Overheads: - Outline

Recap Friday: Reactions of Carbonyl Compounds With LG's

** tetrahedral intermediate

General Rule: Better LG leaves!

Acyl halides: - good LG, can use to make all others

Reaction with alcohols: similar to
$$H_2O$$

$$R = C - Br + R'OH$$

$$alcohol$$

$$R = C - Br$$

$$R = C - B$$

Reaction with amines: -same mechanism

$$\begin{array}{c} O \\ R-C-CI \\ \end{array} + H_2NR' \\ \end{array} \longrightarrow \begin{array}{c} O \\ R-C-NHR' \\ \end{array} + HCI \\ \vdots \\ H_2NR' \\ \end{array} + HCI \\ \longrightarrow \begin{array}{c} H_3NR' \\ \end{array} + CI \\ \end{array}$$

** half of amine gets wasted as base! : need 2x H₂NR'

2) Anhydrides: - can be used to make everything except acyl halides

e.g.
$$H_3C-C-O-C-CH_3$$
 + H_2O \longrightarrow $H_3C-C-OH$ + $H-O-C-CH_3$ (LG + H^+ from H_2O)

overall:
$$R-C-O-C-R+H_2O$$
 \longrightarrow 2 $R-C-OH$

-removing H_2O from carboxylic acid gives anhydride

 $dry = anhydrous$

Lab #8:
$$R-C-O-C-R + R'OH$$
 \longrightarrow $R-C-OR' + H-O-C-R$ ester = aspirin

Reaction with amines:

$$R-C-O-C-R + H_2NR' \longrightarrow R-C-NHR' + H-O-C-R \xrightarrow{H_2NR'} H_3NR' \xrightarrow{\Theta} O-C-R$$

$$= again, need 2x H_2NR' \xrightarrow{\Theta} O-C-R$$

$$= (one gets wasted as base)$$

3) Esters: - less reactive than acyl halides and anhydrides ∴ slower reactions ⇒ can only make carboxylic acids and amides

Reaction with H₂O – ester <u>hydrolysis</u>

$$R-C-OCH_3 + H_2O \longrightarrow R-C-OH + H-OCH_3$$
similar bases, : similar LG

- 1) position of equilibrium can be controlled by LeChatellier
- 2) reaction is very slow : need catalyst
- 2 ways to do reaction: acid (H⁺) catalyzed base (OH-) promoted

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B) Acid Catalyzed \Rightarrow in 6 easy steps :-)
          \Rightarrow need to: 1) add Nu- (H<sub>2</sub>O) = not great Nu-
2) kick out LG (CH<sub>3</sub>O-) = not great LG
                                                                                        slow!!
                   : use H<sup>+</sup> catalyst to help Nu<sup>-</sup> add and LG leave
                                                                                                                             no good LG,
                                                                                                                             so add H<sup>+</sup>
                                                                                H_2\dot{O}
                                 R-C-OCH<sub>3</sub>
H^+ makes C more \delta^+
∴ Nu<sup>-</sup> adds faster
                                                                                                                   LG! leaves
       6 easy steps! - same 2 as usual (+ Nu-, -LG)
                           + 4 \text{ extra:} + H^{+} / - H^{+} / + H^{+} / - H^{+}
                                         make C \delta^+
                                                             turn OR into LG
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