

SUMMARY CHART

Synthesis of alcohols from carbonyl compounds and epoxides

The reactions below are nucleophilic additions except for:
 1) hydrogenations (H_2 /catalyst reagents)

| Carbonyl compounds | reduction reactions | | makes new C-C bond | |
|---|--|--------------------------------------|--|-------------------------------|
| | $H_2 + \text{catalyst}$ or $NaBH_4/ROH$ | 1. $LiAlH_4/ether$ 2. H^+, H_2O | 1. $R''Li$ or $R''MgX$ 2. H^+, H_2O | |
| $\begin{matrix} O \\ \\ H-C-H \end{matrix}$ | methanal (HCHO) | methanol (CH_3OH) | methanol (CH_3OH) | 1° alcohol ($R''CH_2OH$) |
| $\begin{matrix} O \\ \\ R-C-H \end{matrix}$ | aldehyde (RCHO) | 1° alcohol (RCH_2OH) | 1° alcohol (RCH_2OH) | 2° alcohol ($RR''CHOH$) |
| $\begin{matrix} O \\ \\ R-C-R' \end{matrix}$ | ketone ($RR'CO$) | 2° alcohol ($RR'CHOH$) | 2° alcohol ($RR'CHOH$) | 3° alcohol ($RR'R''COH$) |