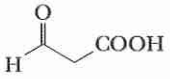
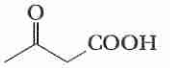
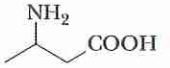
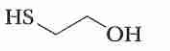
Nomenclature of Carboxylic Acid Derivatives

Table 16.1 Increasing Order of Precedence of Six Functional Groups

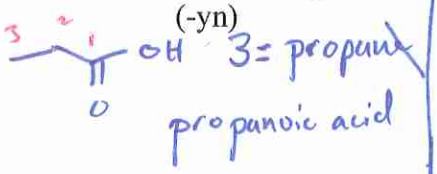
Functional Group	Suffix if Higher Priority	Prefix if Lower Priority	Example When the Functional Group Has Lower Priority
Carboxyl	-oic acid	—	
Aldehyde	-al	oxo-	3-Oxopropanoic acid 
Ketone	-one	oxo-	3-Oxobutanoic acid 
Alcohol	-ol	hydroxyl-	4-Hydroxybutanoic acid 
Amino	-amine	amino-	3-Aminobutanoic acid 
Sulfhydryl	-thiol	mercapto-	2-Mercaptoethanol 

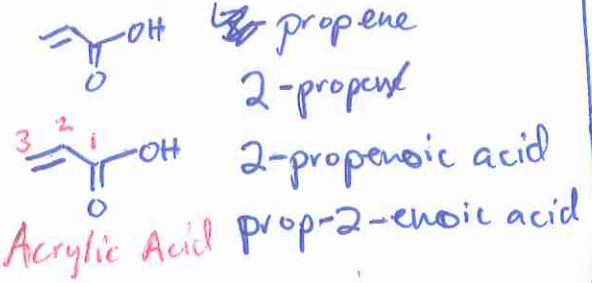
Increasing precedence

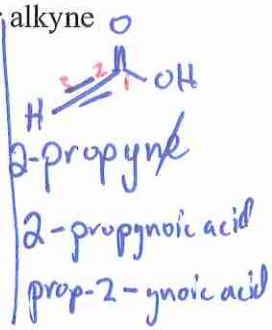
Functional Group	Formula	Prefix	Suffix
Carboxylic Acids	-COOH (-CO_2H)	carboxy-	-oic acid
Carboxylic Acid Esters	-COOR (-CO_2R)	R-oxycarbonyl	-R –oate
Carboxylic Acid Halides	-COCl(F,Br,I)	halocarbonyl-	-oyl halide
Carboxylic Acid Amides	-$CONH_2$	carbamoyl-	-amide
Carboxylic Acid Anhydride			-oic anhydride
Nitriles		cyano-	-nitrile
Aldehydes	-COH	oxo-	-al

Carboxylic Acids

1. Longest parent carbon chain attached to the functional group with highest precedence.
   a. Numbering starts at that functional group down to the end of the chain consecutively
2. Longest parent chain gets: methane, ethane, propane, butane
   a. Drop "e" and add suffix
   b. Don't forget the "an"!
      i. This distinguishes a chain that is an alkane or has an alkene (-en) or alkyne (-yn)

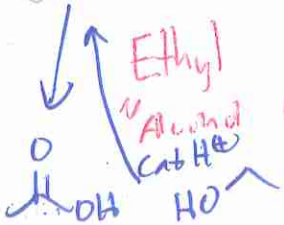







Carboxylic Acid Derivatives

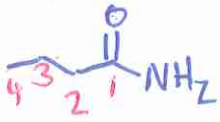
3. Esters
   a. Alcohol component based on longest carbon chain containing the –O- group
      i. Giving the carbon attached to the –O- with the longest number
   b. Use a Space in between the "alcohol" group and the acid
   c. Drop the "e" and replace with "oate"

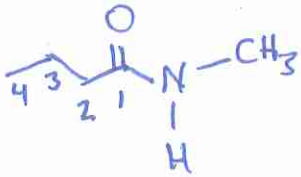
Ethyl Ethanoate

Ethyl Acetate

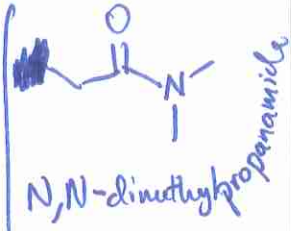
4. Amides
    a. If have a substituent on the Nitrogen, then name as "N-substituent" or "N,N-di*substituent*"
    b. Drop the "e" and replace with "amide"



butanamide

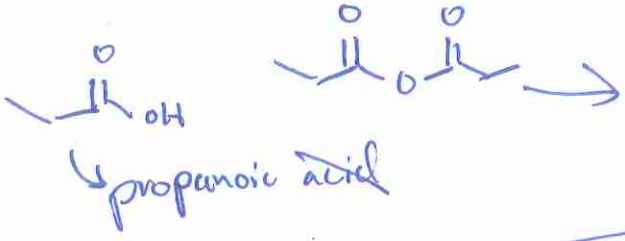


N-methyl butanamide



N,N-dimethylpropanamide

5. Ahydrides
    a. Will always be symmetric for our class so just name group as would carboxylic acids but end with "anhydride" instead of "acid"



propanoic anhydride

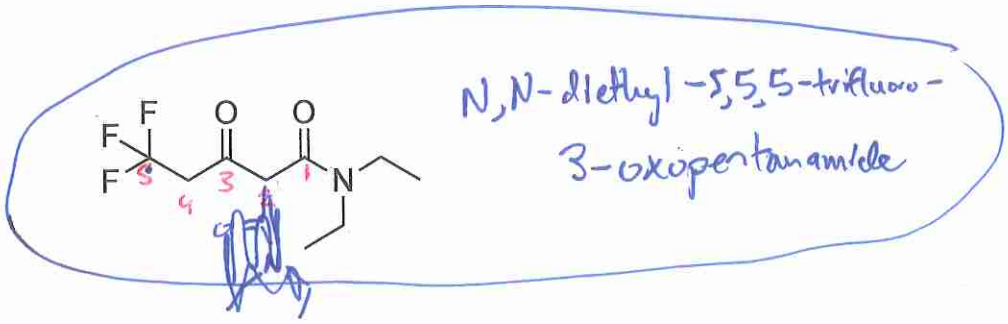
propanoic acid

pentanamide

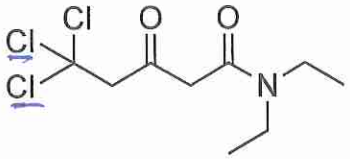
3-oxo

5,5,5-trifluoro

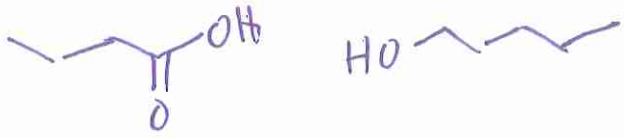
N,N-diethyl



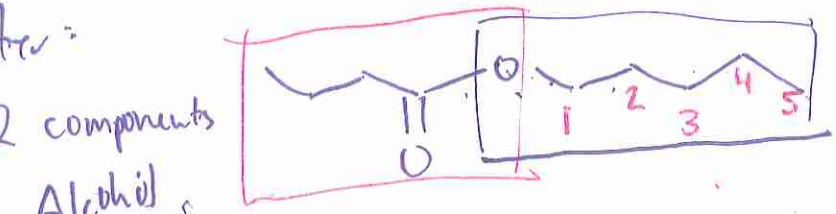
N,N-diethyl-5,5,5-trifluoro-3-oxopentanamide



5,5,5-trichloro-N,N-diethyl-3-oxopentanamide



$H^{\oplus}$



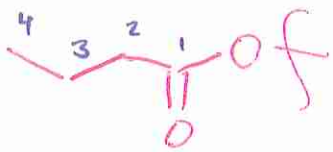
Ester:

2 components

Alcohol

Acid

→ pentanol → Pentyl

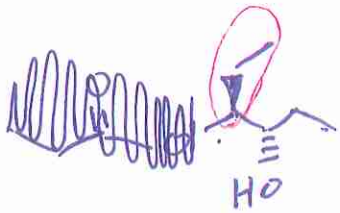


"oate"

butan~~ol~~ → butanoate

Alcohol + "Acid"

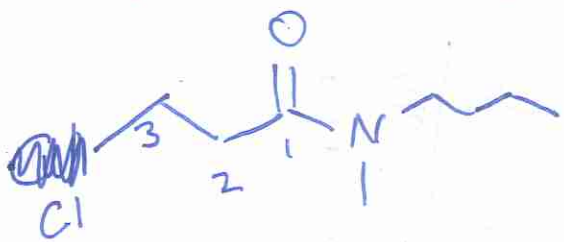
Pentyl butanoate

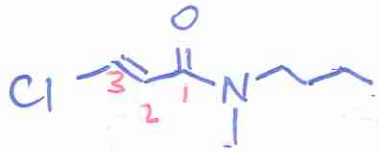


ethyl

pentane

N-butyl-3-chloro-N-methylpropanamide





// N-butyl-3-chloro-N-methylpropanamide

3→ propanamide

N-~~ethyl~~ butyl

N-methyl

3-chloro

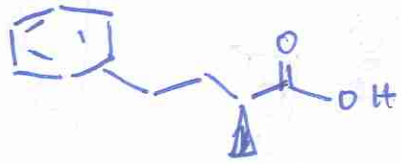
(E)-//

(E)-//

// N-methylprop-2-enamide

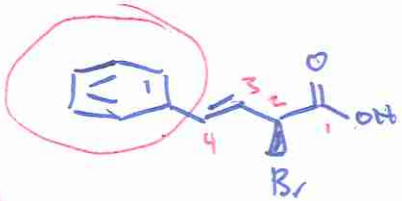
// N-methyl-2-propenamide

(S)-2-bromo-4-phenylbutanoic acid



(S) 4-phenyl

~~(Z)~~ (E) 2-bromo

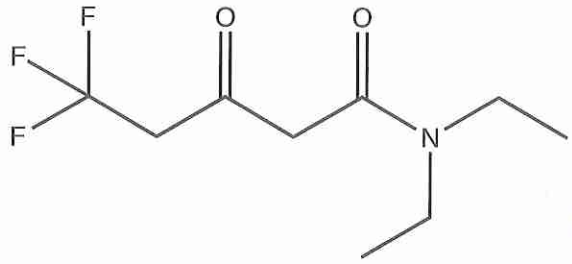


~~butanoic acid~~ 3-butenoic acid

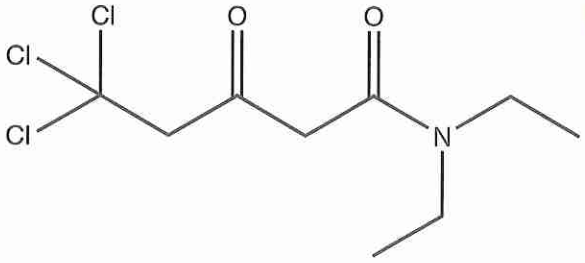
(S) ~~(S),(Z)-~~ (S,E)-2-bromo-4-phenylbut-3-enoic acid

phenyl

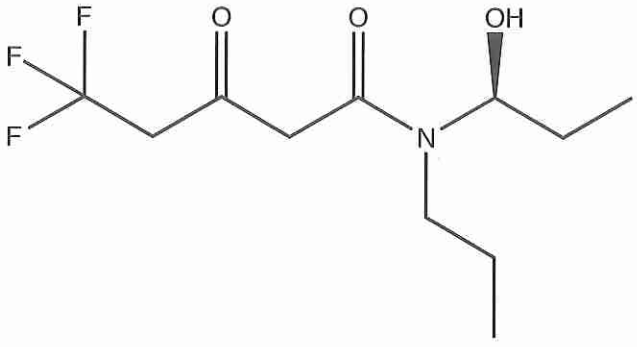
benzyl



N,*N*-diethyl-5,5,5-trifluoro-3-oxopentanamide



5,5,5-trichloro-*N*,*N*-diethyl-3-oxopentanamide



(*S*)-5,5,5-trifluoro-*N*-(1-hydroxypropyl)-3-oxo-*N*-propylpentanamide

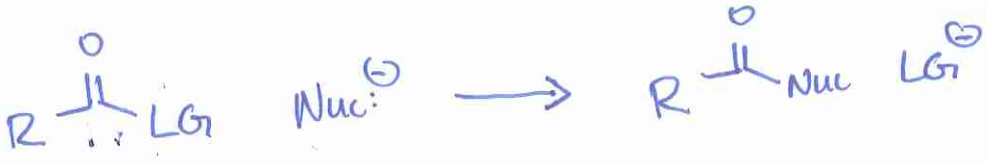
Recognize how groups are ordered ↓ Alphabetical

FYI → how chiral groups on amide are treated → just like any other "group"

Not likely to ever be asked / tested on.

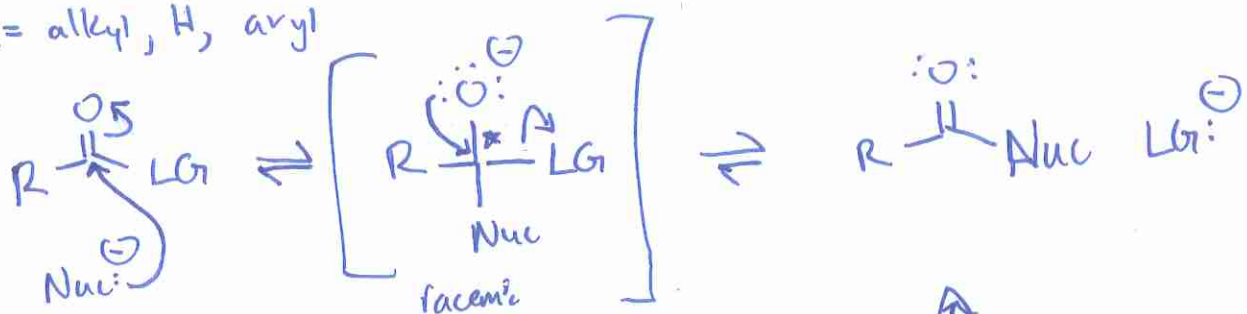
MTW 3/6/2017

Mechanism B:

Overall 

LG = Leaving Group

R = alkyl, H, aryl

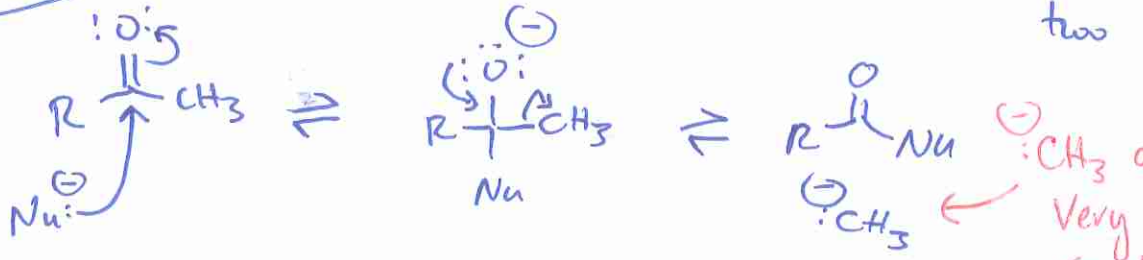


Nuc = Nucleophile

racemic Tetrahedral Intermediate

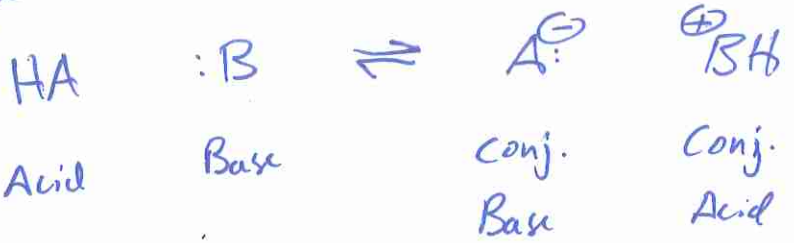
Note there could be proton transfers between these two intermediates

Hypothetical

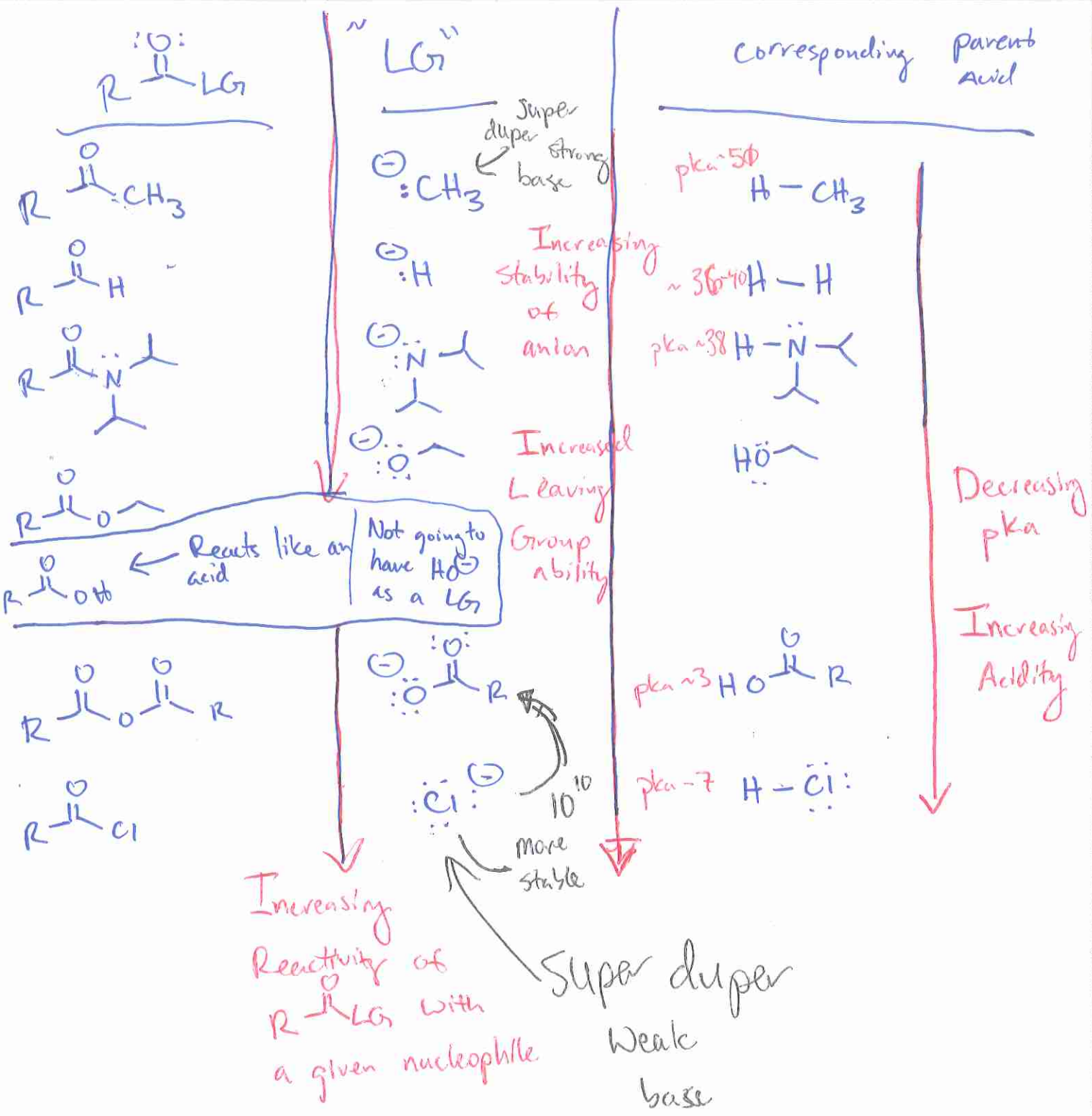


$:CH_3$ as a LG!?! Very unstable anion so this won't happen b/c it isn't a stable anion, thus NOT a LG whatsoever

Acid-Base



HA	:B	A^-	BH^+
Acid	Base	conj. Base	conj. Acid


"LG"
Corresponding parent Acid
Super duper strong base
Increasing stability of anion
Increased Leaving Group ability
Decreasing pka
Increasing Acidity
Reacts like an acid
Not going to have HO⊖ as a LG
pka ~50
pka ~36-40
pka ~38
pka ~3
pka ~7
10^10
more stable
Increasing Reactivity of R-LG with a given nucleophile
Super duper Weak base