

SYNTHETIC REAGENTS

1.

Organic chemistry
Paper-VII, Chapter-2

LECTURE -4

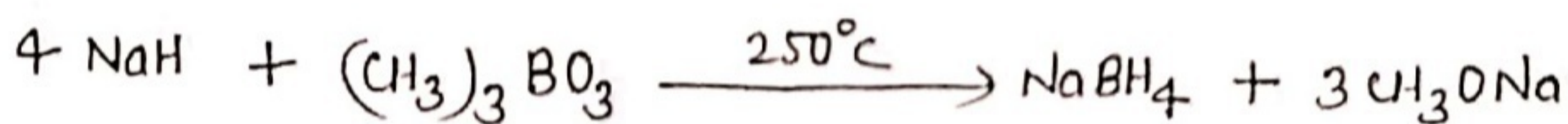
By-Dr.Rinky
05-08-2020

DEGREE-III (CHEMISTRY HONS.)

TOPIC - SODIUM BOROHYDRIDE

Preparation

* Sodium borohydride is prepared by the reaction of methyl borate with sodium hydride at elevated temperature.



* Sodium borohydride, unlike LiAlH_4 , is insoluble in ether but soluble in water.

* The reagent is normally used as reducing agent in aqueous or alcoholic solution at room temp.

* Sodium borohydride is less reactive than LAH, thus it is a more selective reagent.

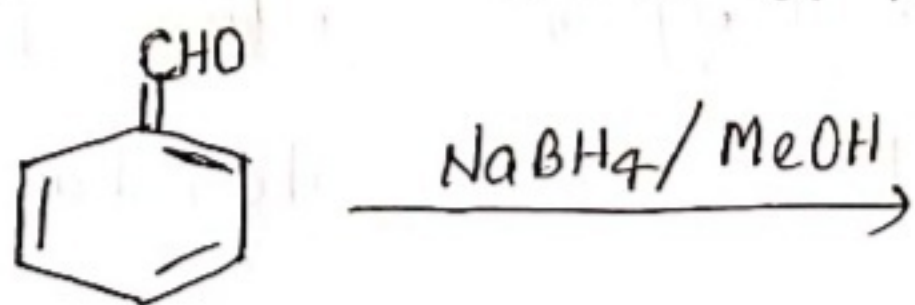
* Like LiAlH_4 , sodium borohydride also does not usually reduce isolated carbon-carbon double or triple bonds.

* It reduces aldehydes and ketones to alcohols while the halogen, cyano, nitro, amido and ester groups remain unaffected.

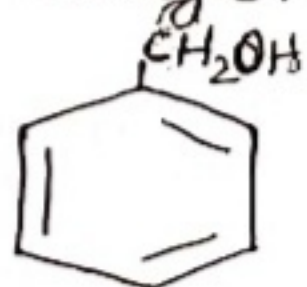
It is also inert towards lactones, epoxides and carboxylic acids.

Reduction of aldehydes & ketones

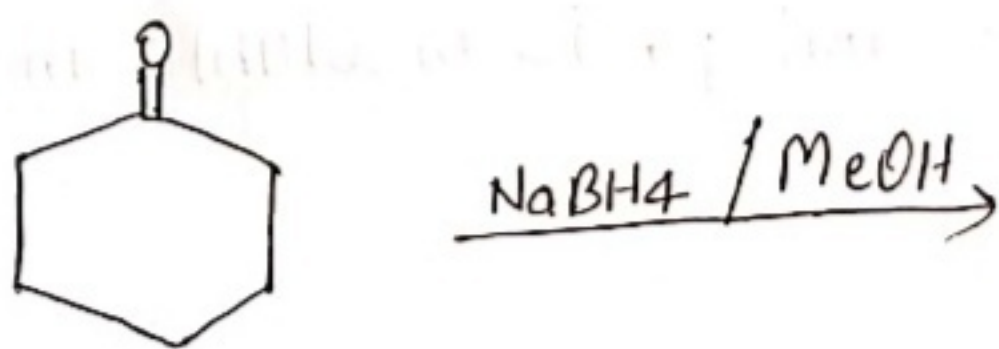
The aldehyde is reduced to primary alcohol and ketone to secondary alcohol with NaBH_4 . Some typical reductions of this reagent are given below.



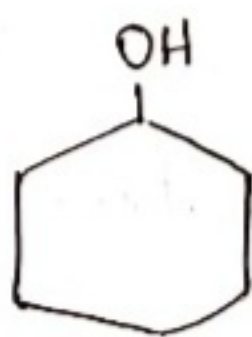
Benzaldehyde



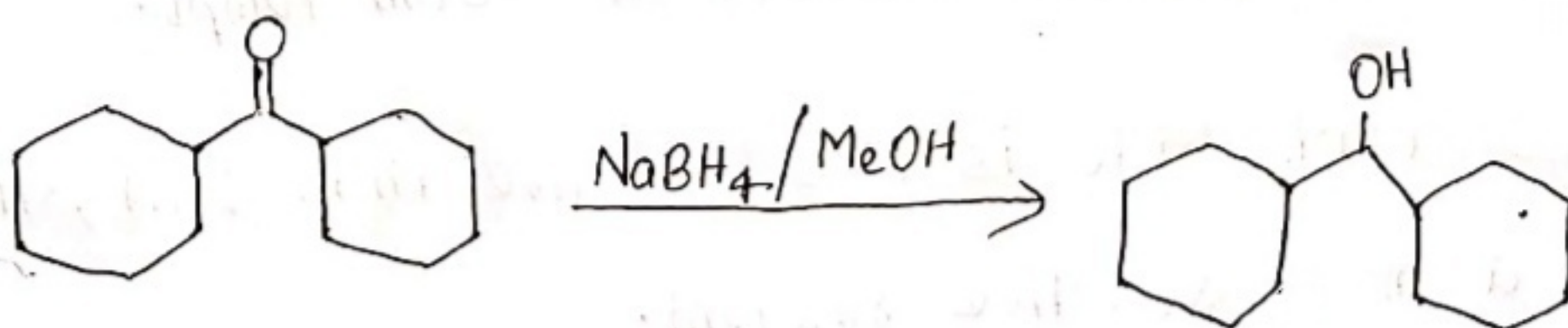
Benzyl alcohol



Cyclohexanone

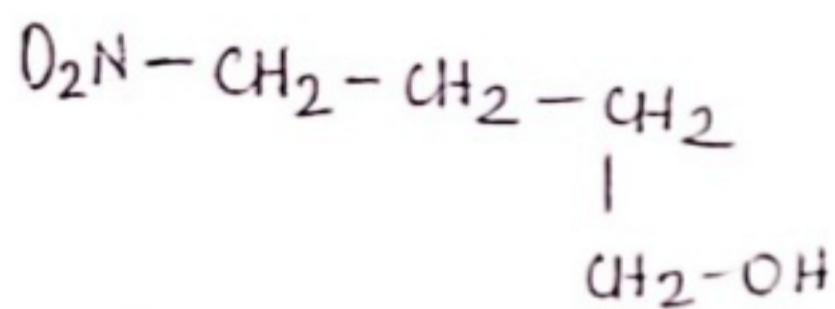
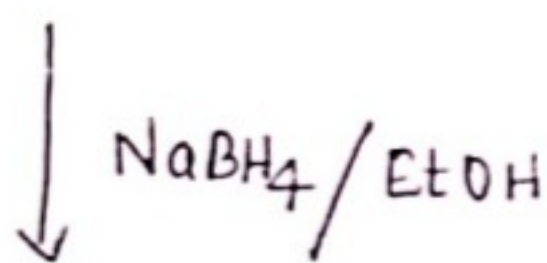
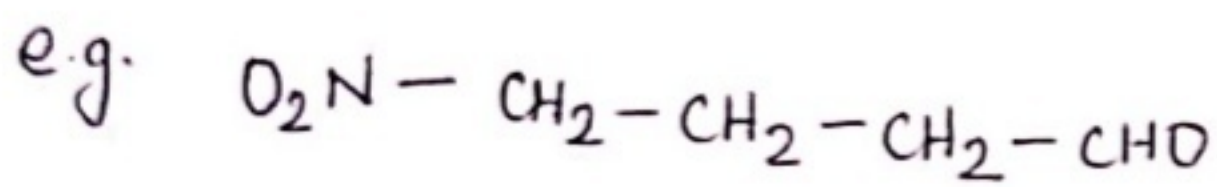


Cyclohexanol

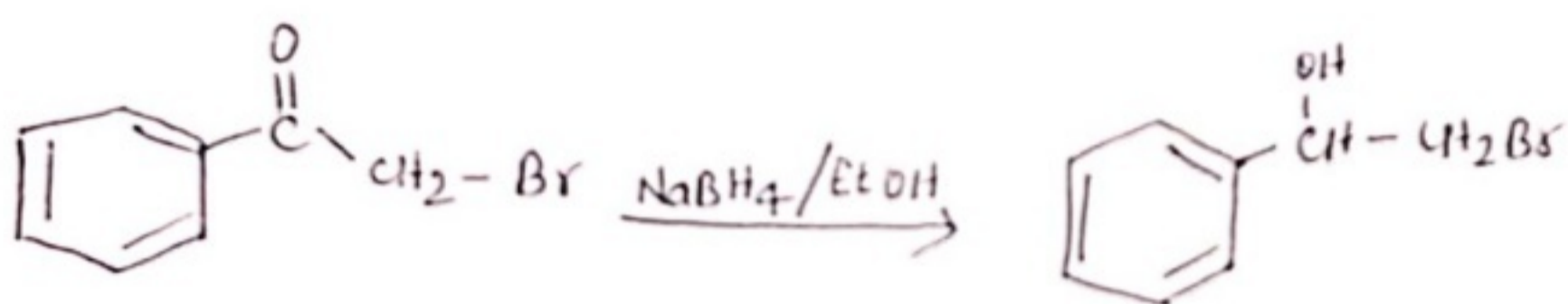


88%

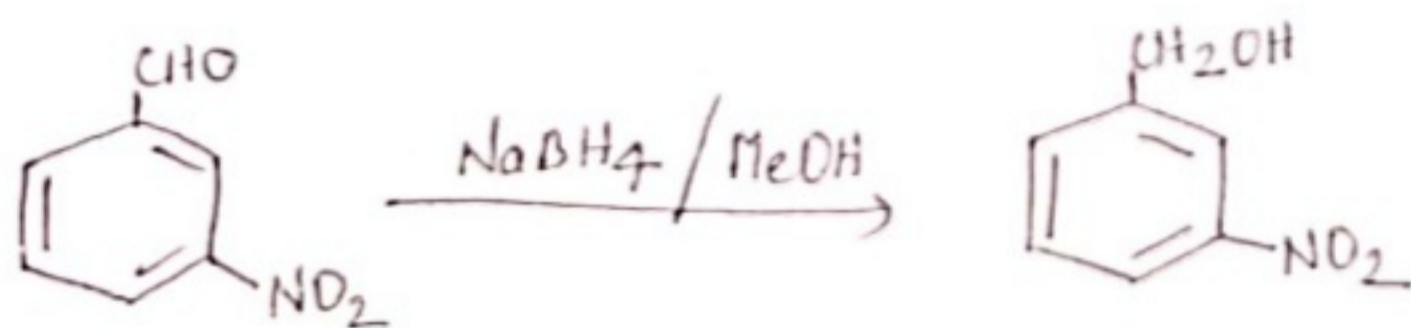
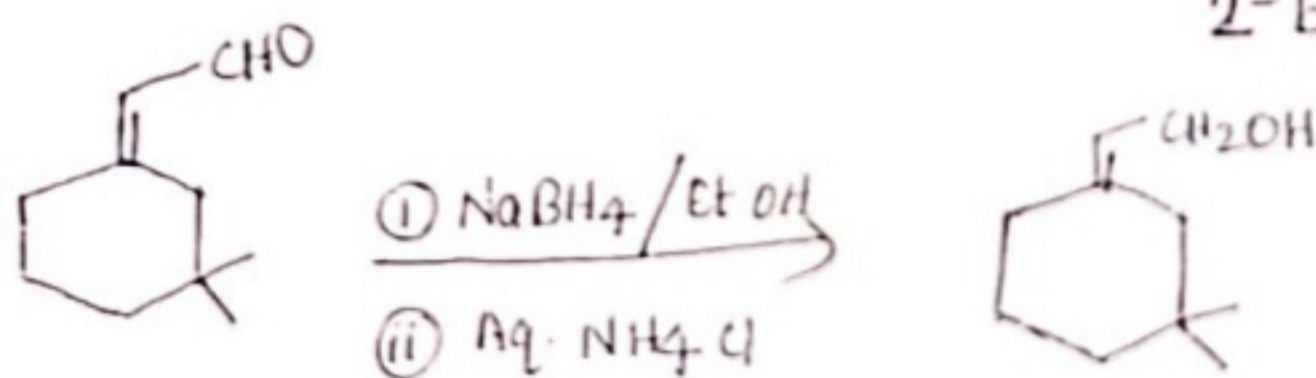
Sodium borohydride reacts with aldehydes much faster than ketones in alcohol. It is a reagent of choice for the reduction of aldehydes and ketones in presence of a variety of other functional group.



4-nitro-1-butanol



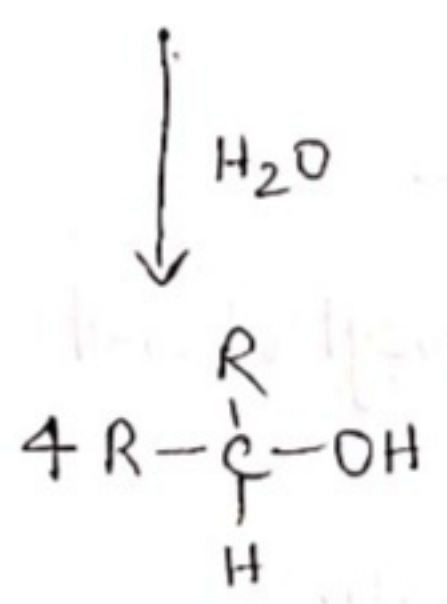
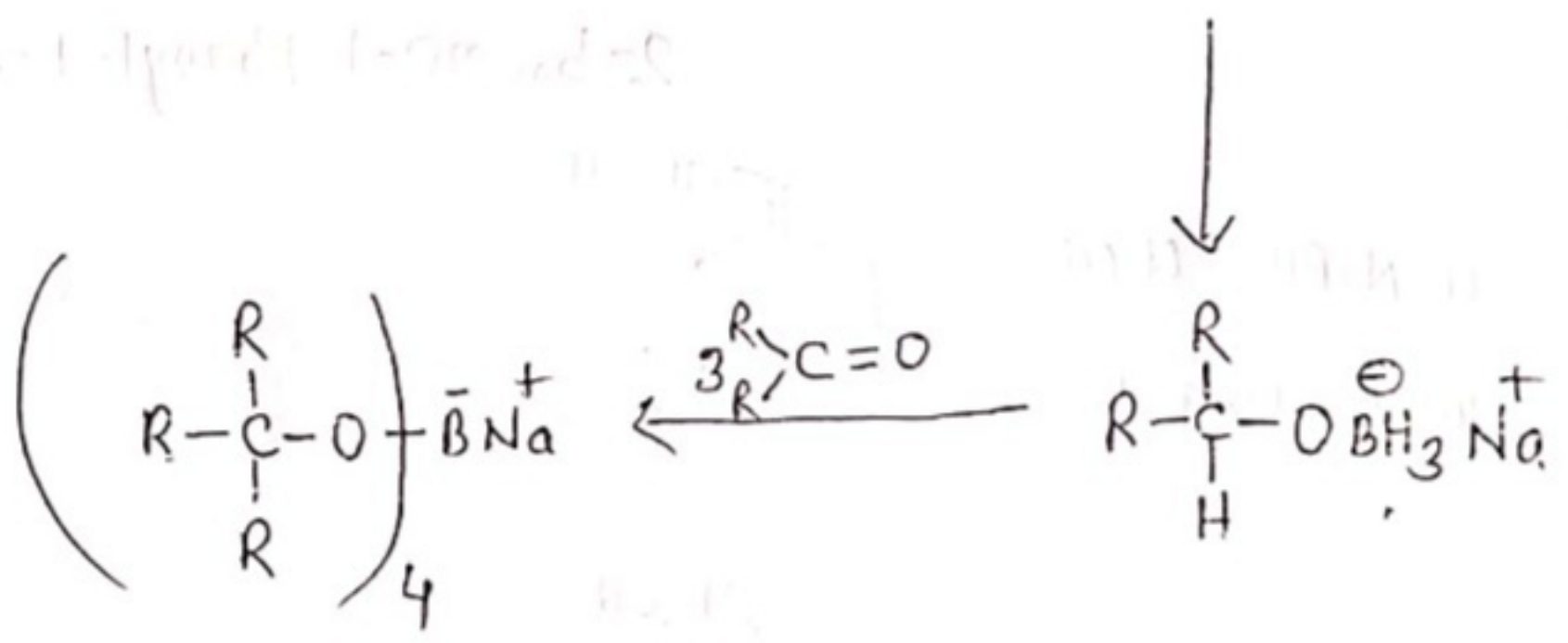
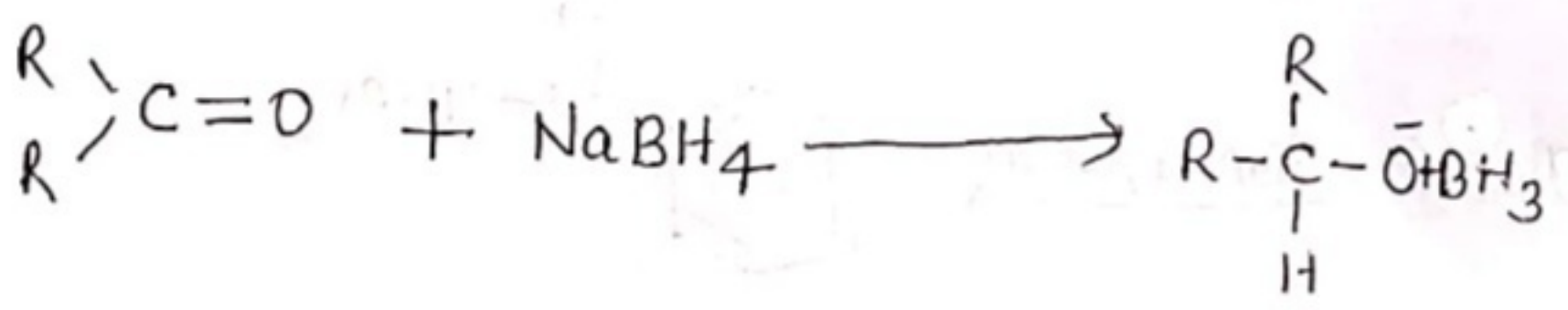
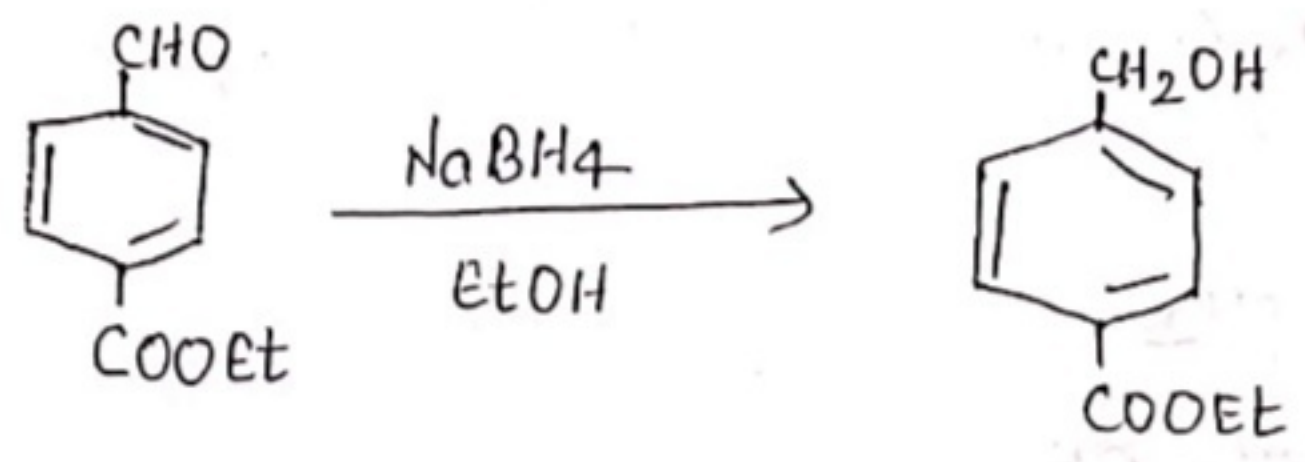
2-bromo-1-phenyl-1-ethanol



m-nitrobenzyl alcohol

- * NO reaction occurs at the nitro group.
- * NaBH_4 does not react with less reactive carbonyl compounds such as esters or amides.
- * Thus, when both the ester and aldehyde groups are

present in the same molecule, only the aldehyde will be reduced as shown in the following example.



- * NaBH_4 reacts in a similar manner as LiAlH_4 .
- * It also delivers hydride ion (H^-), as the powerful nucleophile, to the carbonyl carbon.

To be continued in next lecture..