Course 343 Lecturer Sam Gellman

Day Friday Date 9-16-16

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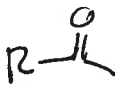
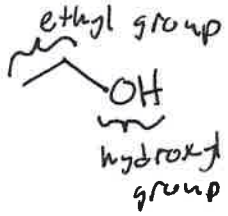
Functional groups: Recall alkyl groups (Me, Et, n-Pr, i-Pr....)

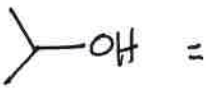
1) ~~OH~~ = "hydroxyl" ~~alcohol~~

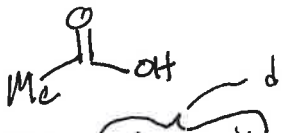
2)  ≡ ~~CO$_2$H~~ ≡ ~~COOH~~ = carboxylic acid

Introduce idea of "R" groups. R = any alkyl group

R–OH = alcohols  = carboxylic acids

Ex: 

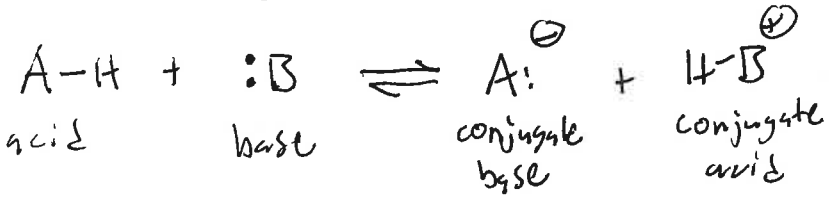
= ethanol (-ol denotes alcohol group)  = isopropanol

Ex: 

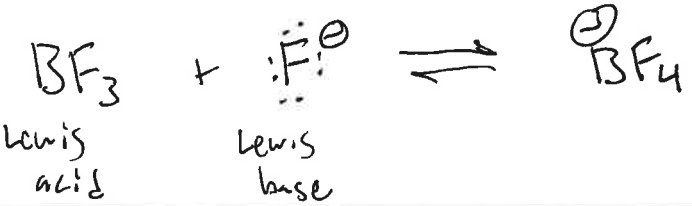
= acetic acid, in vinegar

Even though both have an O–H bond, the pK$_a$ of this bond is very different between the two groups. Affects properties.

Acid - Base Chemistry

Recall: 

Brønsted - Lowry acid base chem.



Lewis acid base theory, electrons are the ones to follow

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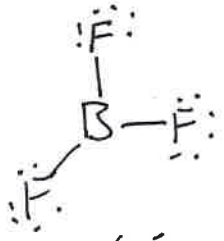
Lewis acid = e⁻ pair acceptor, (e⁻ deficient)

Lewis base = e⁻ pair donor (e⁻ rich)



6 e⁻ around B, e⁻ deficient, can can accept a e⁻

in 3D

empty p-orbital, can donate e⁻ pair to fill borons octet

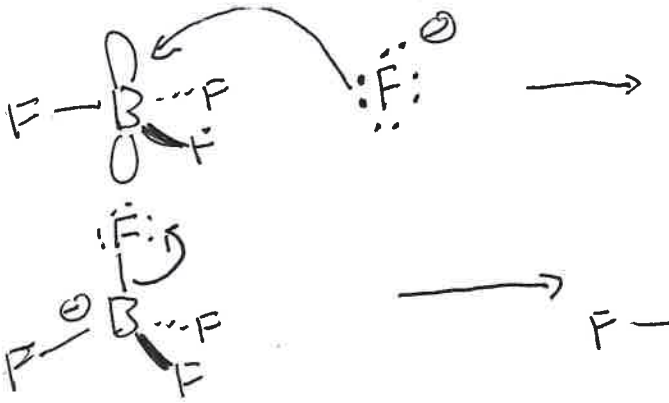
How are reactions occurring? = "Reaction Mechanism"

- Following the "flow" of electrons

Curved arrow notation

1) arrow starts at e⁻ source, (e⁻ donor, aka Lewis base)

2) arrow ends at e⁻ acceptor



e⁻'s in bond came from fluorine lone pair

e⁻'s in lone pair came from B-F bond

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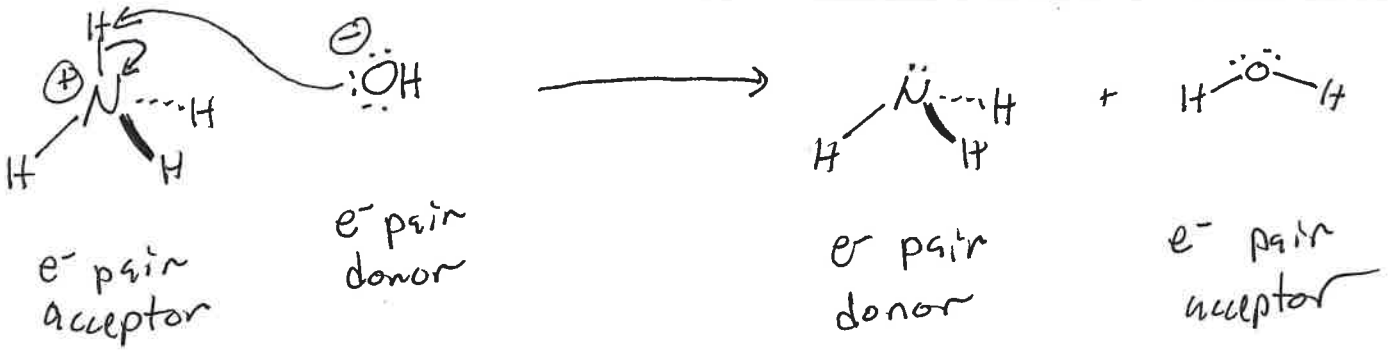

e⁻ pair acceptor

e⁻ pair donor

e⁻ pair donor

e⁻ pair acceptor

- book calls it "electron pair displacement"

$2e^-$ in bond + $2e^-$ in lone pair → $2e^-$ in lone pair + $2e^-$ in bond

Remember ⇒ all Brønsted bases are Lewis bases, all Brønsted acids are Lewis acids. Reverse is not true. Not all Lewis acid/bases are Brønsted acids/bases.

Related Mechanism:

Nucleophilic displacement ~~was~~ reaction

e⁻ pair donor also called Nucleophile

e⁻ pair acceptor also called Electrophile

Nucleophile = nucleus loving

Electrophile = electron loving

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Strengths of Bronsted Acids

$$HA + H_2O \underset{}{\overset{K_{eq}}{\rightleftharpoons}} A^{\ominus} + H_3O^{\oplus}$$

$$K_{eq} = \frac{[A^{\ominus}][H_3O^{\oplus}]}{[HA][H_2O]} \qquad pK_a = -\log K_a$$