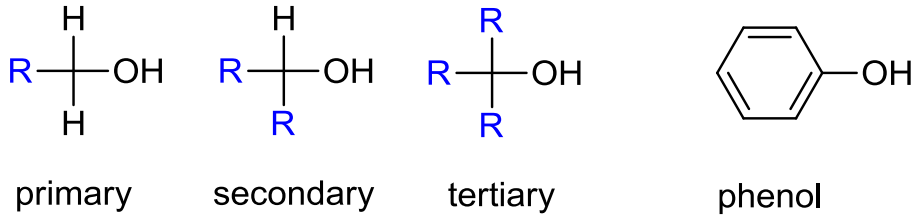
Synthesis and Structure of Alcohols

Alcohols can be considered organic analogues of water.

Alcohols are usually classified as primary, secondary and tertiary.

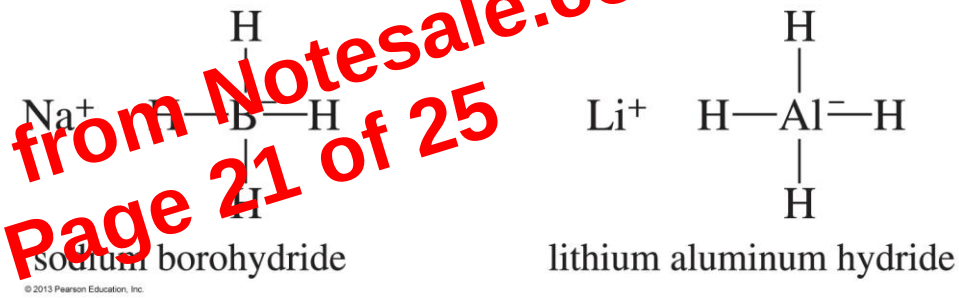


Alcohols with the hydroxyl bound directly to an aromatic (benzene) ring are called phenols.

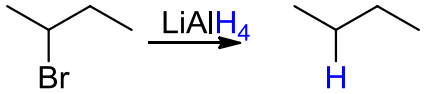
Hydride Reductions

Complex hydrides are the source of hydride ions, and the two most commonly used reagents are sodium borohydride and lithium aluminum hydride.

($LiAlH_4$ is stronger than $NaBH_4$).



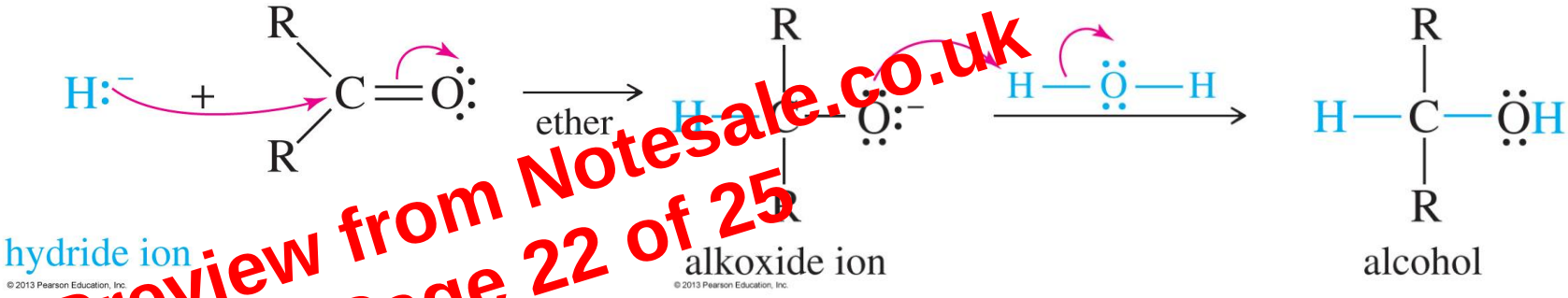
Lithium aluminum hydride ($LiAlH_4$) is a strong reducing agent, and will reduce alkyl halides to alkanes.



Essentially a hydride ion, ($:H^-$) acts as a nucleophile displacing the halide.

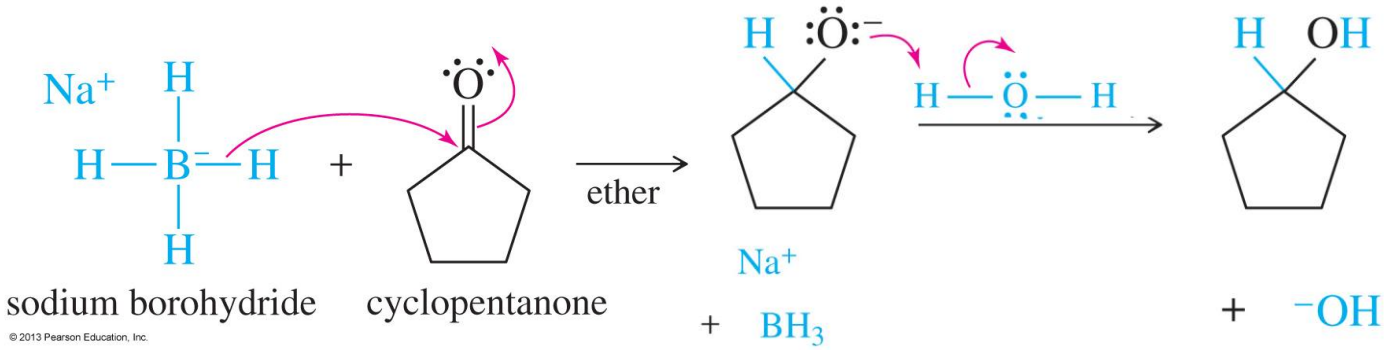
Syntheses of Primary and Secondary Alcohols (Carbonyl Reductions)

Hydride ions will also attack carbonyl groups, generating alkoxide ions, and protonation furnishes alcohols.



The conversion of ketones to alcohols involves the addition of H_2 across the C=O bond – a reduction.

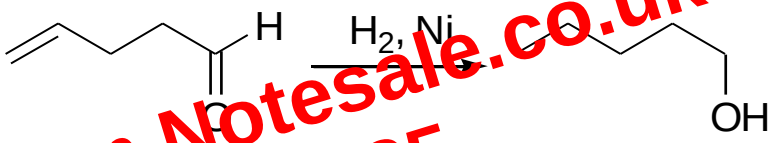
In reality, these reagents deliver a hydride to the electrophilic site.



Catalytic Hydrogenation

Carbonyls can be reduced to alcohols by the addition of hydrogen across the double bond.

Usually a Raney Ni catalyst is employed.



However, C=C double bonds are reduced quicker than C=O double bonds.

Thiols

Thiols are sulfur analogues of alcohols, they contain an –SH group.

They are named using the suffix –thiol, and as a substituent as *mercapto*-.

CH_3-SH	$CH_3CH_2CH_2CH_2$-SH	HS-CH_2CH_2OH
Methanethiol	1-butanethiol	2-mercaptoethanol

Thiols stink, literally.