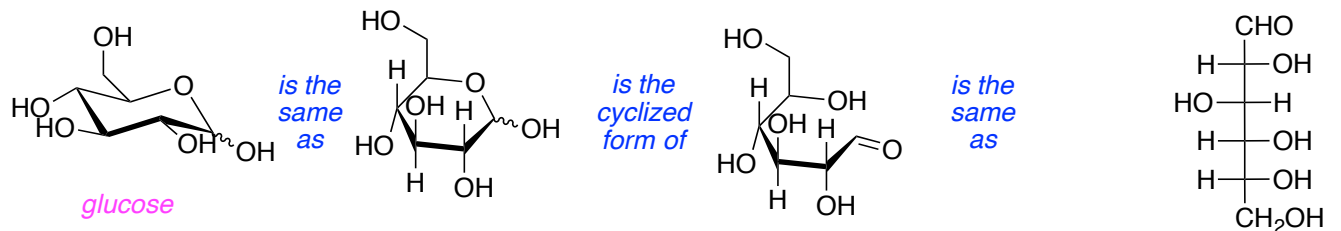


*protonated aldehyde redrawn  
poised for 5-membered ring formation*

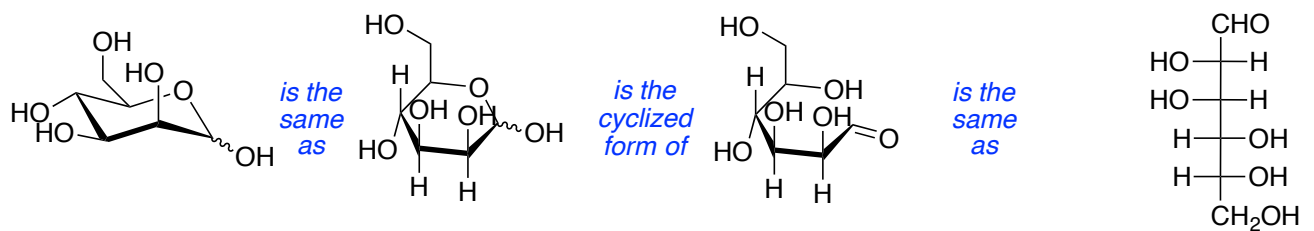
Glucose *and*

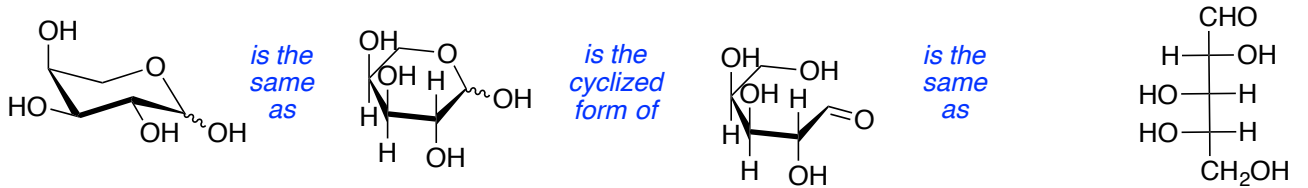
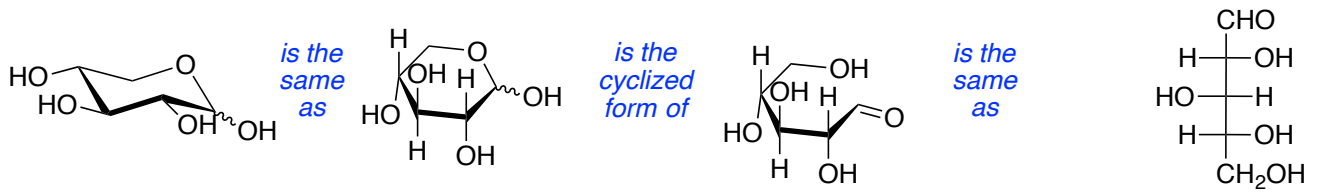
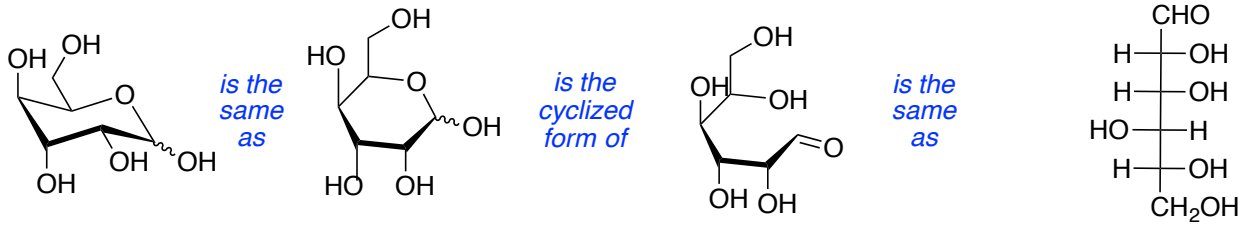


**pyranose**  
**hexoses** to Fischer projections.

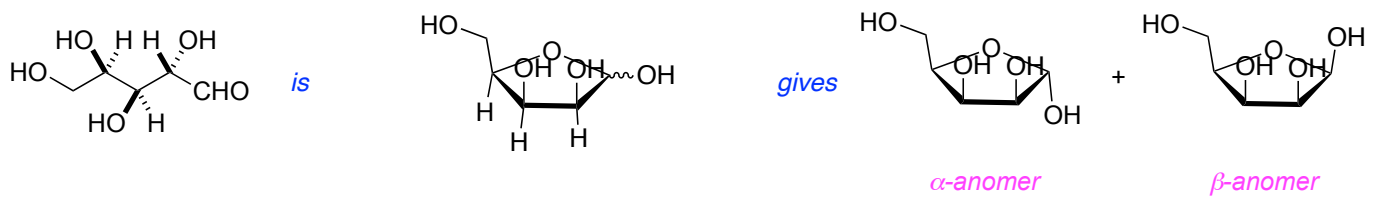


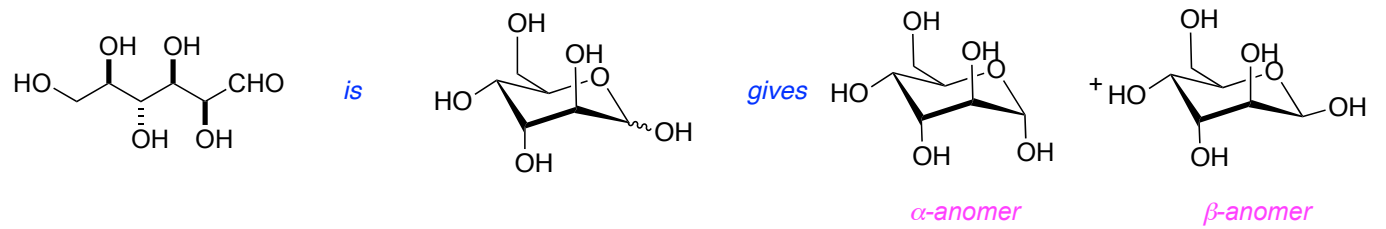
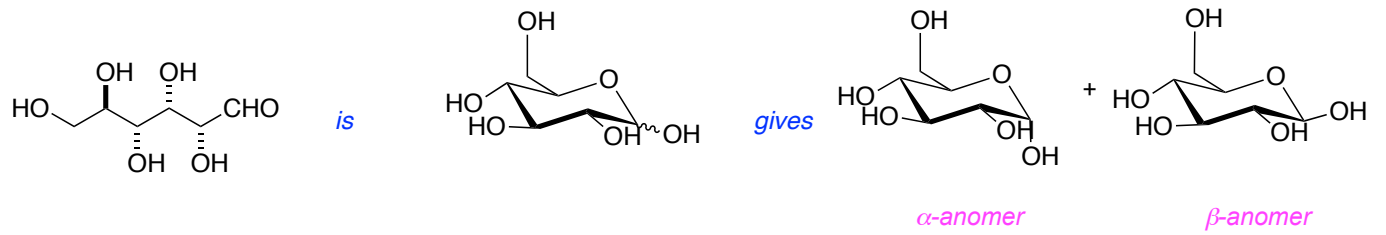
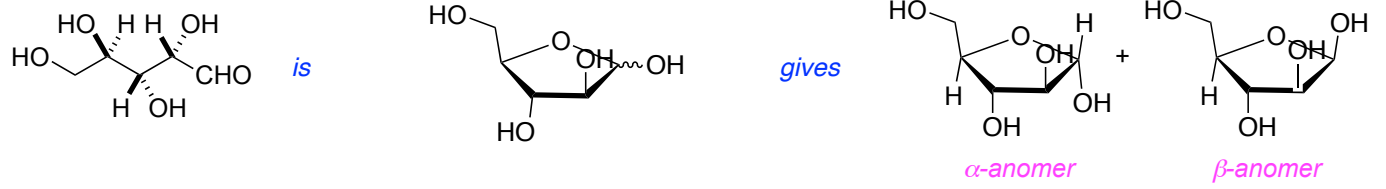
is  $\beta$ -.

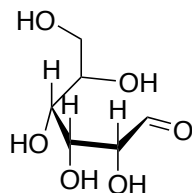
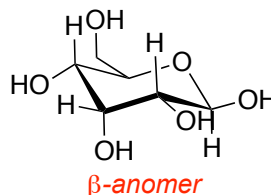
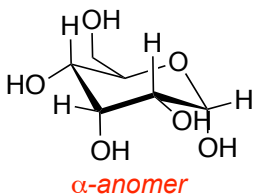
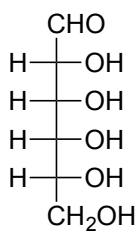




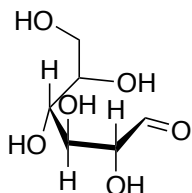
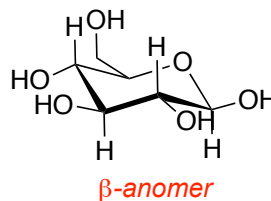
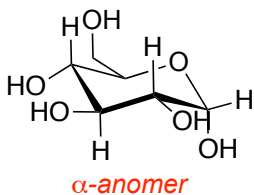
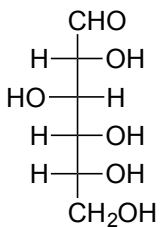
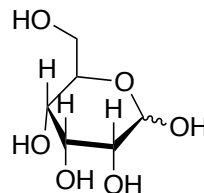
*trans* to the  $-\text{CH}_2\text{OH}$



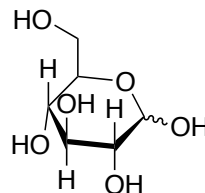


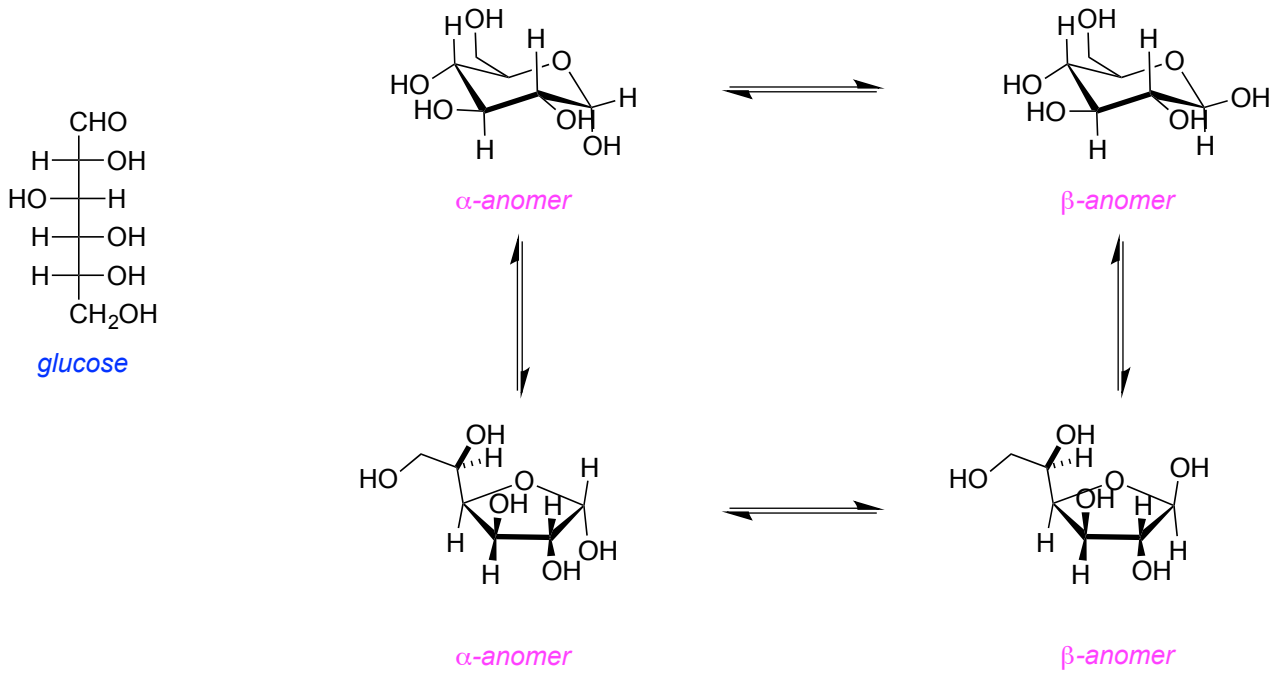


*convert to the cyclized form*

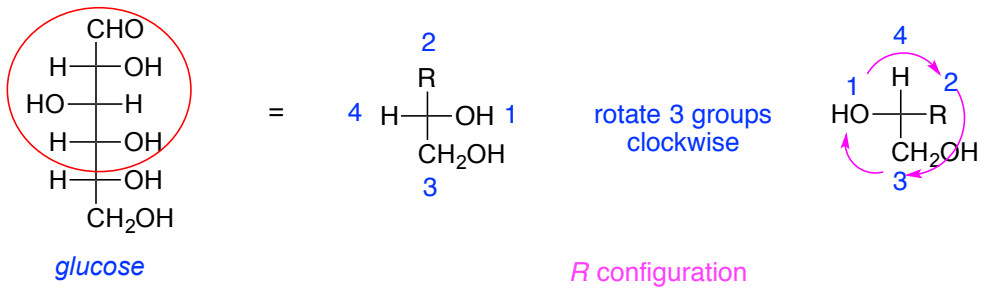


*convert to the cyclized form*





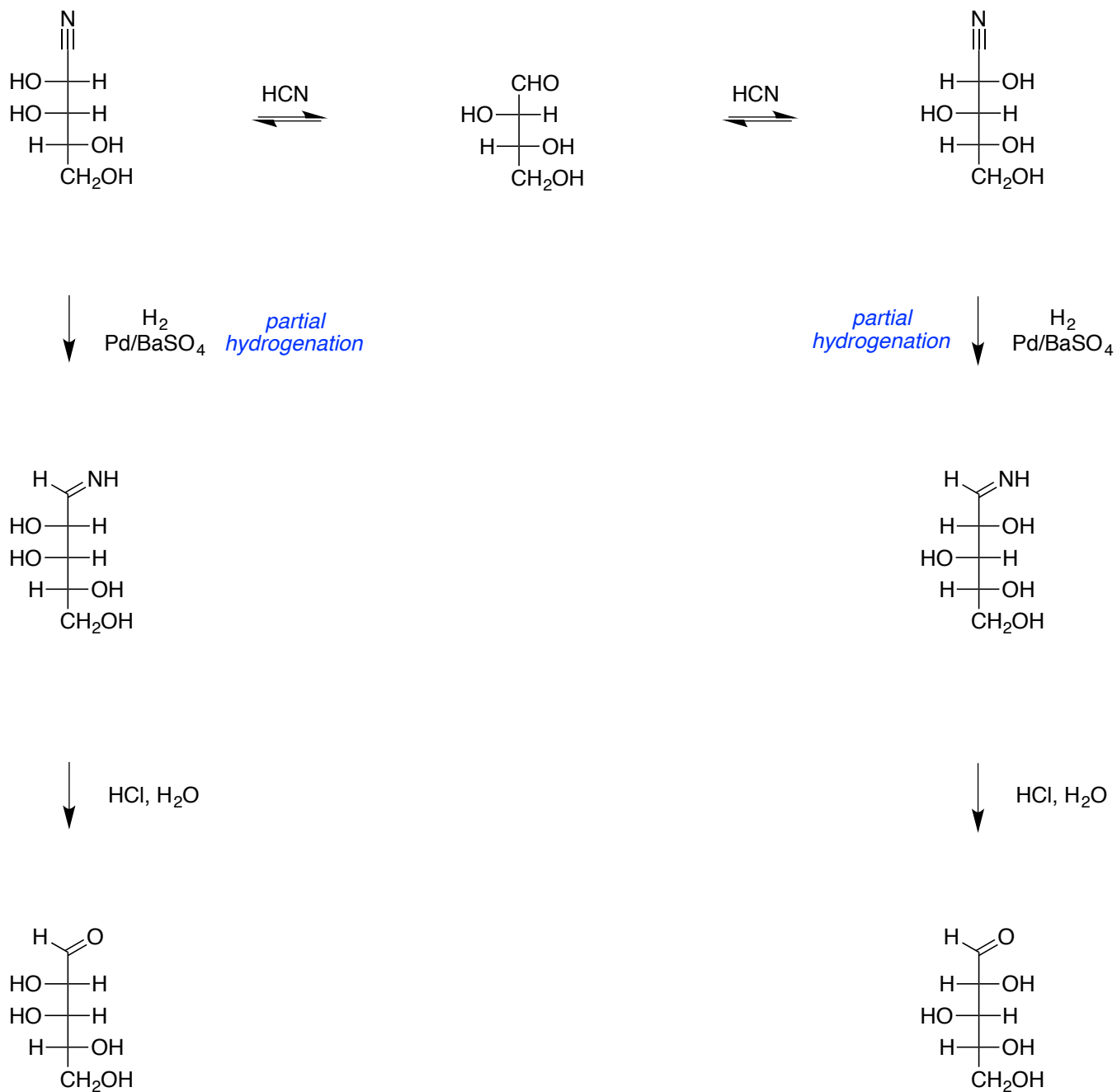
box for reasoning, write answers above



## E. Homologation Of Sugars By Reaction With HCN

*imines*

*aldoses*

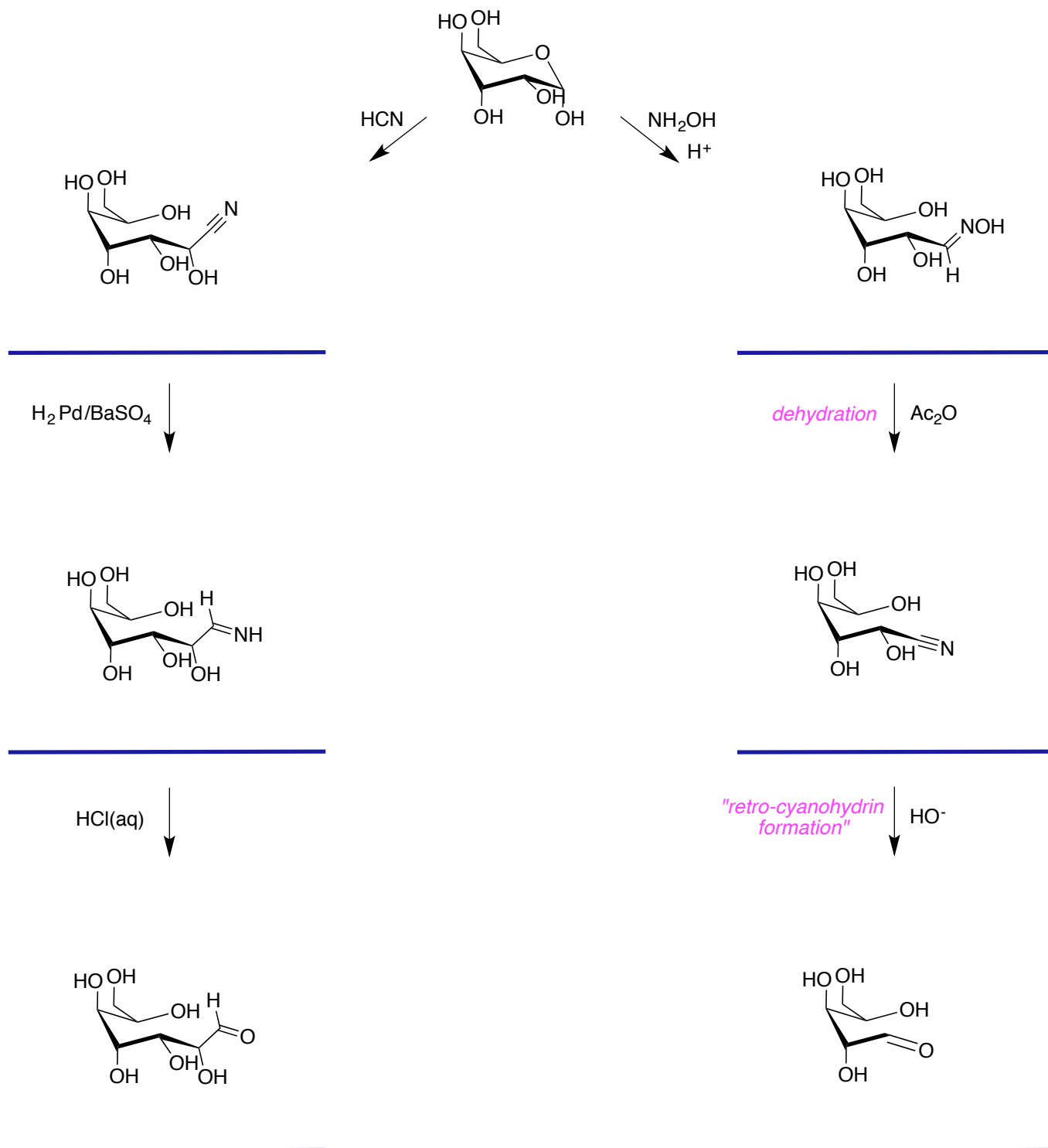


*epimers*

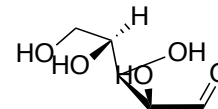
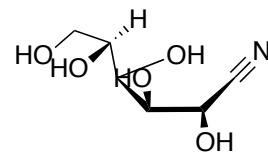
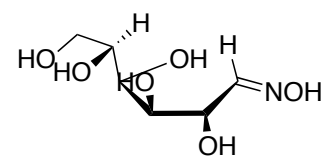
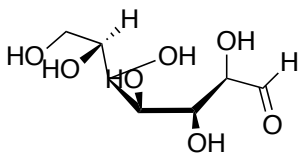
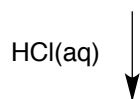
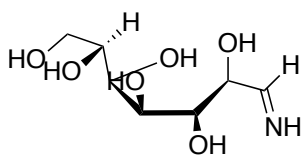
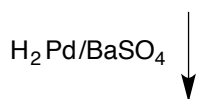
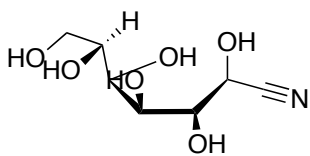
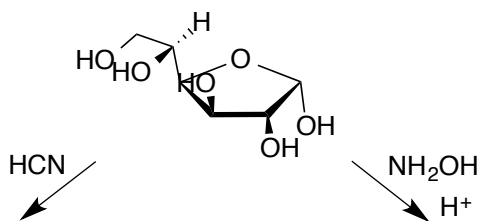
*would be*

## F. Conversion Of Aldoses To Lower Homologs

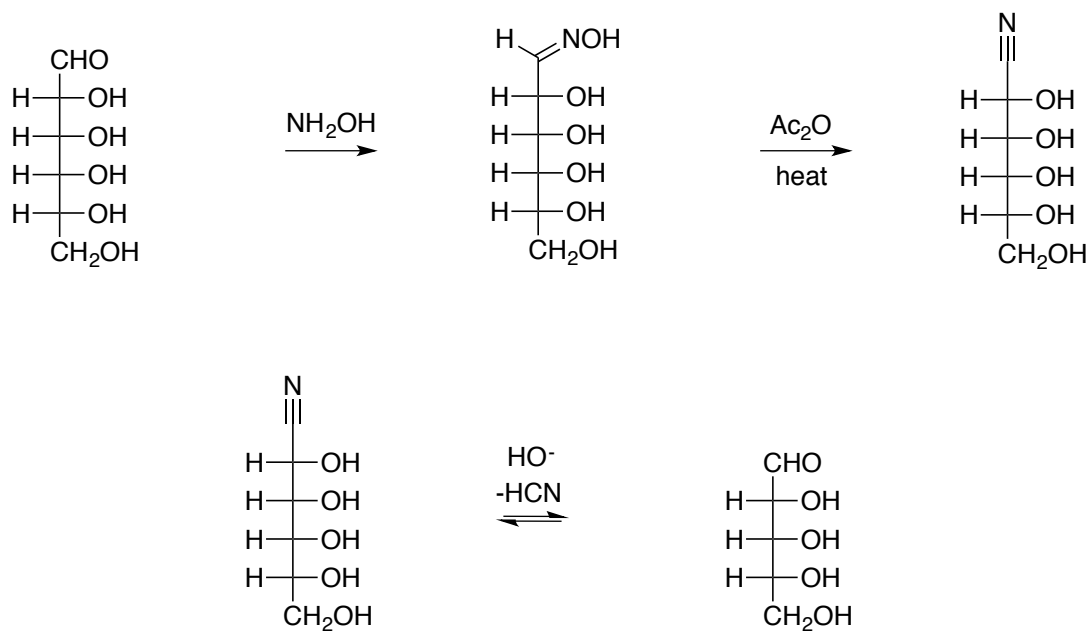
*left*  
*right.*







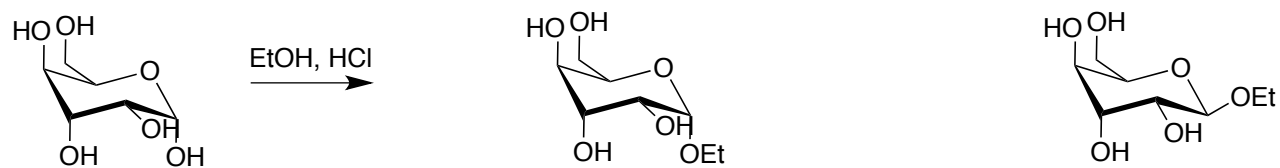
Fill in the gaps in the following sequence.



## G. Other Reactions Of Sugars

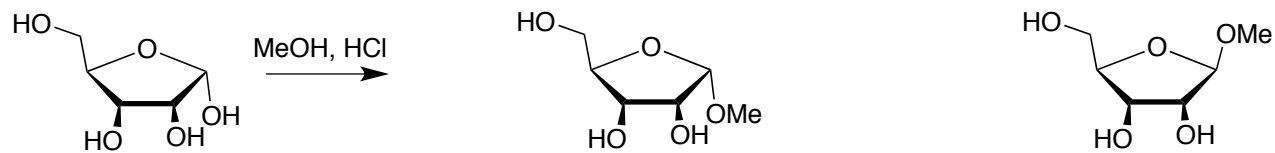
*oxidized*

*reducing*



*α-anomer*

*β-anomer*

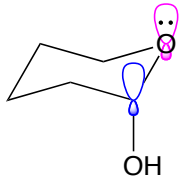


*α-anomer*

*β-anomer*

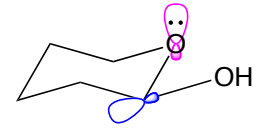
## H. Relative Stabilities Of Anomers

*axial* non-bonded



---

$\alpha$ -anomer  
 $\sigma$ -to- $\sigma^*$  interactions possible

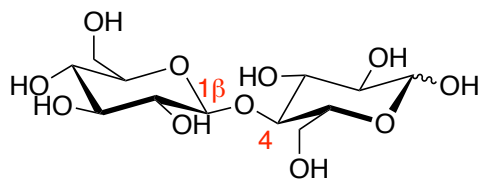


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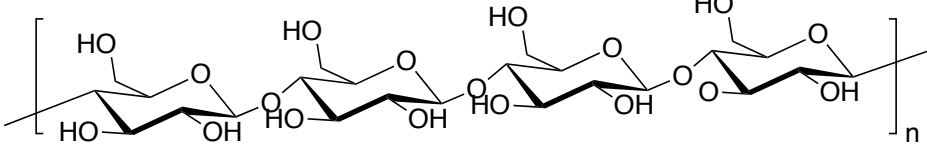
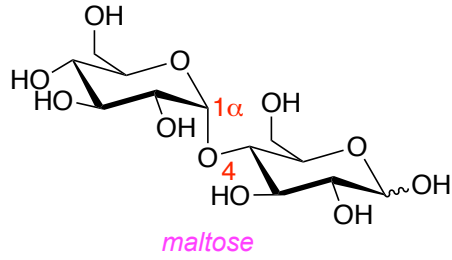
$\beta$ -anomer  
 $\sigma$ -to- $\sigma^*$  interactions impossible

## I. Di- And Oligosaccharides

*acetal or ketal*

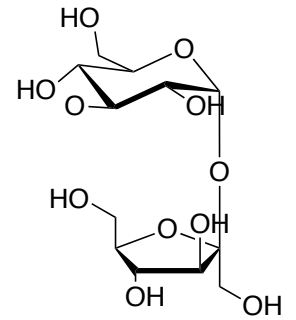


cellobiose



cellulose

linkages are:  $\beta$ -1,4

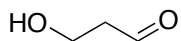


sucrose

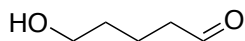
linkage is:  $\alpha$ 1,  $\beta$ 2

*poly*-saccharide,  
*di*-saccharide.  
photosynthesis.

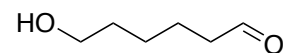
## J. Carbohydrates In Summary



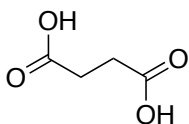
*D-(+)-glyceraldehyde*



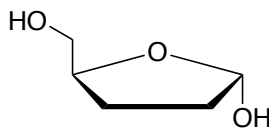
*D-ribose*



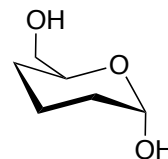
*D-glucose*



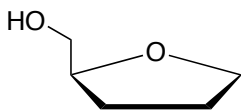
*D-(-)-tartaric acid*



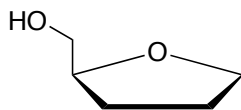
*α-D-ribofuranose*



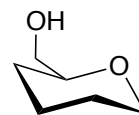
*α-D-glucopyranose*



*β-D-2-deoxyribofuranose*



*β-D-ribofuranose*



*β-D-glucopyranose*

*β-D-ribofuranose.*

*β-D-2-deoxyribofuranose.*