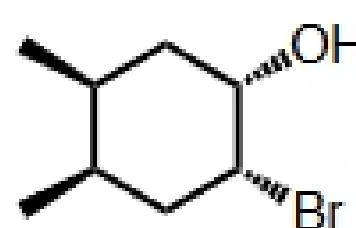
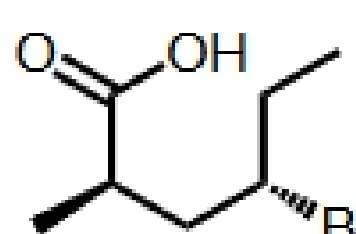
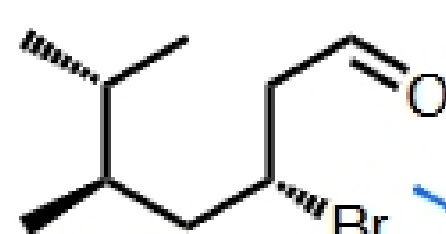
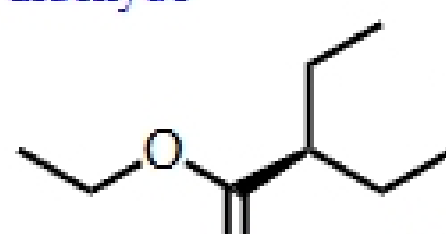
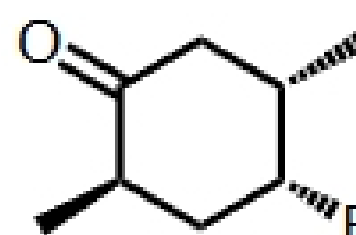


CHEM 232 Worksheet
Carbonyls, Enolates, Aldol Reactions, and Synthesis Problems

1. Name all carbonyl functional groups in the compounds below, then match each compound to its name.

 ketone	<p>(2<i>R</i>,4<i>R</i>,5<i>S</i>)-4-bromo-2,5-dimethylcyclohexanone</p>
 carboxylic acid	<p>ethyl (<i>S</i>)-2-ethylpentanoate</p>
 aldehyde	<p>(1<i>S</i>,2<i>R</i>,4<i>R</i>,5<i>S</i>)-2-bromo-4,5-dimethylcyclohexanol</p>
 ester	<p>(2<i>R</i>,4<i>S</i>)-4-bromo-2-methylhexanoic acid</p>
 ketone	<p>(3<i>R</i>,5<i>R</i>)-3-bromo-5,6-dimethylheptanal</p>

2. List the named reactions and reagents we've encountered in the unit for Exam 3. What do these reactions and reagents do, or what functional groups do they generate?

Williamson ether synthesis → makes ethers from an alkoxide and a primary alkyl halide.

Jones reagent → chromium oxidant converts alcohols to ketones or carboxylic acids

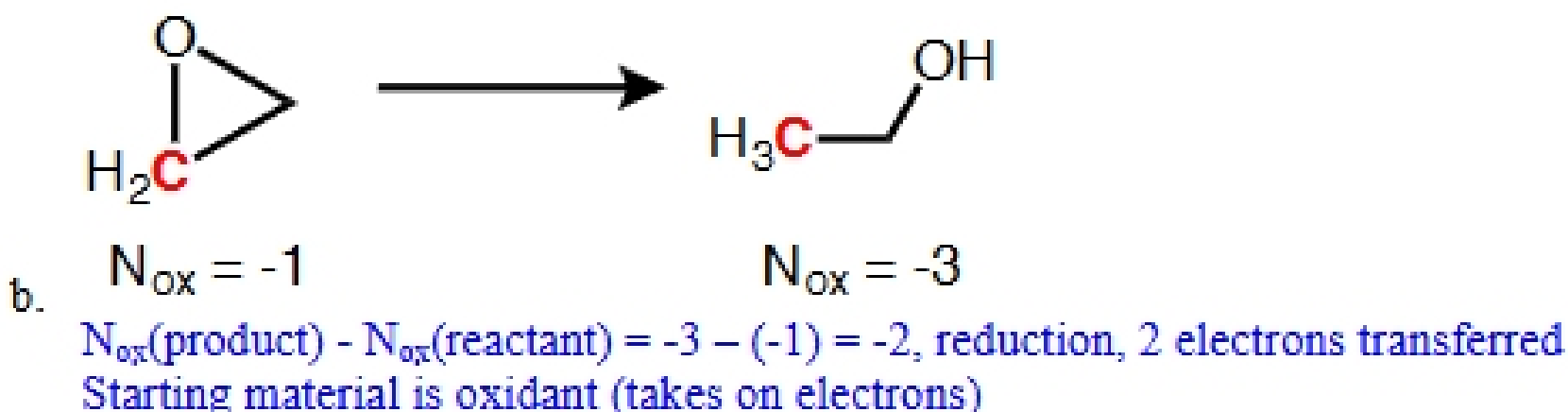
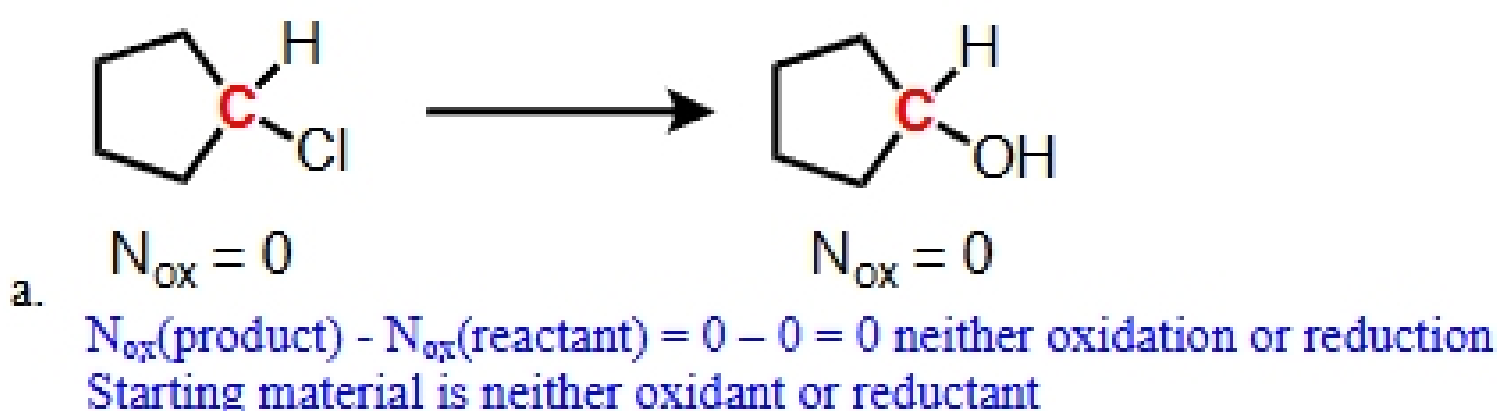
Aldol addition → makes a β-hydroxy carbonyl from aldehydes and ketones

Aldol condensation → makes an α,β-unsaturated carbonyl (enone) from a β-hydroxy carbonyl or from aldehydes and ketones

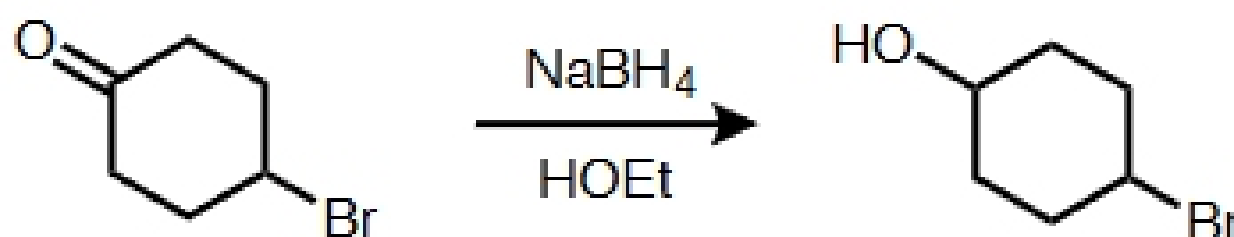
Claisen-Schmidt condensation → crossed aldol condensation that makes an α,β-unsaturated carbonyl (enone) from a ketone and an aldehyde lacking α-hydrogens

Gilman reagent \rightarrow organometallic reagent containing copper. Allows for conjugate addition to an enone.

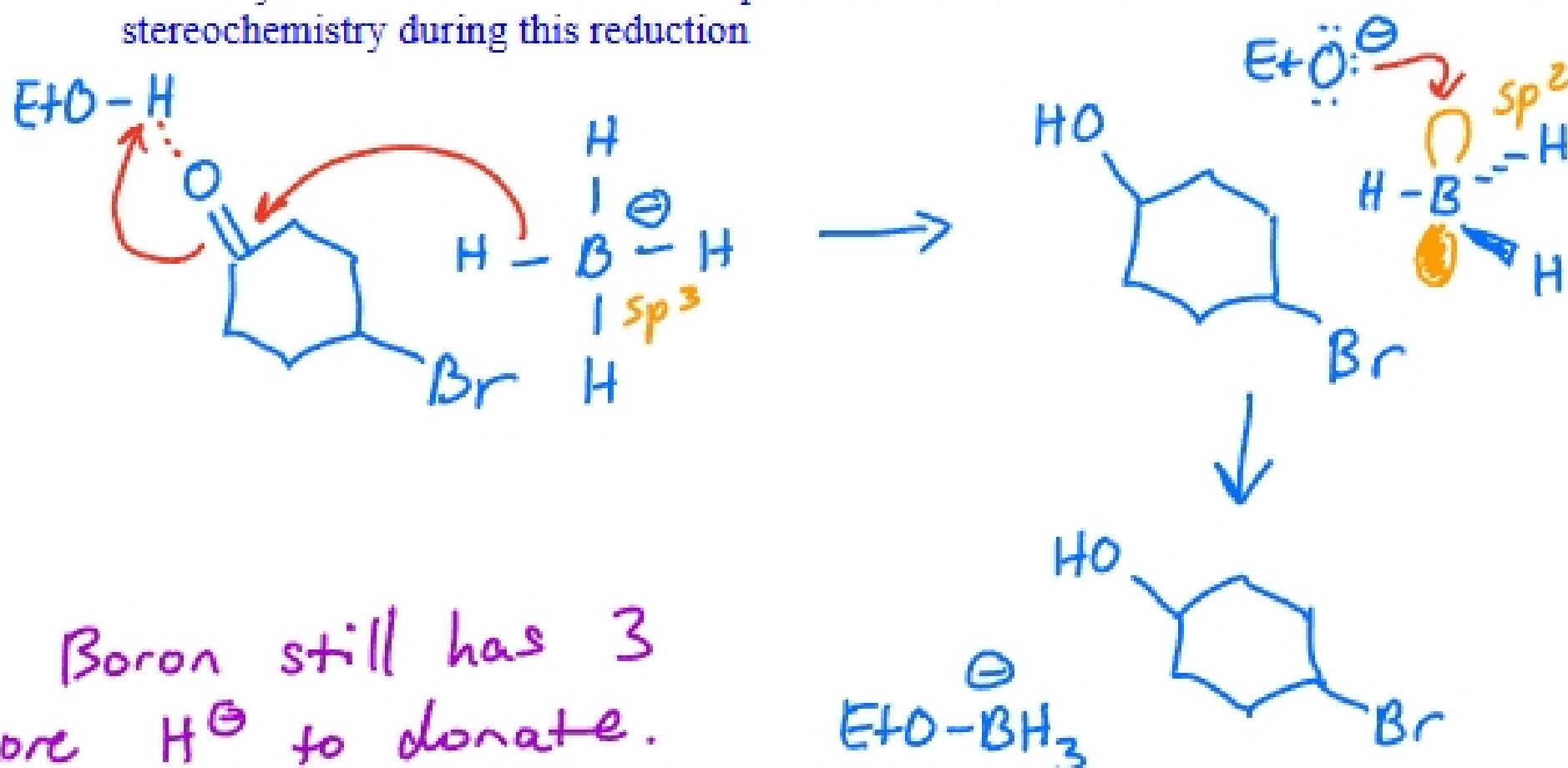
3. Calculate the oxidation number for each carbon atom that experiences changes in its bonds. Then, determine whether an oxidation, reduction, or neither took place and the number of electrons transferred. Is the starting material acting as an oxidant, reductant, or neither?



4. Draw the mechanism for the reaction of sodium borohydride with an aldehyde.

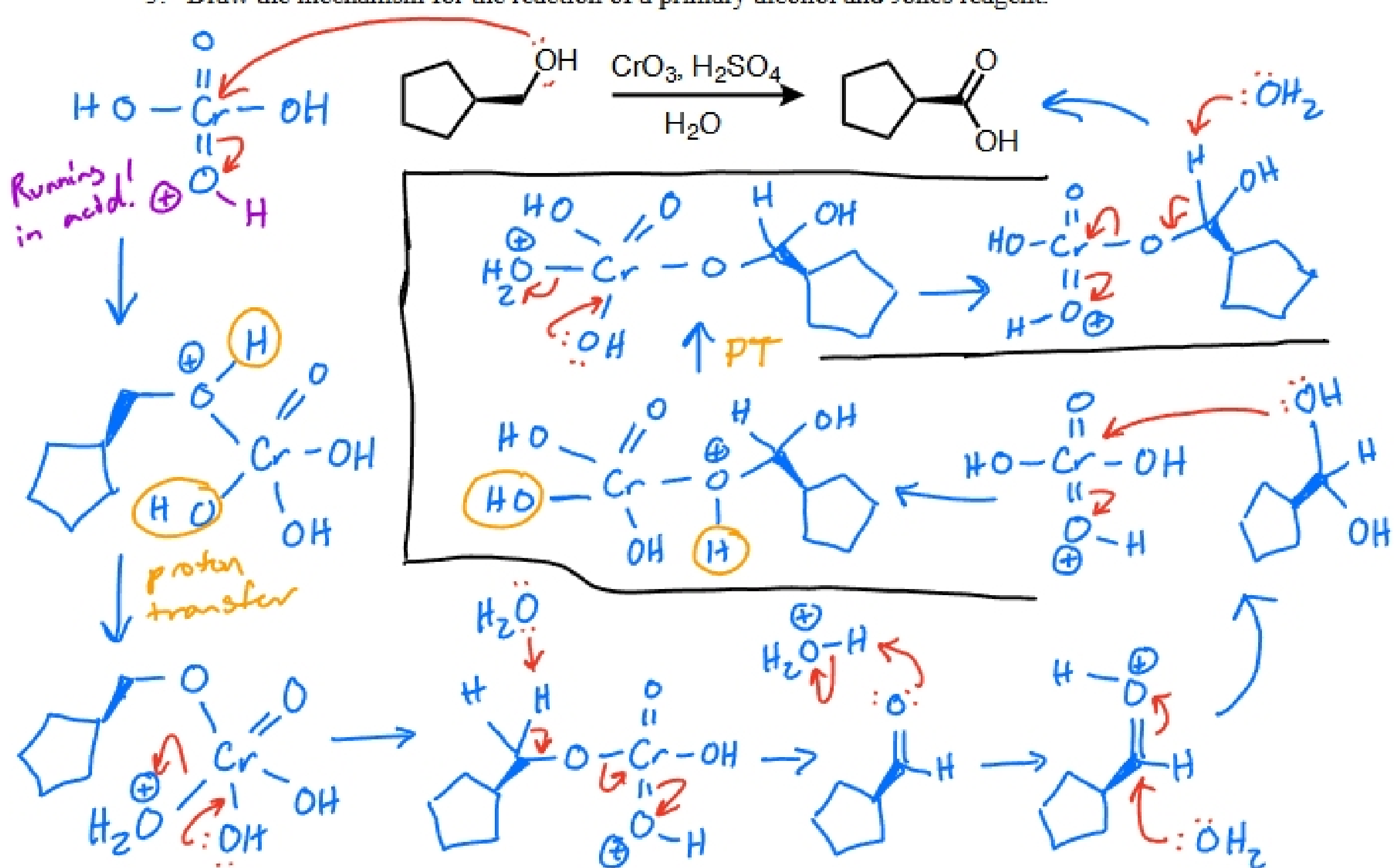


Note: Hydride can attack from the top or the bottom of the ketone. We can't control the stereochemistry during this reduction

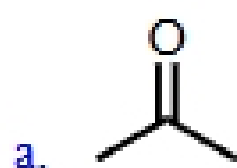


Boron still has 3 more H^+ to donate.
 $EtOBH_3^-$ can go on & react with 3 more carbonyls

5. Draw the mechanism for the reaction of a primary alcohol and Jones reagent.



6. Synthesize the alcohol shown here starting from the substrates provided in each part. Give the synthetic sequence as a list of sequential steps. Assume aqueous workups are performed if needed.



1. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{MgBr}$



1. $\text{CrO}_3, \text{H}_2\text{SO}_4, \text{H}_2\text{O}$ 2. MeLi