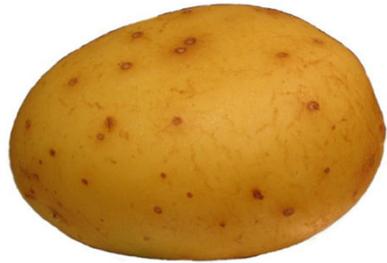


# Carbohydrates serve a variety of functions



starch

Energy storage  
and food

Structure and  
support



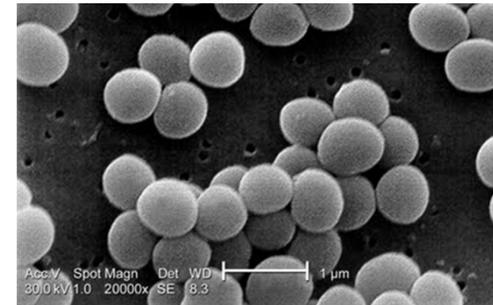
chitin and cellulose



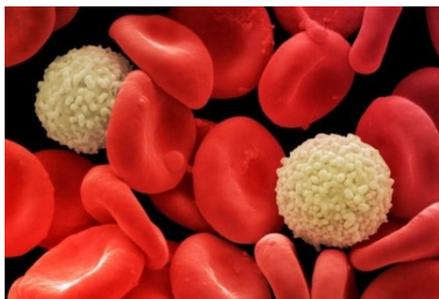
mucin (glycoprotein)

Lubrication

Protection



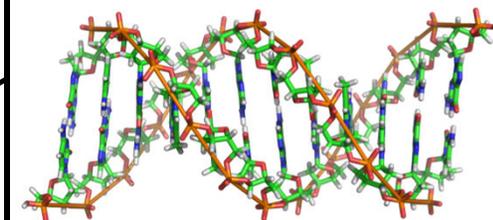
cell wall peptidoglycan



surface glycoproteins

Recognition and  
signaling

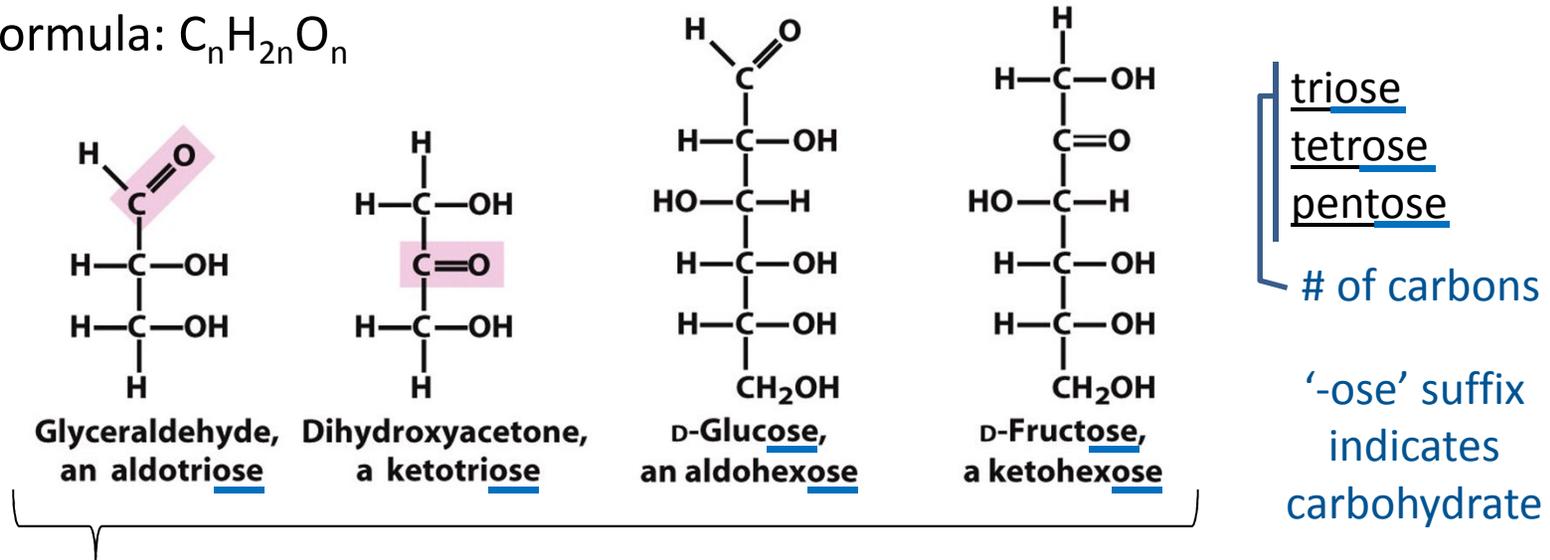
Component of  
nucleotides



2-deoxyribose

# Carbohydrates are polyhydroxylated aldehydes (aldoses) and ketones (ketoses)

Base formula:  $C_nH_{2n}O_n$



Monosaccharides (sometimes called ‘simple sugars’) → Saccharide: from Greek *sakcharon*

= sugar

also, Oligosaccharides (disaccharides, trisaccharides, ...)

and Polysaccharides (sometimes called ‘complex carbohydrates’)

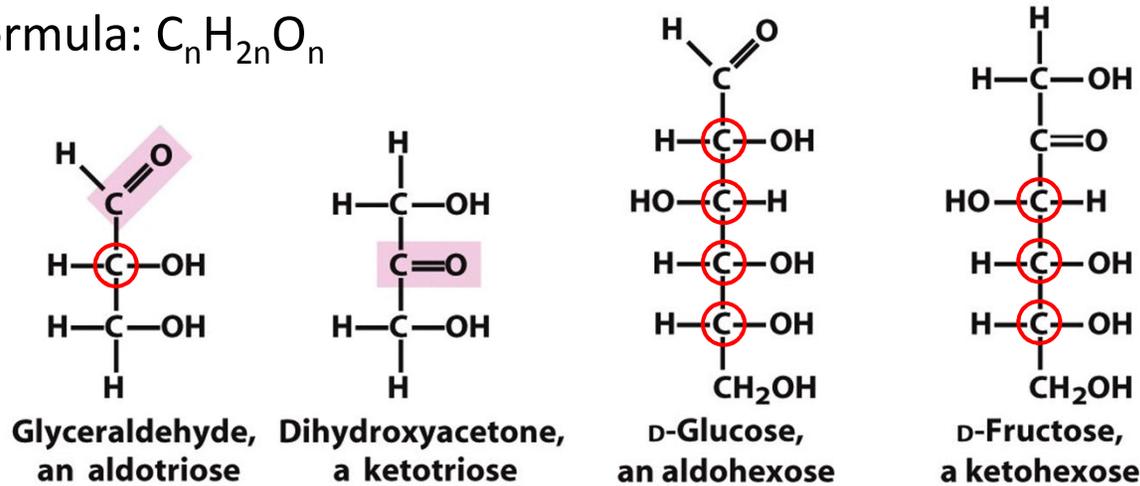
Formed from monosaccharides linked via a condensation reaction

‘glyc’ (from Greek *glykys* = sweet) also designates carbohydrate

ex: glycoside, glycolysis, peptidoglycan

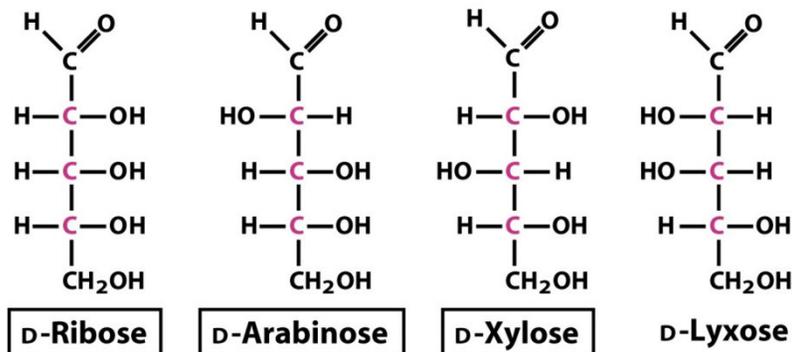
# Most carbohydrates are chiral, and their configuration is a major distinguishing feature

Base formula:  $C_nH_{2n}O_n$



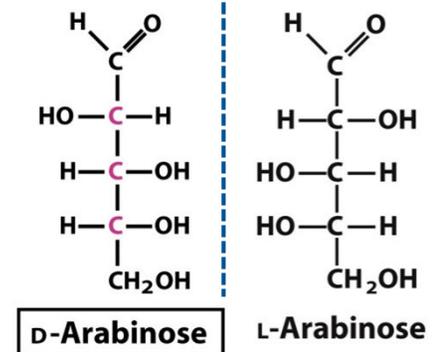
**Chiral carbons:**  
**#C - 2 for aldoses**  
**#C - 3 for ketoses**

Number of stereoisomers:  $2^x$ , where x is # of chiral carbons

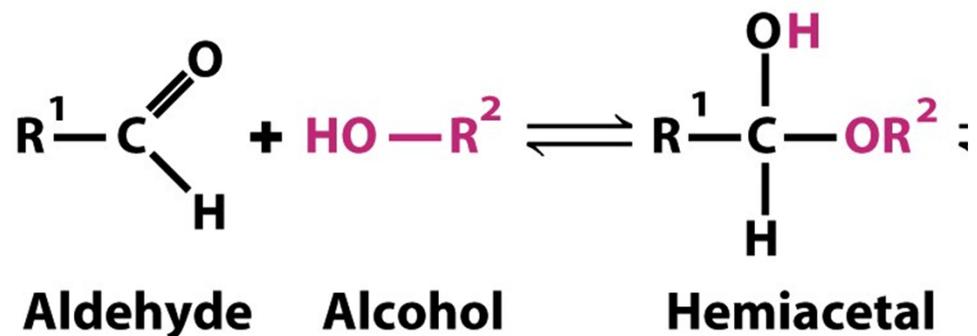


D-aldopentoses are diastereomers

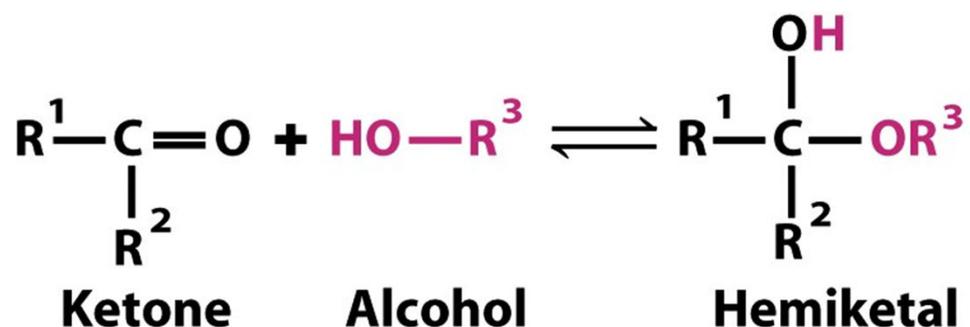
D- and L- arabinose are enantiomers



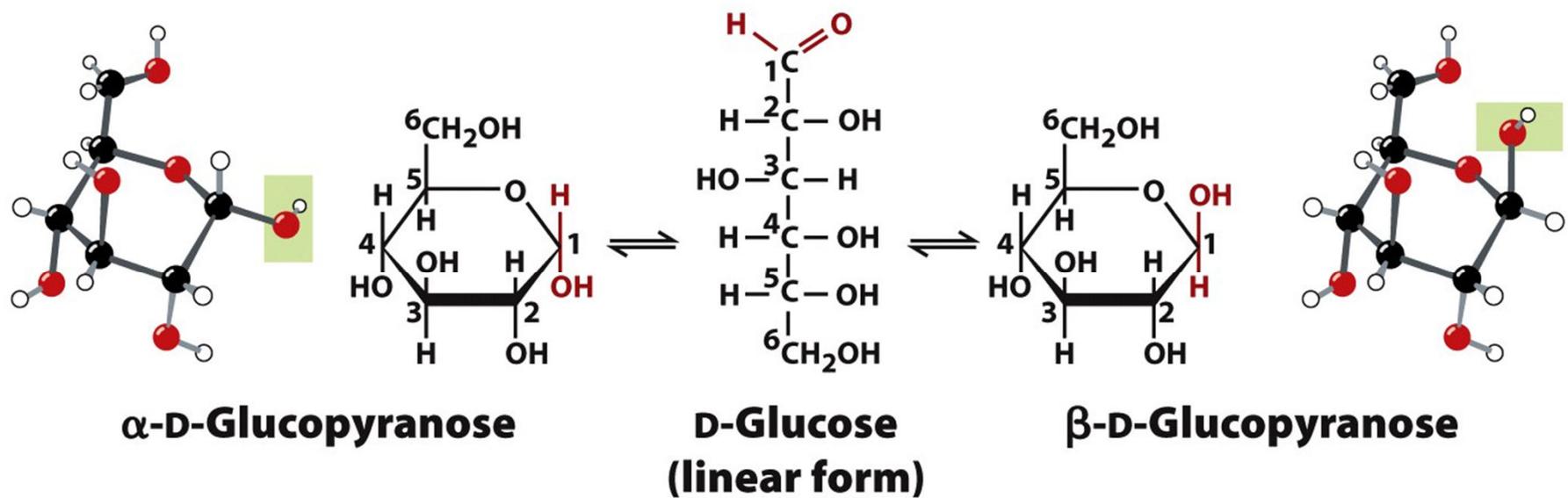
A carbonyl and an alcohol will readily react to form a new chiral center



This is how monosaccharides spontaneously cyclize



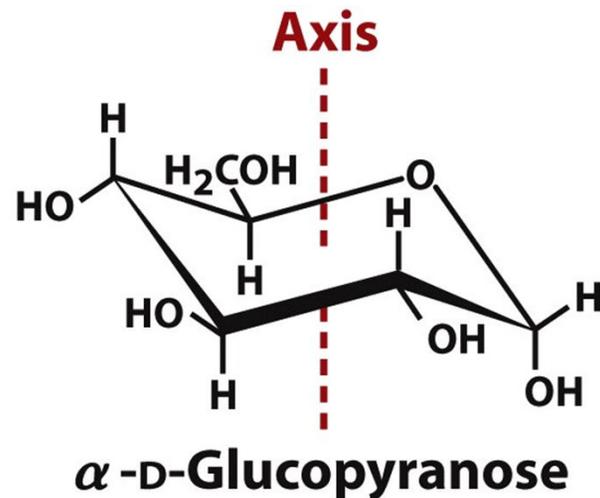
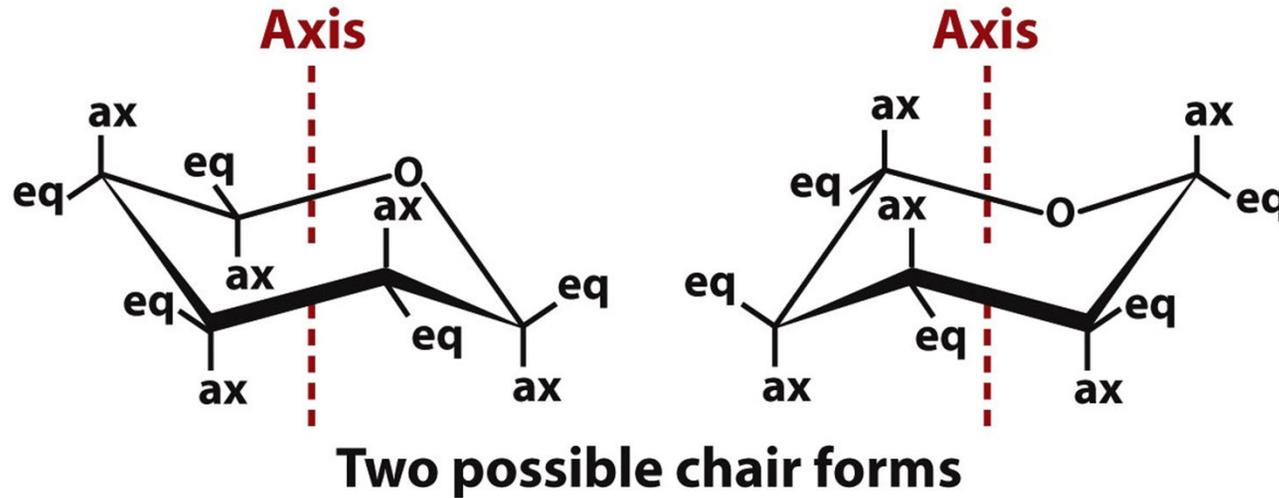
Mutarotation is the interconversion of anomers



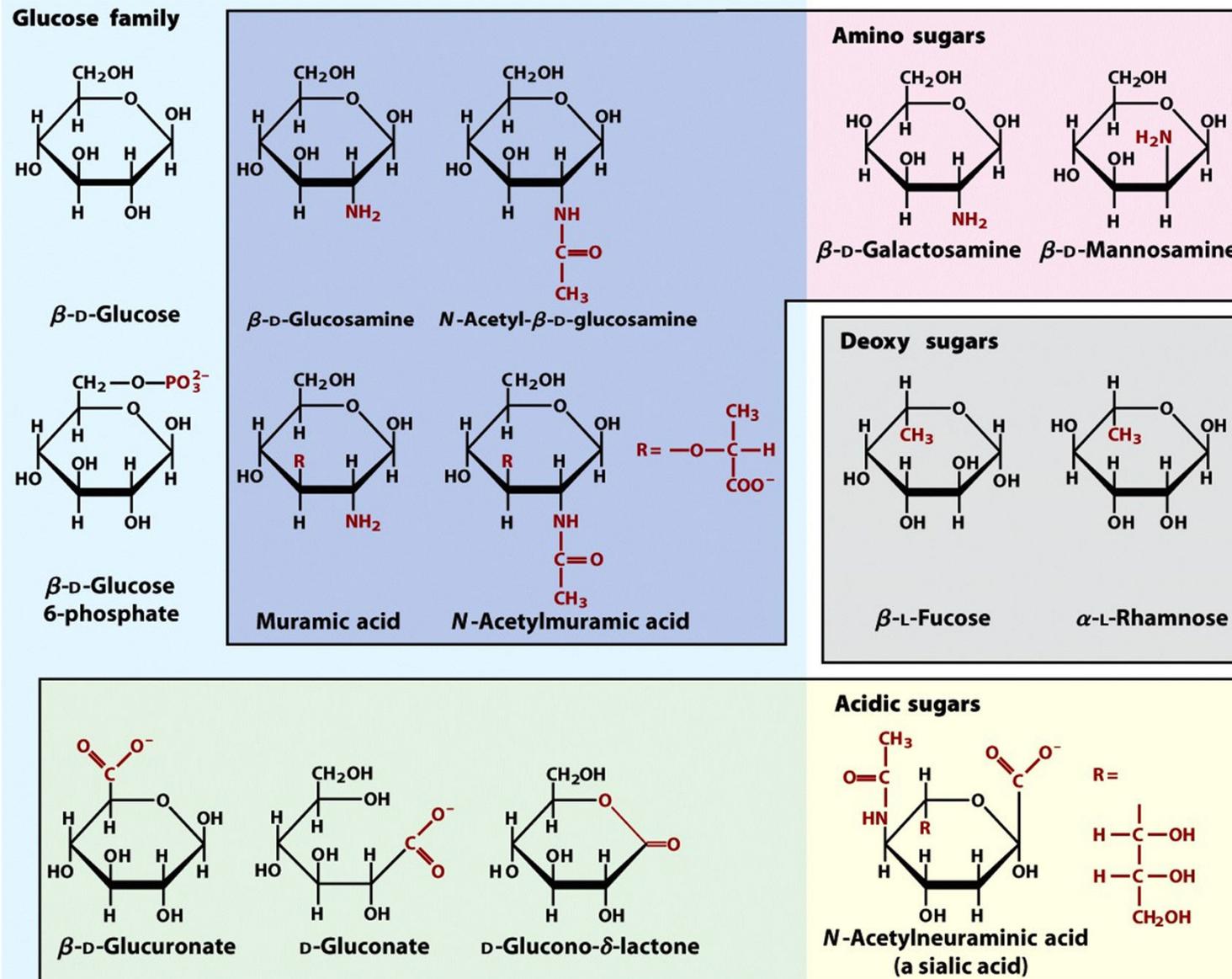
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Figure 8-4

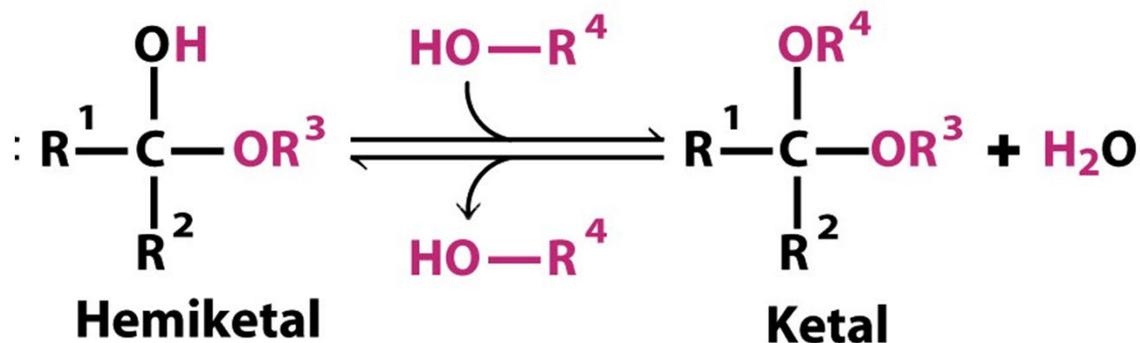
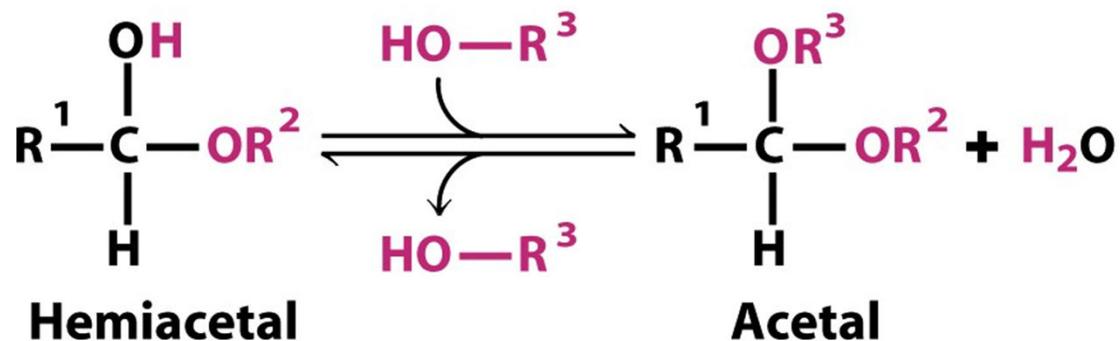
A six-membered sugar ring, like glucopyranose, adopts one of two chair conformations



# Modified sugars are important in biochemistry

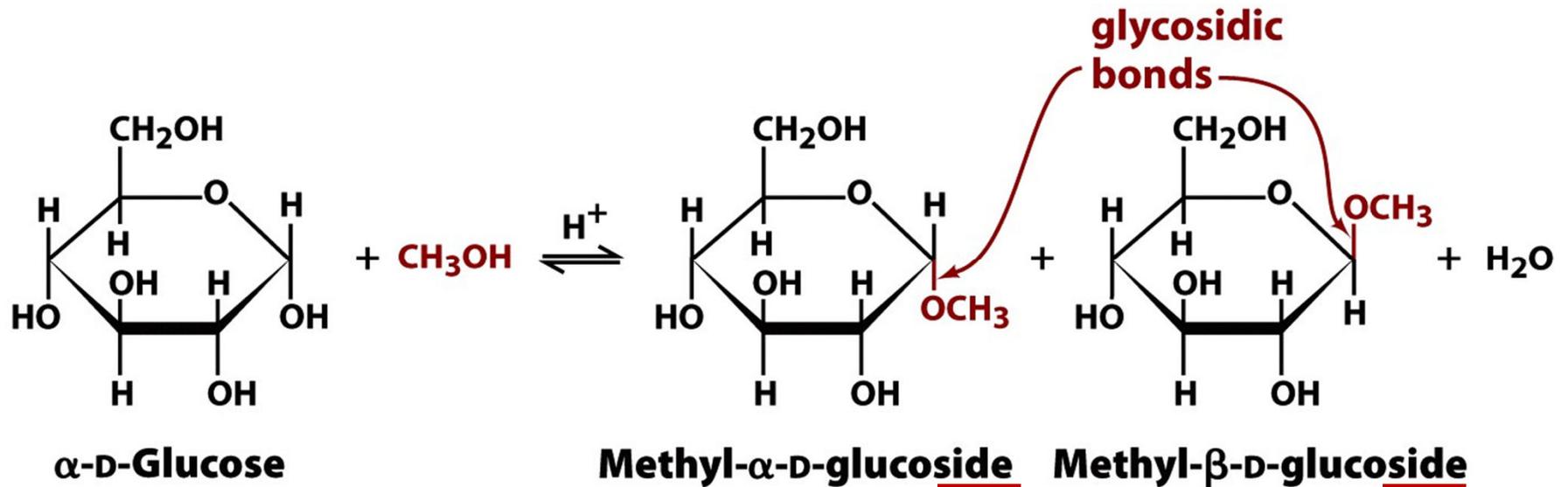


A hemiacetal or hemiketal may condense with an alcohol to form an acetal or ketal



Glycosidic bonds link the anomeric carbon to other compounds, to form 'glycosides'

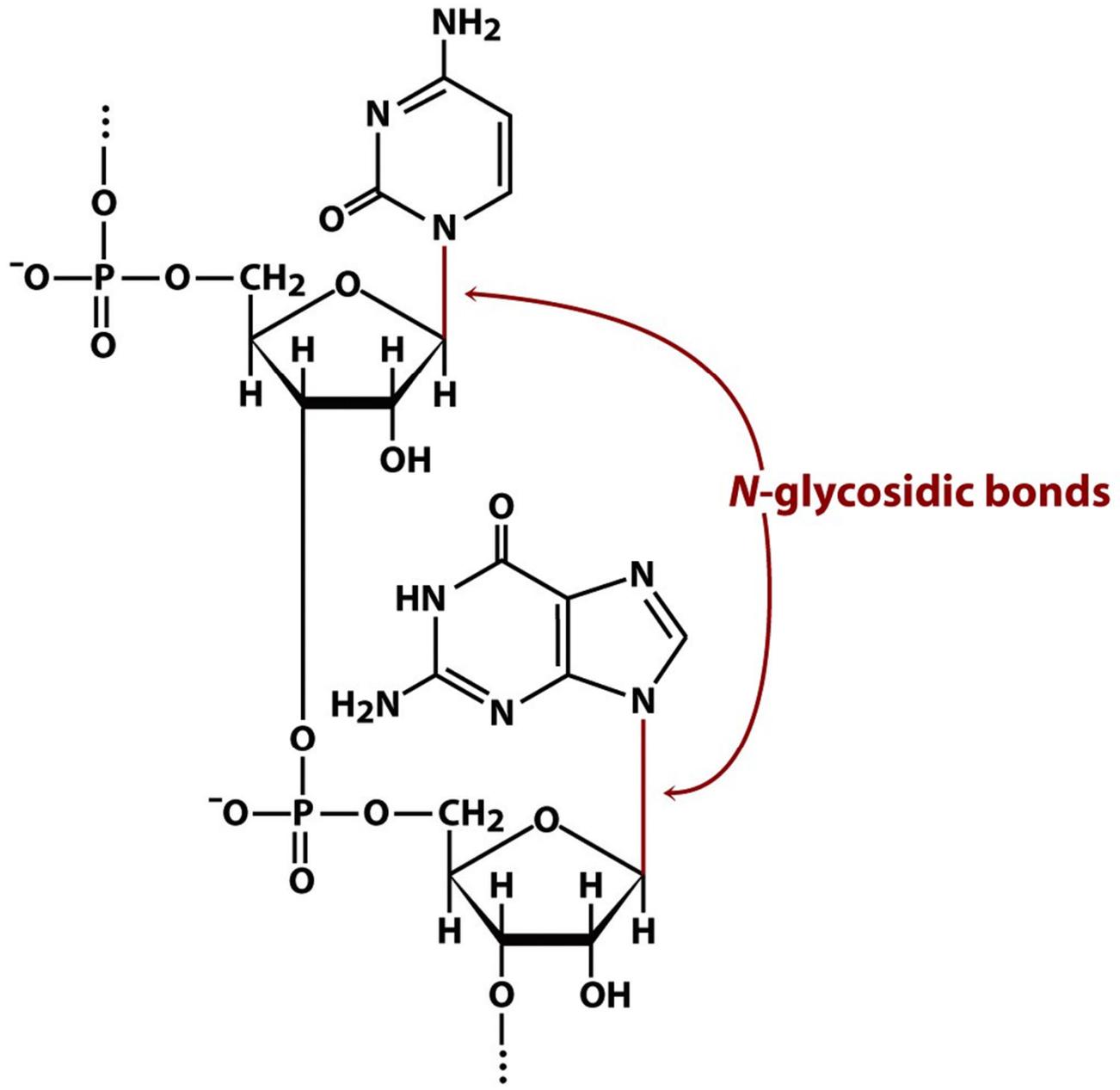
O-glycosidic (or O-glycosyl) bonds (or linkages)



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*Can these sugars interconvert?*

Figure 8-7



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# Condensation reactions link monosaccharides into disaccharides (and polysaccharides)

