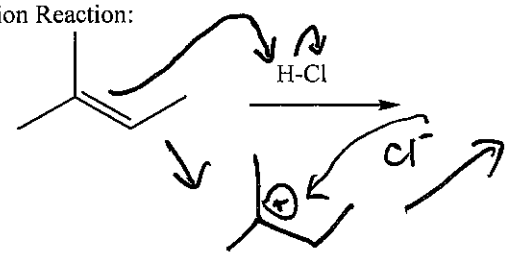
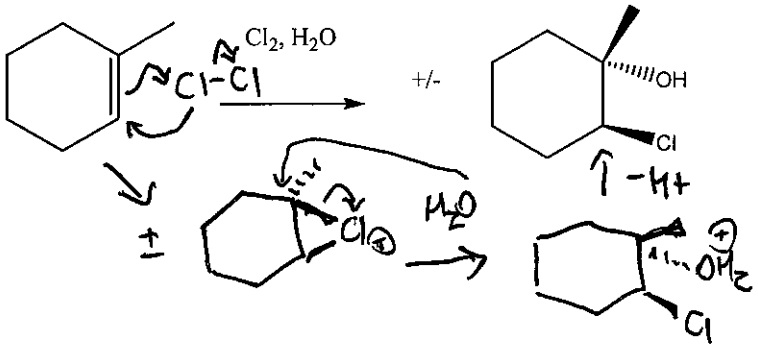
1. Mechanisms. These are the very basic types of mechanisms. You should also be able to explain regiochemistry and stereochemistry outcomes, as well as rearrangements, etc. You should be able to apply these basic mechanisms to more challenging molecules, or to explain why an expected result does not happen.

Addition Reaction:



2-chloro-2-methylbutane

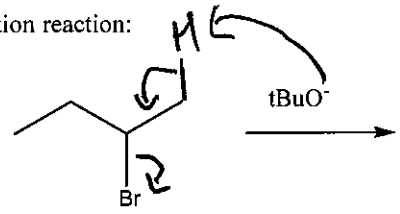
Markovnicov: the more stable ⊕ formed faster (Hammond)



Regio: water attacks more 5° carbon

Stereo: anti addition because water must attack backside to chloronium.

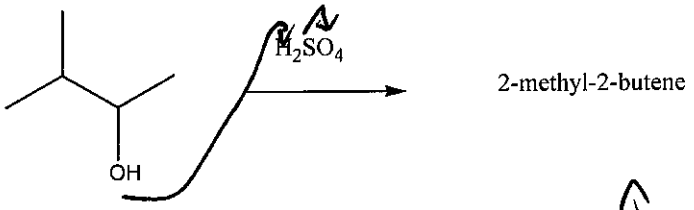
Elimination reaction:



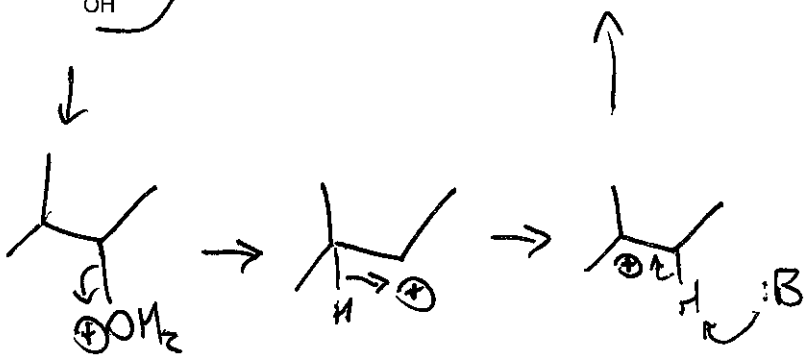
1-butene

E2: Hoffman regiochem due to bulky base

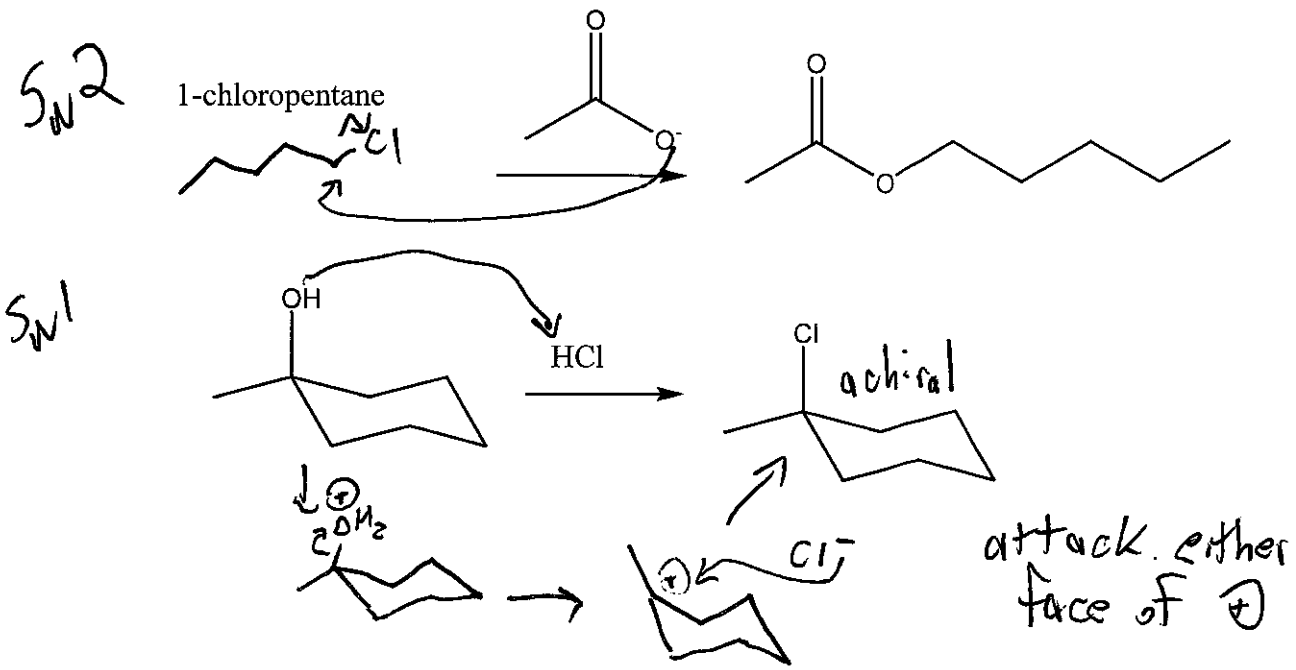
E1 with rearrangement (or without - either will lead to pdt.



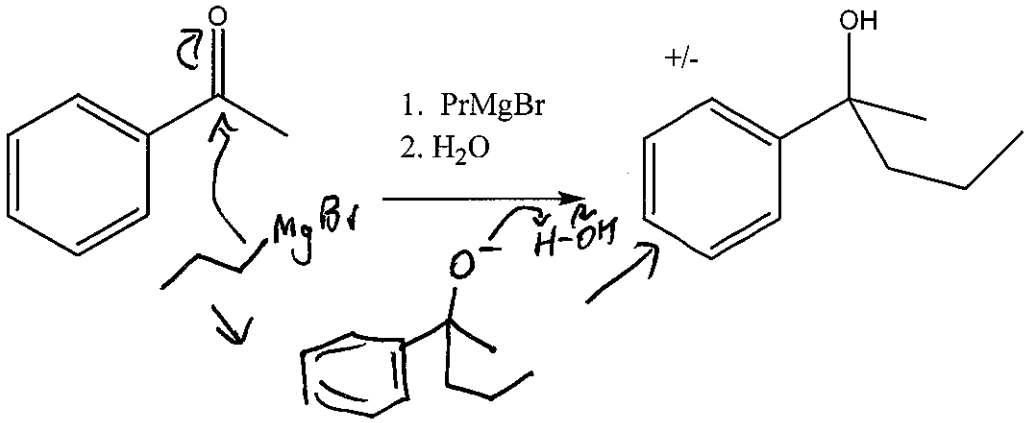
2-methyl-2-butene



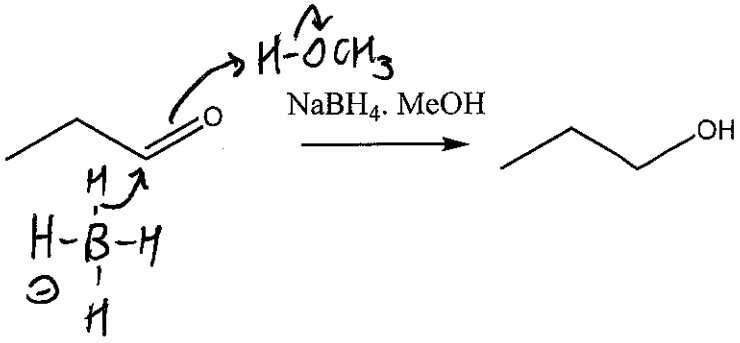
Substitution Reaction:



Grignard:

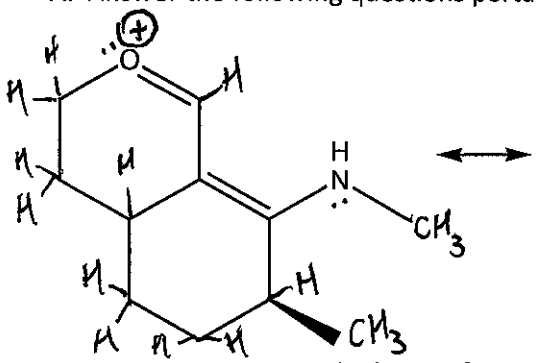


Reduction:



2. Structure (formal charge, hybridization, resonance, stereochemistry, conformational analysis)

A. Answer the following questions pertaining to this structure.



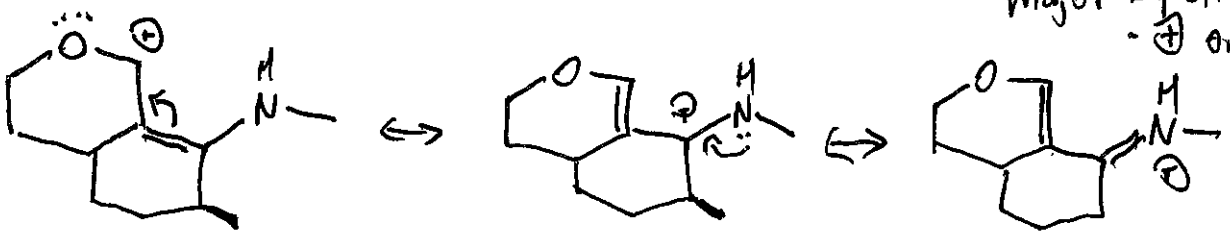
A. How many hydrogens? How many lone pairs?

18 2

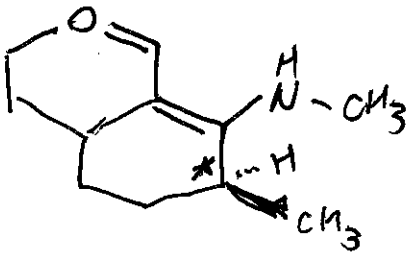
B. Label the structure with any missing formal charges.

C. Draw at least two more resonance structures and rank them from most major contributor to most minor contributor.

major - full octet
- ⊕ on nitrogen

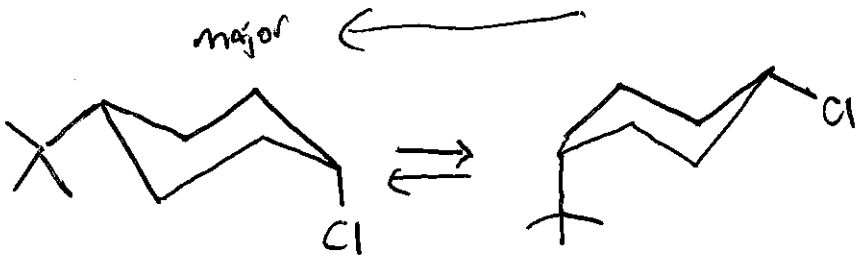


D. Mark all the chiral centers and label any designated chiral centers R or S.



R

B. Would you expect the elimination of cis-1-t-butyl-4-chlorocyclohexane using a strong base to be faster or slower than the elimination of chlorocyclohexane with a strong base?

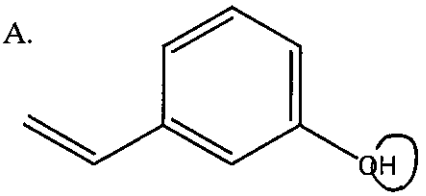


faster. t butyl locks the Chlorine axial, which is in the reactive E2 conformation

3. Acid/base reactions

For each of the following compounds, circle the most acidic hydrogen. Give an approximate pKa value. Would this compound be deprotonated by HO^-? Would this compound be deprotonated by H_2N^-? Draw the conjugate base of each acid.

A.

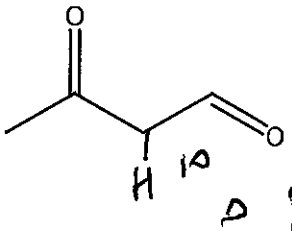


10

HO^- yes

$^-NH_2$ yes

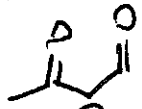
B.



10

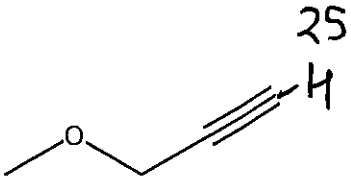
HO^- yes

$^-NH_2$ yes



double resonance

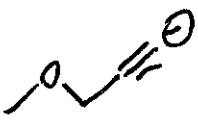
C.



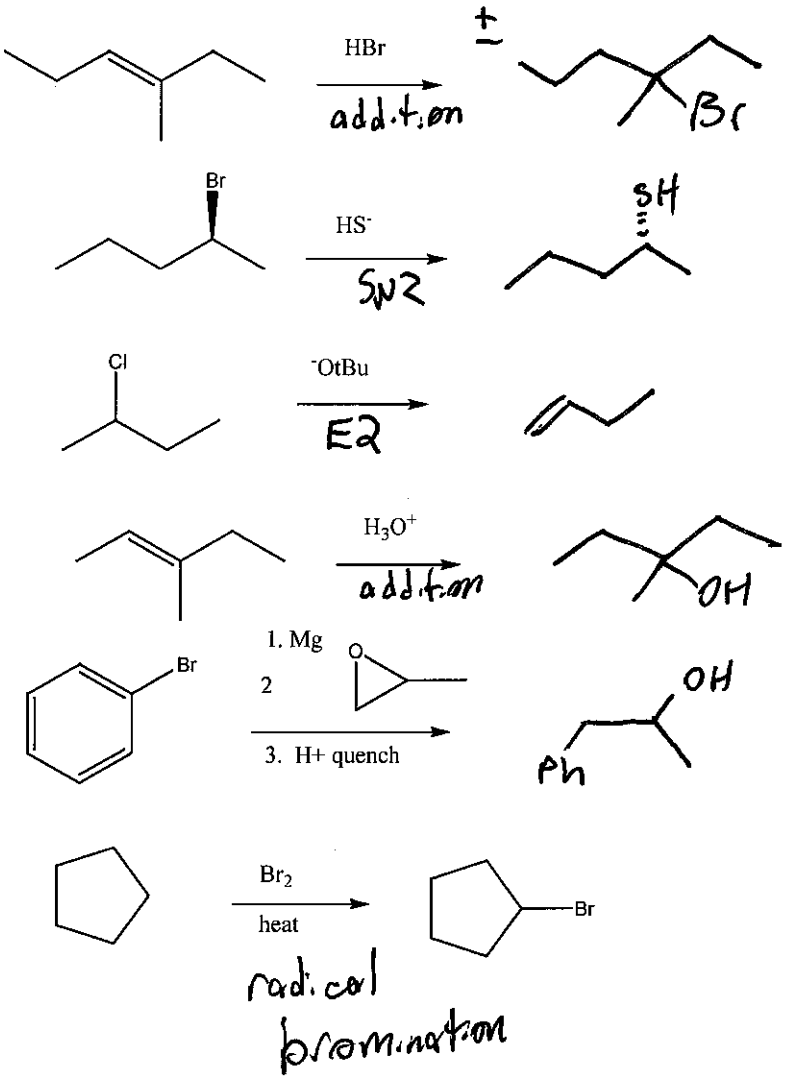
25

HO^- NO

$^-NH_2$ yes

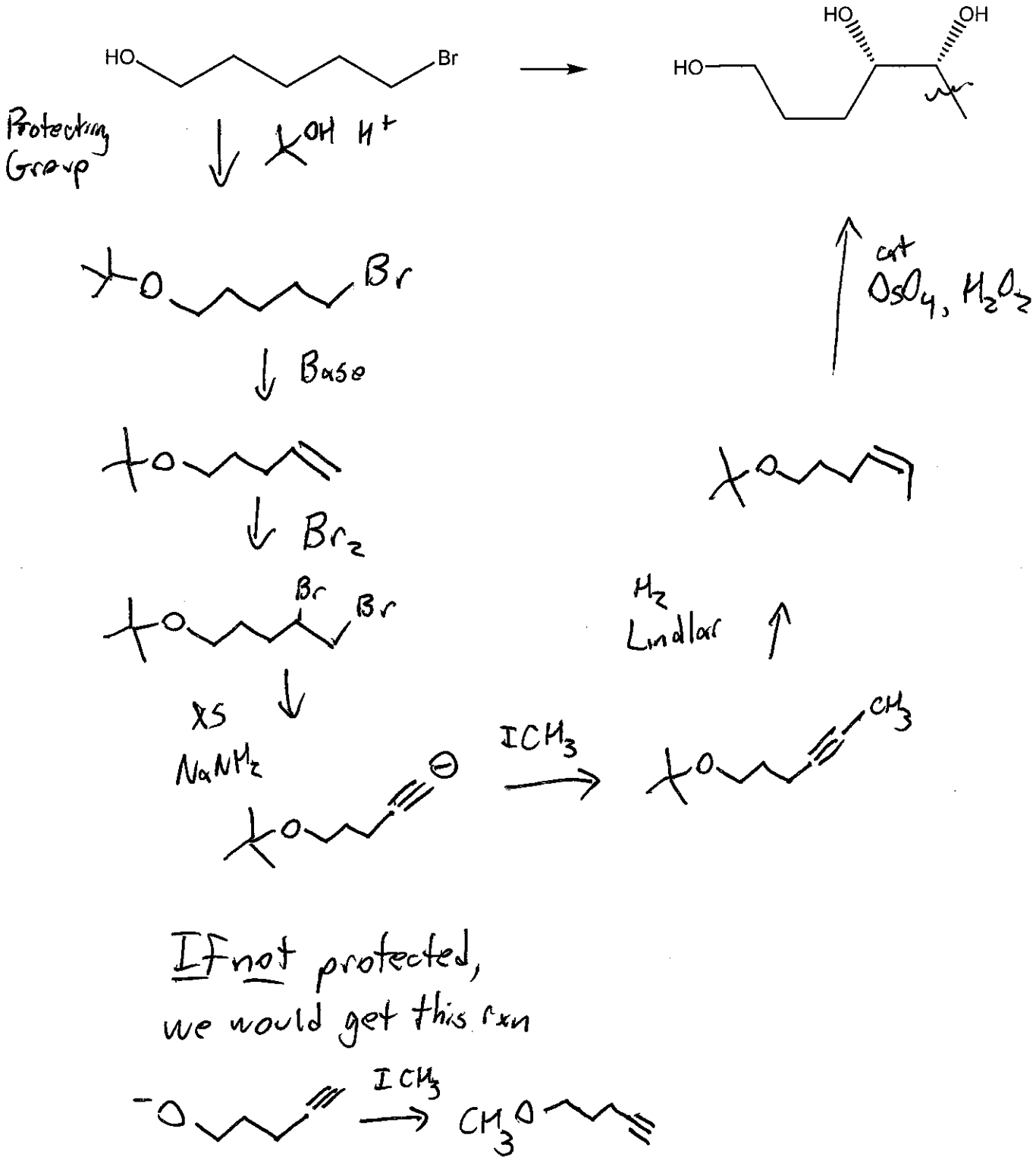


4. Predict the MAJOR products. Include stereochemistry where needed. Indicate the type of mechanism (electrophilic addition, E1, E2, Sn1, Sn2, radical.)



other possibilities

5. Multistep synthesis. Provide all necessary reagents, and explain why a protecting group is necessary.



If not protected, we would get this rxn