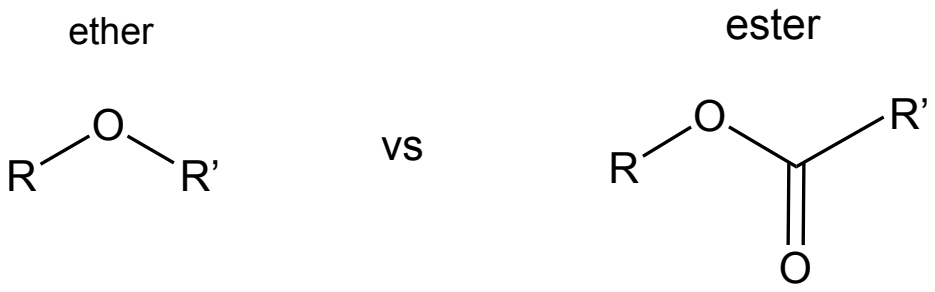
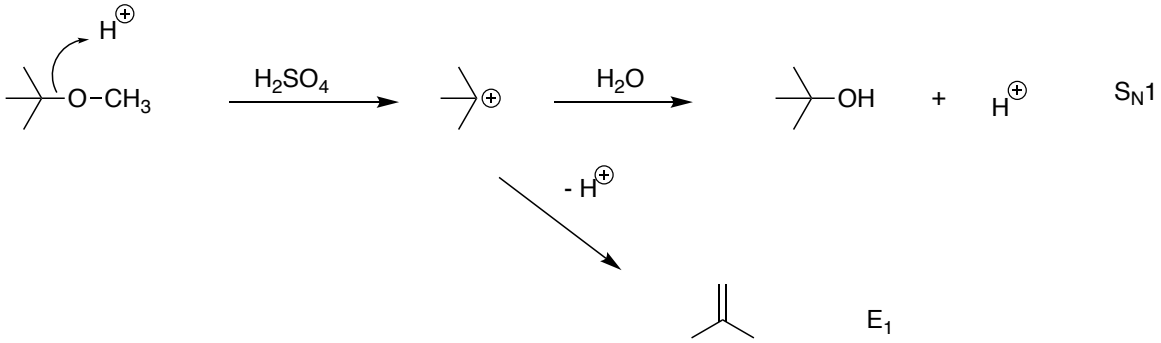
Ethers:

Recall: The difference between ester and ethers

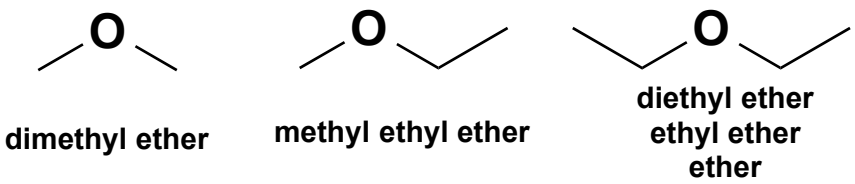


Ethers are essentially inert except in the case of reacting with a strong acid

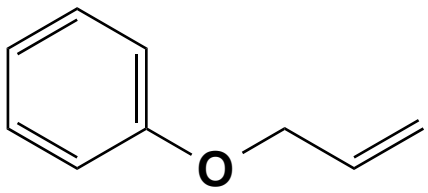
Example:



Naming Examples:

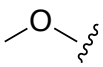


dimethyl ether **methyl ethyl ether** **diethyl ether ethyl ether ether**

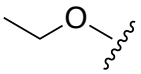


phenyl allyl ether

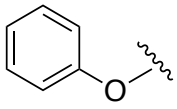
In order to name ethers as a group, drop “yl” and add “oxy” as seen below:



methoxy

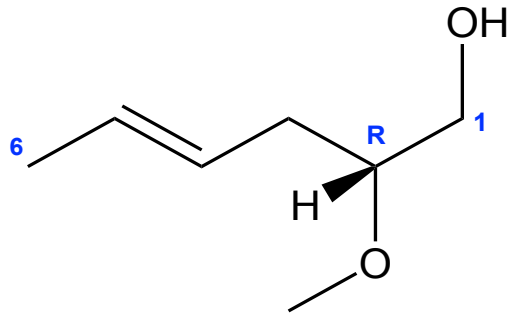


ethoxy



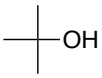
phenoxy

Example:

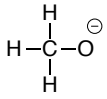


(E)-R-2-methoxyhex-4-en-1-ol

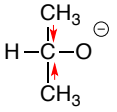
Alcohol pKa comparisons:

	pKa
H-OH	15.7
	16
	17
	18
	19

Methoxide vs. Isopropoxide:



Methoxide
An alkoxide

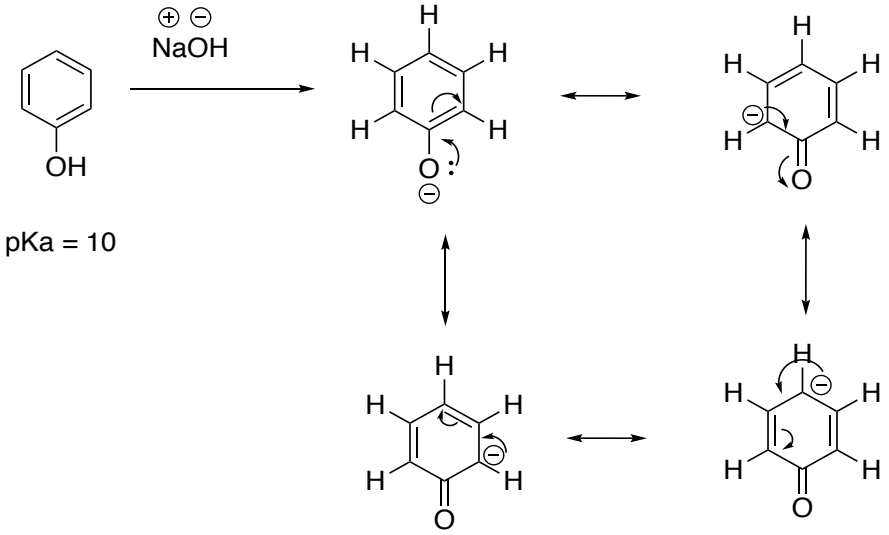


Isopropoxide
Less stable

Alkyl groups donate electrons through single bonds, destabilizing the negative charge (Inductive Effect), therefore, isopropoxide is less stable than methoxide

Phenol and *p*-Nitrophenol Resonance:

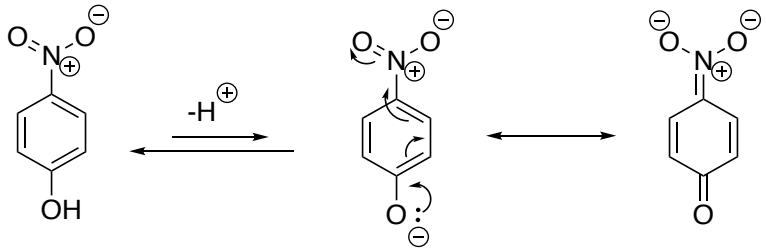
Phenol:



pKa = 10

The alkoxide of phenol is a conjugated anion and is therefore much more acidic

p-Nitrophenol:



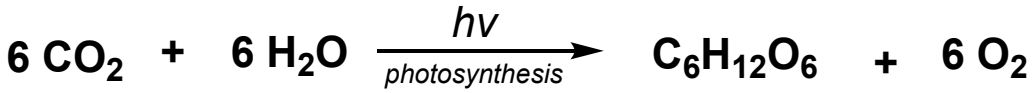
pKa = 7.3

p-Nitrophenol is more acidic than phenol because on top of the resonance forms that phenol contains, *p*-nitrophenol also contains the above extra resonance form, making the proton on the alcohol even more acidic.

Carbohydrates

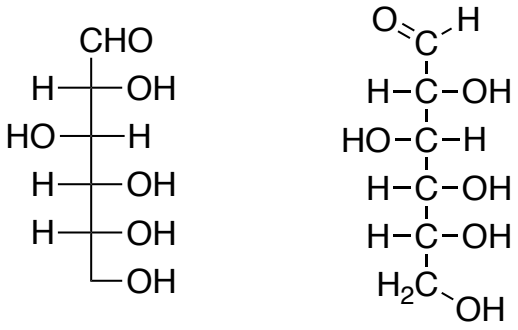
- sugars, saccharides

A familiar equation:



- about 4 x 10^{11} metric tons of carbon dioxide is converted into glucose by plants
- the process of photosynthesis only uses 0.02% of the suns total energy on Earth
- the sugar produced is known as D-glucose, shown below in a Fischer Projection

D-Glucose



Nomenclature

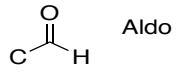
General formula of sugars: $C_NH_{2N}O_N$ *(approx.)*

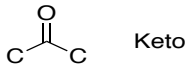
The number of carbons is indicated as follows:

3 carbon sugar (C_3) – triose
4 carbon sugar (C_4) – tetrose
5 carbon sugar (C_5) – pentose
6 carbon sugar (C_6) – hexose

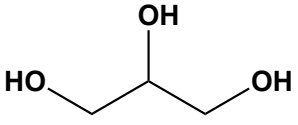
The location of the carbonyl group is indicated by the prefix:

aldo – aldehyde
keto – ketone





Example 1: Glycerol

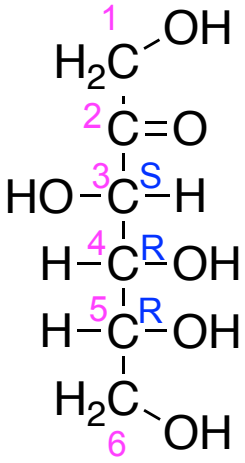


Triose

Additionally, an allocation of D or L is given to indicate the stereochemistry of the highest numbered (last) stereocentre.

D sugar – highest numbered stereocentre in *R* configuration.
L sugar – highest numbered stereocentre in *S* configuration.

Example 2: D-Fructose

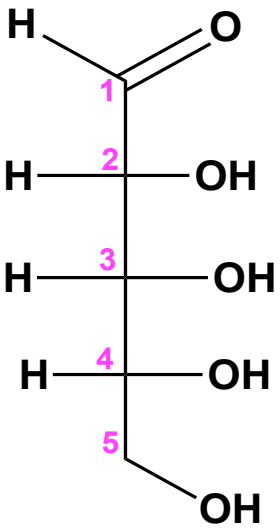


D-Fructose

Based on the above nomenclature, D-Fructose is an ketohexose (ketone, 6 carbons)

The above structure is labelled as "D" because the R configuration occurs at carbon 5 *(note that carbon 6 is not a stereocentre)*.

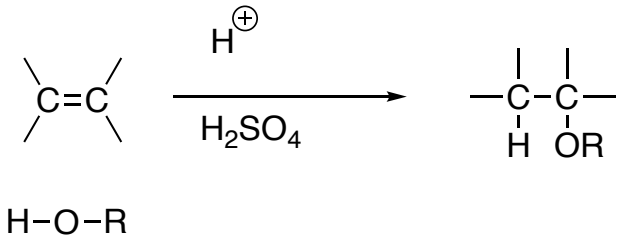
Example 3: D-Ribose



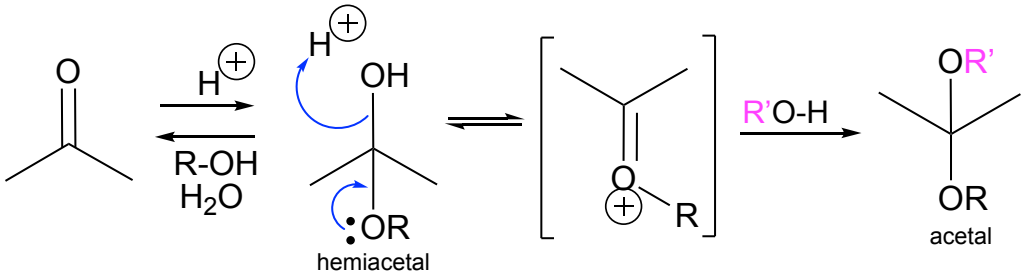
An aldopentose (aldehyde, 5 carbons long). At the highest numbered stereocentre (carbon 4) the stereochemistry is R.

The name of this is D-ribose (found in RNA! – deoxyribose is in DNA)

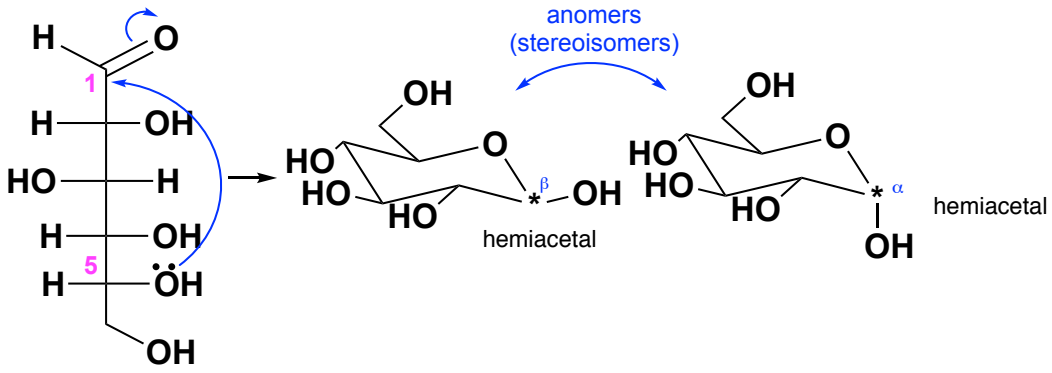
Recall: Addition reactions



Similarly, addition reactions can be done on carbonyls (Ketones and Aldehydes):



Example on Sugars:



If OH ay anomeric carbon (has 2 oxygens) is on same side of reing as CH_2OH then the configuration called β (beta) – if on opposite side it is α (alpha)

6-Membered sugar rings are called pyranose
5-Membered sugar rings are called furanose

Example:

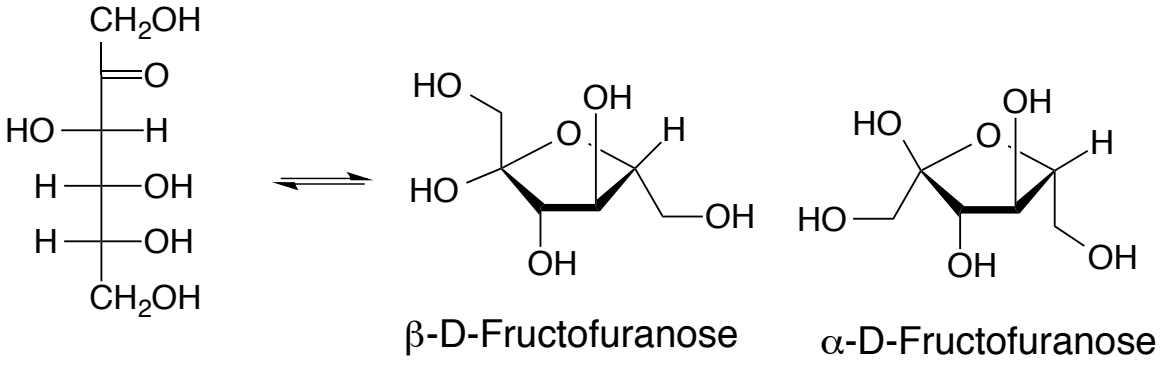
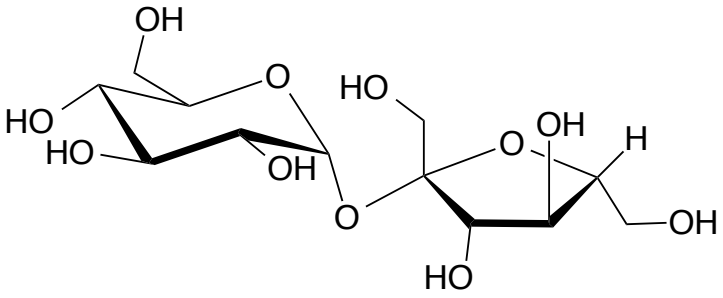
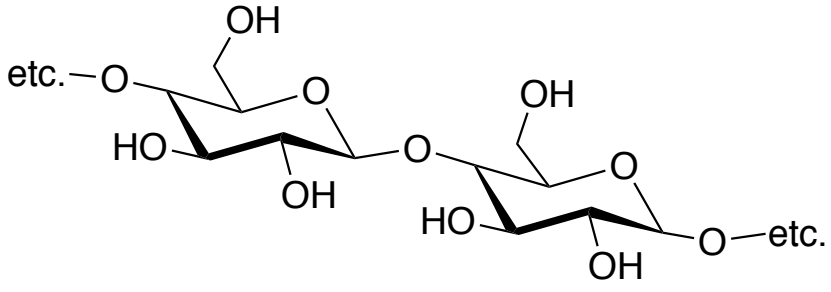


Table Sugar (Sucrose):



α–D-Glucopyranosyl-β–D-Fructofuranoside

Cellulose:



β-linkages cannot be digested by most mammals

Starch (Amylose)