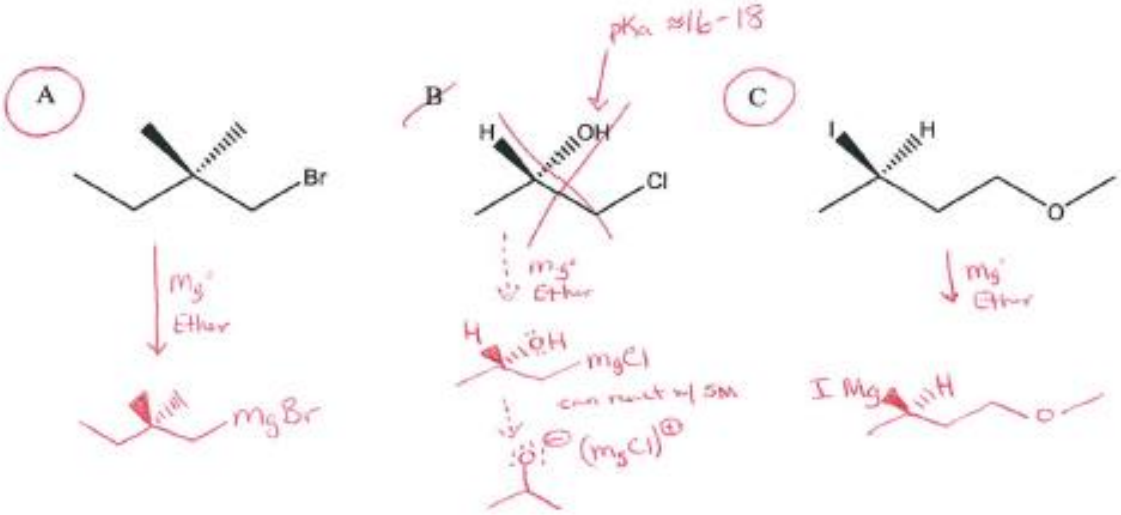
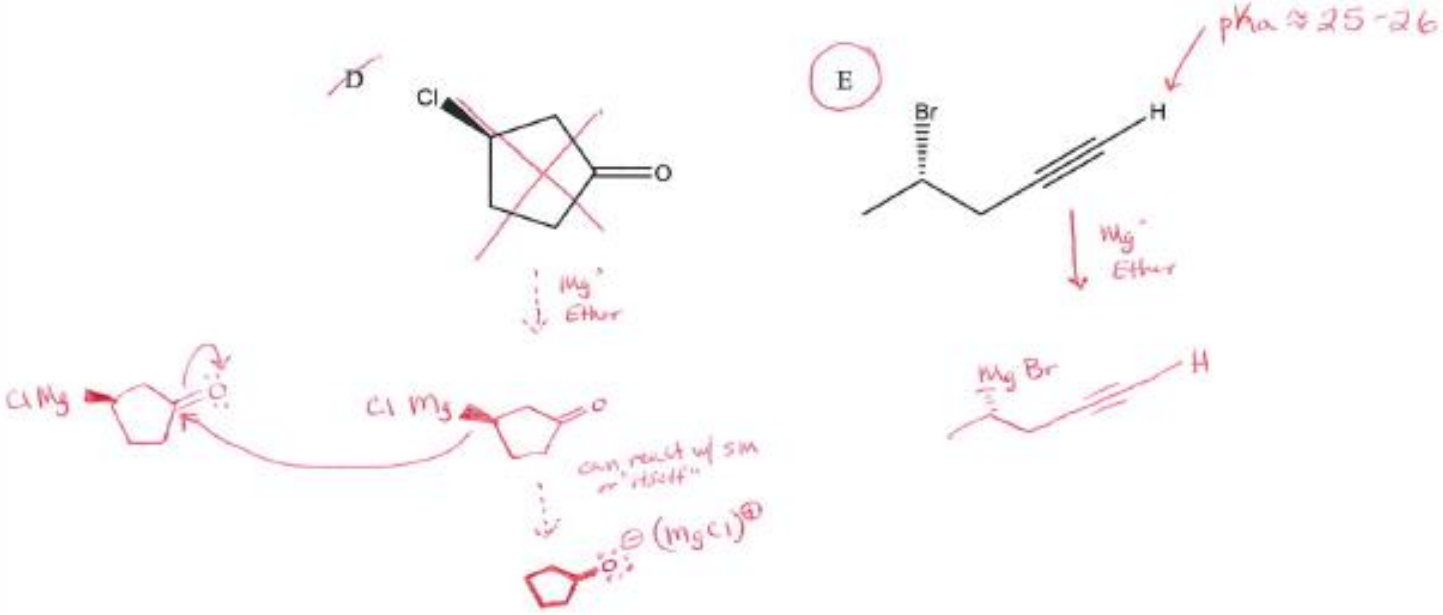
Which compounds can be used to successfully prepare a Grignard reagent for alcohol synthesis by subsequent reaction with aldehydes or ketones, followed by a mild acid aqueous work up? For those that cannot, explain why.



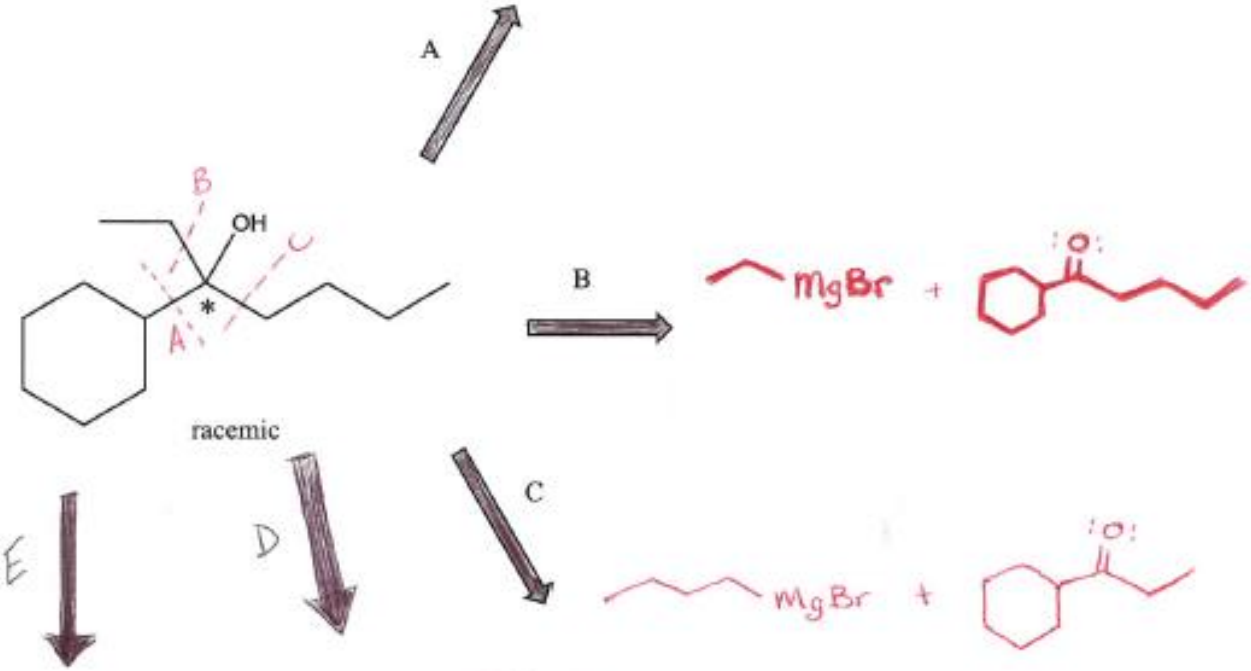


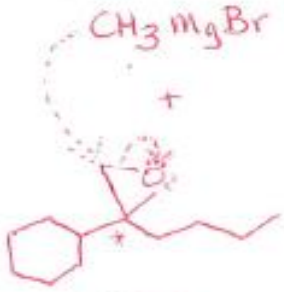
Grignards are good nucleophiles and strong bases. Being basic, they will react with molecules as acidic or more acidic than H_2O ($pK_a \approx 16$).

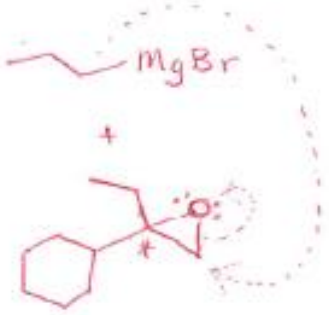
SM = starting material

Retrosynthetic Analysis

Show multiple ways to break down this tertiary alcohol into possible starting materials where one component is an organometallic compound such as a Grignard reagent.



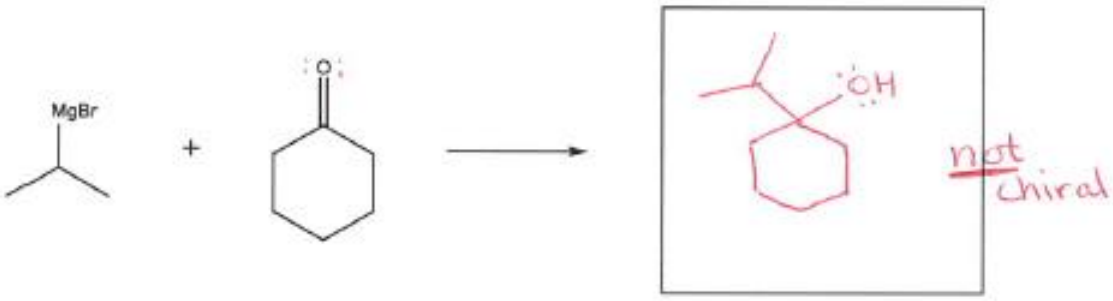




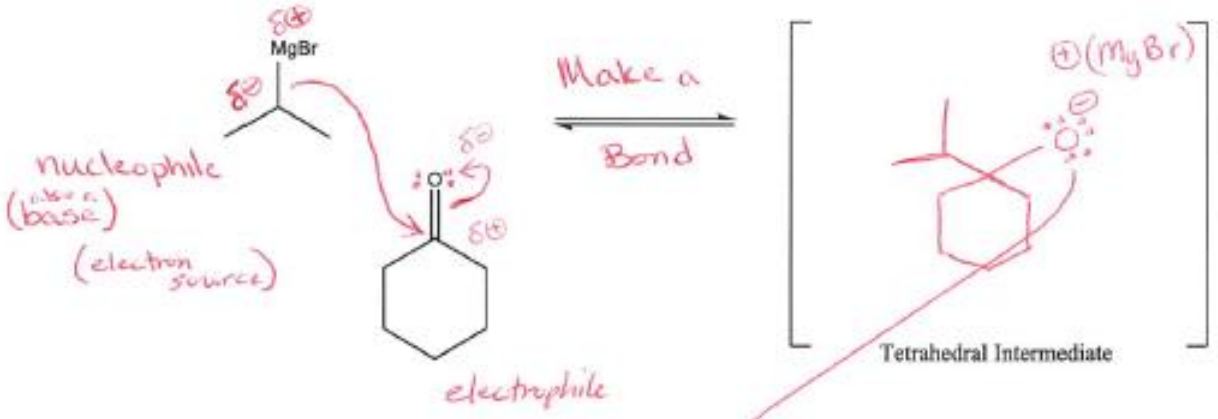
*** Successful Grignard reactions favor the use of primary Grignard reagents. Secondary Grignard reagents can also be used. As reaction sites become increasingly bulky, the chances of a successful and high yielding product decrease.

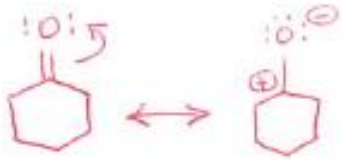
** In cases of ring opening epoxides, the Grignard will attack the least hindered side.

Predict the Product for the following reaction after a mild acid –aqueous work up.

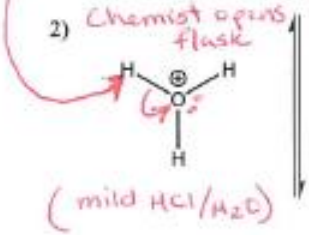


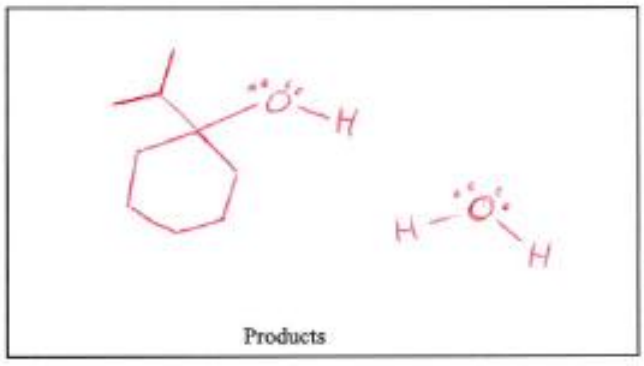
Show the mechanism for the above reaction.





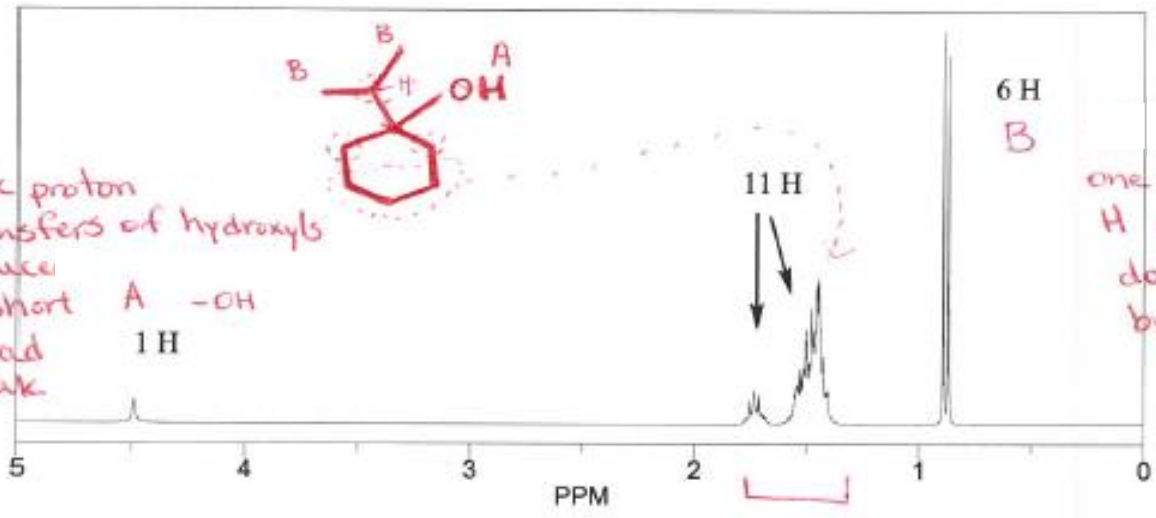
resonance
indicating C an electrophilic center (electron sink)





also have Mg salts

Actual NMR Spectrum:



quick proton transfers of hydroxyls produce a short broad peak

one neighboring H gives a doublet (d) by n+1

overlap of the methine and cyclohexane Hs — example of how something seemingly clean and easy to assign can get tricky as chemical shifts overlap

— on homeworks and exams the spectra will be clear to interpret and label — in the "real world" this is not very common