

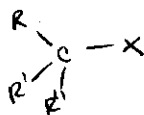
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EXAM #2 - WEDNESDAY

- SAME ROOM ASSIGNMENTS AS FOR EXAM #1
- REVIEW: Tomorrow, 5:00, B371

RECALL:

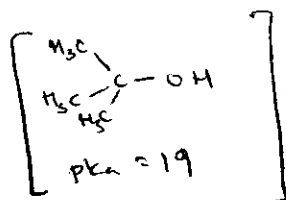
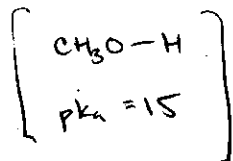
Alcohols, Alkyl halides, etc:



ACID-BASE CHEMISTRY OF ALCOHOLS:

pK_a for a typical alcohol $\boxed{\sim 16}^*$
(H-OH or H-OR)

Specific cases vary:



Quantitative Deprotonation

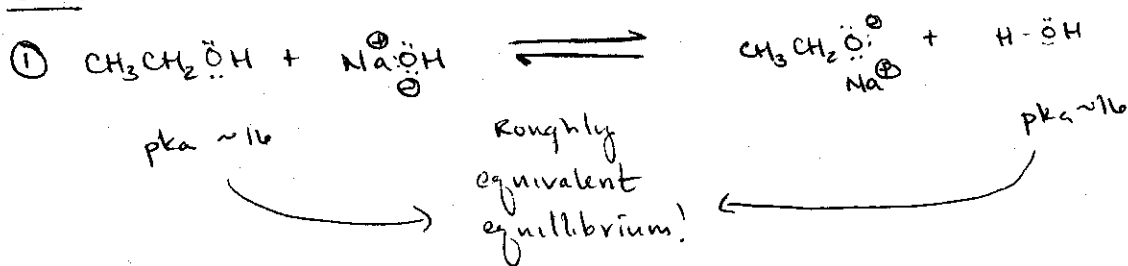
↳ "Complete Deprotonation" of a given species

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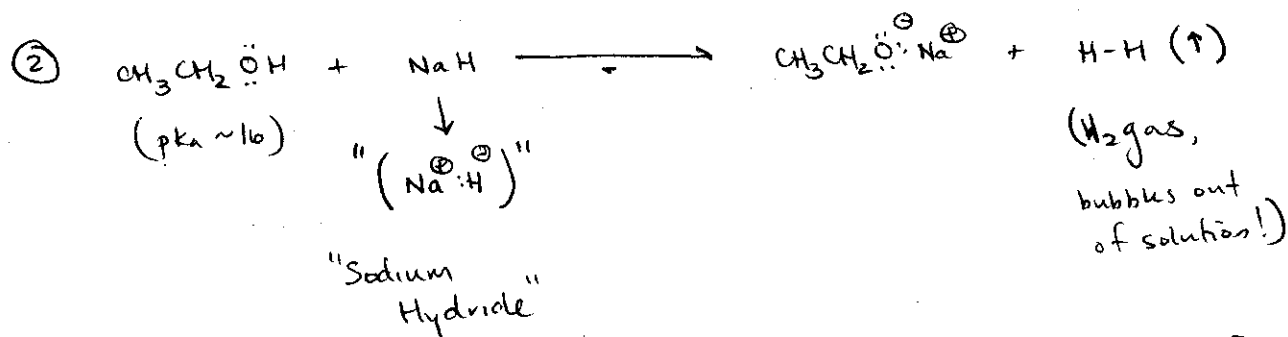
Quantitative Deprotonation of Alcohols

- Requires careful choice of base (Brønsted)
 - ↳ Must be strong enough for complete deprotonation of all alcohol present.

Consider:



$\text{Na}^+\ddot{\text{O}}\text{H}^-$ is not strong enough to quantitatively deprotonate ethanol (EtOH)



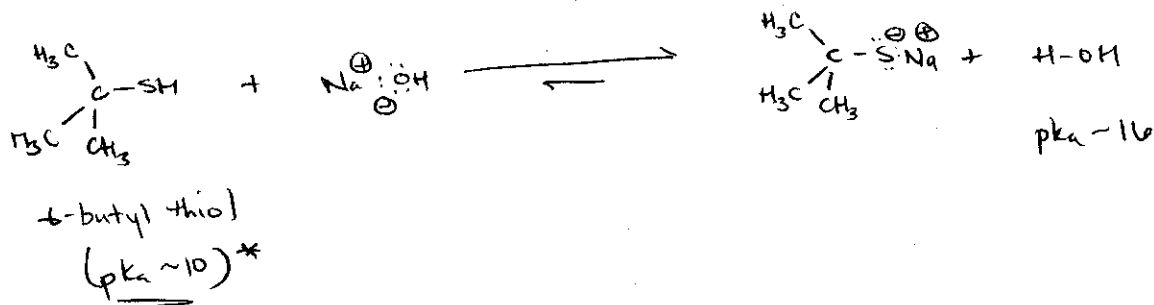
* Quantitatively generate EtO^-Na^+ from EtOH

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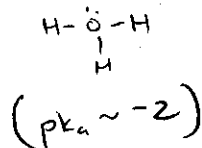
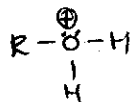
Quantitative Deprotonation of Thiols:

↳ to generate a "Thiolate"

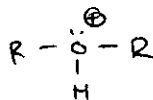


(used to odorize natural gas!)

Alcohols can serve as Brønsted Bases:

Recall: conjugate acid of H_2O Thus:

pKa ~ -2

(conjugate acid
of an alcohol)(conjugate acid
of an ether)

pKa ~ -2

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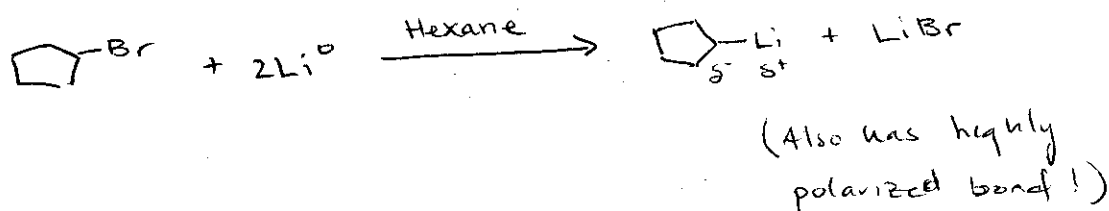
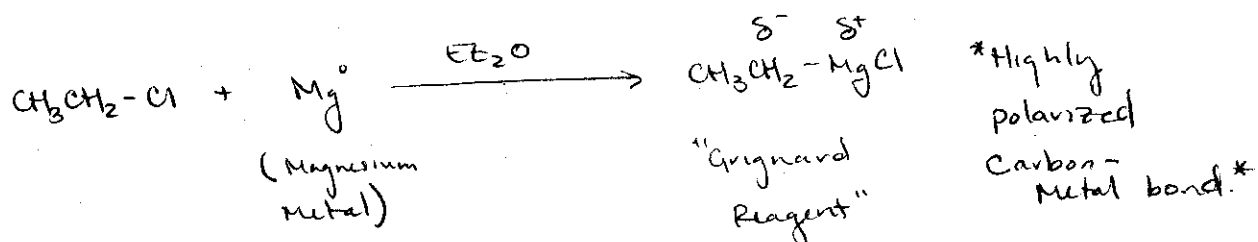
Distinct Reactivity of Alkyl Halides (Cl, Br, I - Not F)

* Formation of Organometallic Reagents

→ Grignard Reagents (Mg)

→ Organolithium Reagents (Li)

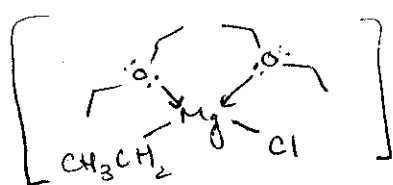
Ex:



** Solvent is crucial in these reactions!

→ For Grignard reagents, Et_2O serves as a Lewis Base, and interacts with Mg

Actual structure of $\text{CH}_3\text{CH}_2\text{MgCl}$

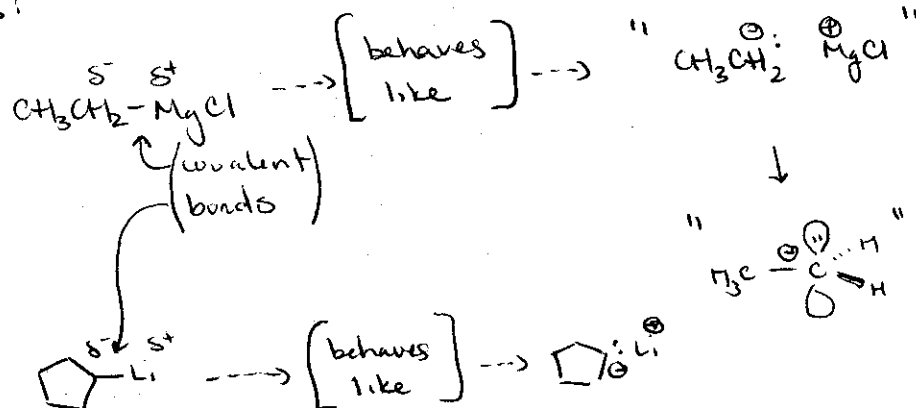
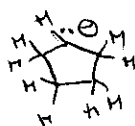


* Diethyl ether lone pairs donate electron density to the Lewis acidic Magnesium

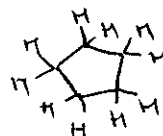
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- Nature of these Reagents: "Carbanion-like"

Thus:* Carbanion-like reactivity!!*Note:

is the conjugate acid of

 $\text{pK}_a \sim 50-60$

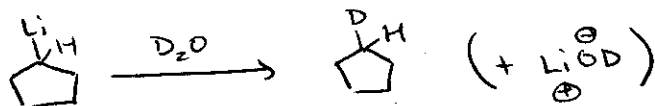
* Since alkanes are very weak acids, their conjugate bases (carbanions) are very strong bases!

Thus: R-MgX and R-Li are very strong bases
($\text{X} = \text{Cl}, \text{Br}, \text{I}$)

Ex: these react rapidly with H_2O .

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Useful for Deuterium incorporation



*Mostly, Reaction with H_2O is problematic!
(or ROH)

CHAPTER 9

Substitution and Elimination Reactions
of Alkyl Halides:

Recommended Problems: 1-5, 8-18, 20-71

~~Substitution Reactions:~~

~~Example:~~

