TABLE 2 The ease of reduction of various functional groups toward catalytic hydrogenation[414]

The groups are listed in approximate order of ease of reduction

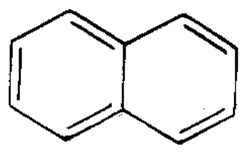
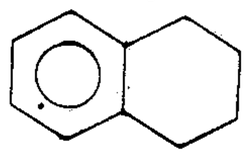
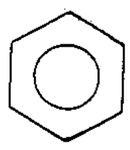
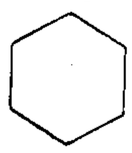
Reaction	Substrate	Product	
0-84	$RCOCl$	$RCHO$	Easiest
9-48	RNO_2	RNH_2	
5-10	$RC{\equiv}CR$	$RCH{=}CHR$	
6-26	$RCHO$	RCH_2OH	
5-10	$RCH{=}CHR$	RCH_2CH_2R	
6-26	$RCOR$	$RCHOHR$	
9-80	$ArCH_2OR$	$ArCH_3 + ROH$	
6-28	$RC{\equiv}N$	RCH_2NH_2	
5-11			
9-43	$RCOOR'$	$RCH_2OH + R'OH$	
9-40	$RCONHR'$	RCH_2NHR	
5-11			Most difficult
9-39	$RCOO^-$		Inert

TABLE 3 The ease of reduction of various functional groups with $LiAlH_4$ in ether[415]

However, $LiAlH_4$ is a very powerful reagent, and much less chemoselectivity is possible here than with most of the other metal hydrides

Reaction	Substrate	Product	
6-26	$RCHO$	RCH_2OH	Easiest
6-26	$RCOR$	$RCHOHR$	
9-46	$RCOCl$	RCH_2OH	
9-43	Lactone	Diol	
0-81	$RCH{-}CHR$ (O)	RCH_2CHOHR	
9-43	$RCOOR'$	$RCH_2OH + R'OH$	
9-39	$RCOOH$	RCH_2OH	
9-39	$RCOO^-$	RCH_2OH	
9-40	$RCONR'_2$	$RCH_2NR'_2$	
6-28	$RC{\equiv}N$	RCH_2NH_2	
9-48	RNO_2	RNH_2	
9-68	$ArNO_2$	$ArN{=}NAr$	Most difficult
5-10	$RCH{=}CHR$		Inert

TABLE 4 The ease of reduction of various functional groups with borane[415]

It is evident that this reagent and $LiAlH_4$ (Table 3) complement each other

Reaction	Substrate	Product	
9-39	$RCOOH$	RCH_2OH	Easiest
5-13	$RCH{=}CHR$	$(RCH_2CHR)_3B$	
6-26	$RCOR$	$RCHOHR$	
6-28	RCN	RCH_2NH_2	
0-81	$RCH{-}CHR$ (O)	RCH_2CHOHR	
9-43	$RCOOR'$	$RCH_2OH + R'OH$	
0-84,9-46	$RCOCl$		Most difficult Inert