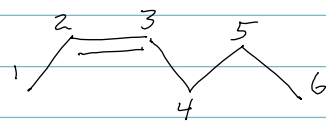


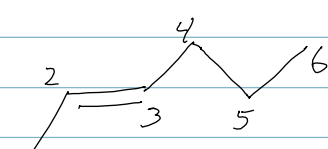
Functional Groups — not the alkane part
 — specific bonding arrangements
 — often include heteroatoms (not C, H)

1) Alkenes: $\begin{matrix} \diagdown & & / \\ & C=C & \\ / & & \diagdown \\ sp^2 & sp^2 & \end{matrix}$ π bond restricts rotation \Rightarrow cis & trans isomerism

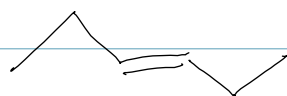
Ex) cis-2-hexene
 cis-hex-2-ene



trans-2-hexene
 (trans-hex-2-ene)



trans-3-hexene



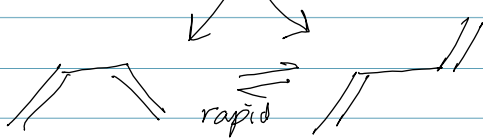
Stereoisomers
 (also known as Geometric Isomers)

constitutional isomers C_6H_{12}
 \downarrow
 Cyclohexane

General formula C_nH_{2n}
 for simple alkenes

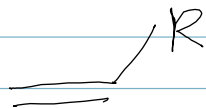
conformers

1,3-butadiene



Simple Alkenes

R = substituent



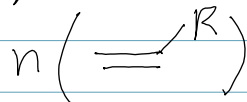
$R=H \Rightarrow$ ethene or ethylene C_2H_4

$R=CH_3 \Rightarrow$ propene or propylene C_3H_6

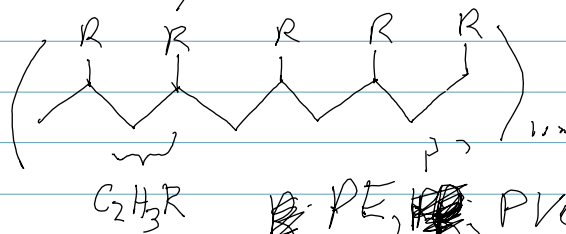
$R=Cl \Rightarrow$ vinyl chloride C_2H_3Cl

$R=phenyl \Rightarrow$ styrene

simple alkene



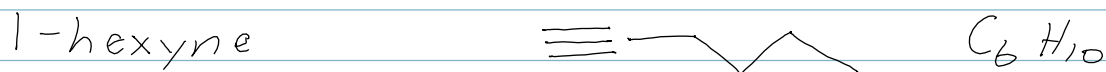
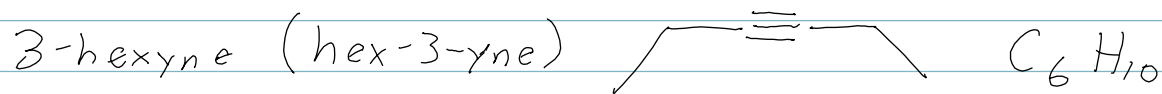
metal catalyst



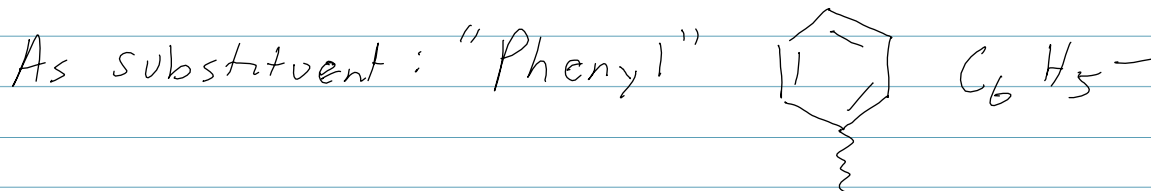
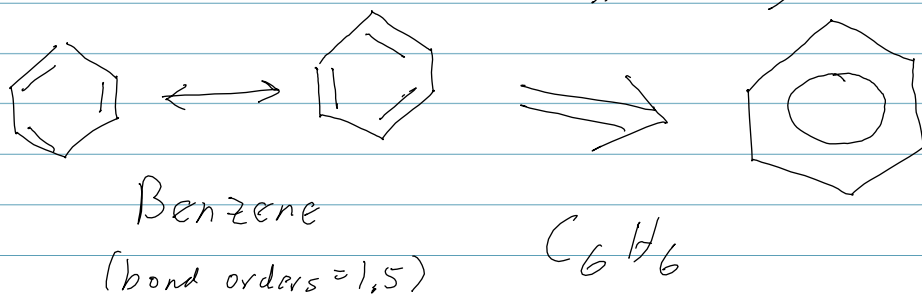
C_2H_3R PE, PVC, PS

Functional Groups (p 2)

2) Alkyne: $\text{—C}\equiv\text{C—}$ 4 atoms in line
 sp sp

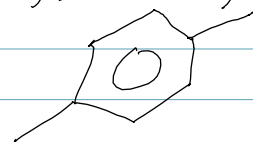
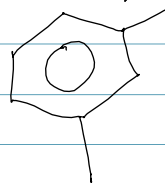


3) Aromatic: most common type - 6 membered rings
 alt // and /

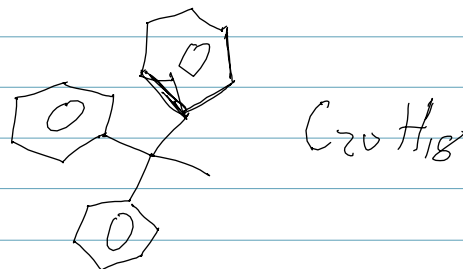


Ex) Xylenes - 3 const. isomers C_8H_{10}

(o)	(m)	(p)
ortho-Xylene	meta-Xylene	para-xylene
1,2-dimethylbenzene	1,3-dimethylbenzene	1,4-dimethylbenzene



Ex) 1,1,1-triphenylethane

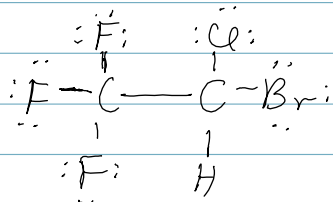


Functional Groups (p 3)

4) Haloalkanes $C-X$ $X = F, Cl, Br, I$

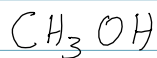
substituent names: fluoro, chloro, bromo, iodo

Halothane: 2-bromo-2-chloro-1,1,1-trifluoroethane

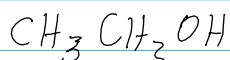
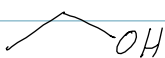


5) Alcohols $C-\overset{\cdot\cdot}{O}-H$ is an excellent H bond donor & acceptor
high b.p. / polar molecules

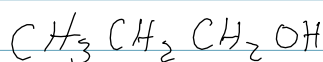
Methanol



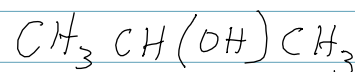
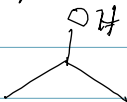
Ethanol



1-Propanol (propan-1-ol)

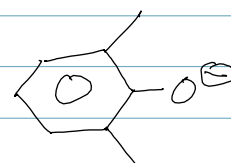
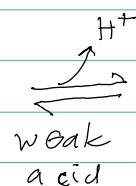
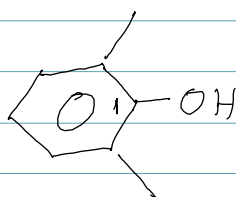


isopropanol (2-propanol)



Phenols: $\text{C}-\text{OH}$

2,6-dimethylphenol

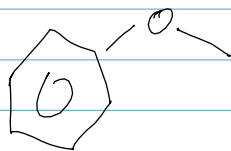


phenolate form

-OH as substituent \Rightarrow "hydroxy"

6) Ether $C-\overset{\cdot\cdot}{O}-C$ Polar. H bond acceptor.

Anisole



methyl phenyl ether

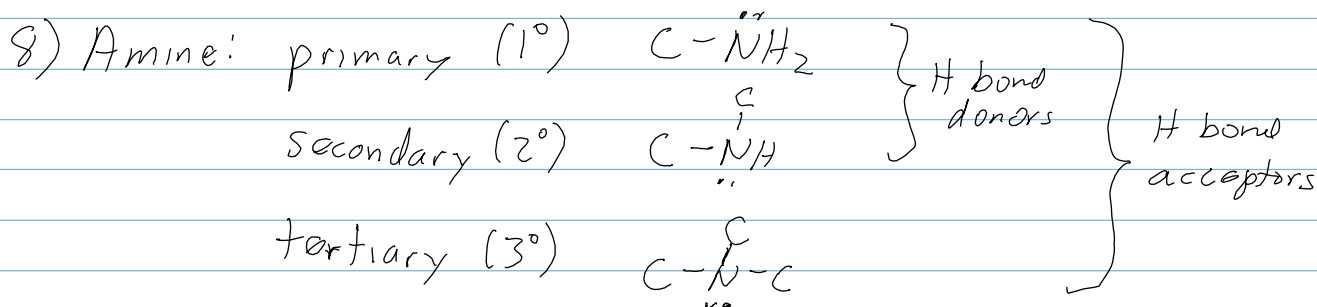
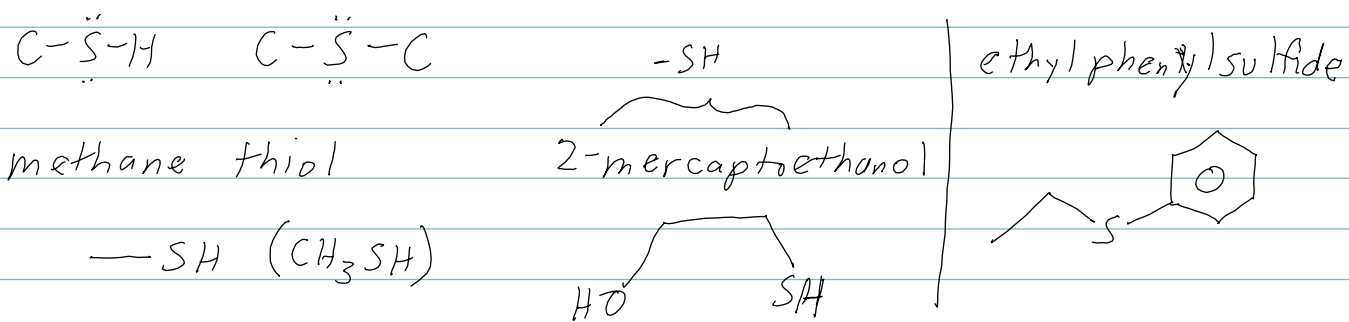
methoxybenzene

"ethoxy" = $\text{CH}_3\text{CH}_2\text{O}$

CH_3O

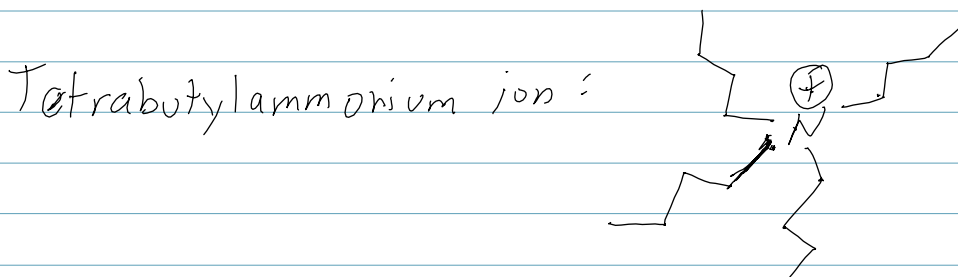
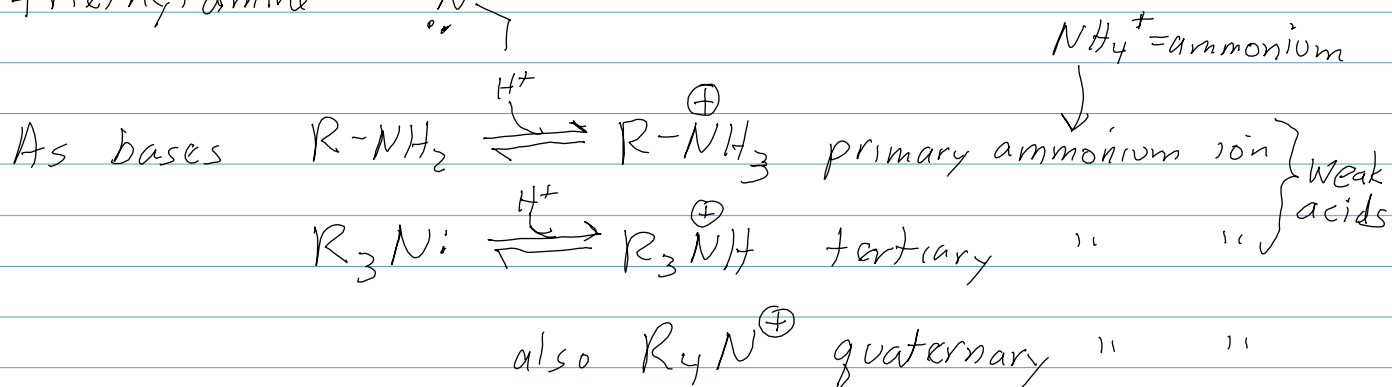
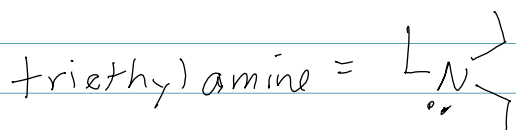
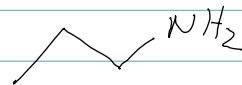
Functional Groups (p 4)

7) Thiols & Thioethers \Rightarrow low polarity, low m.p. (4 b.p.)

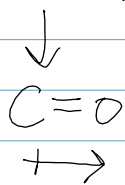


Somewhat polar bonds
rel. high b.p.

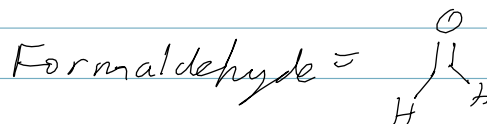
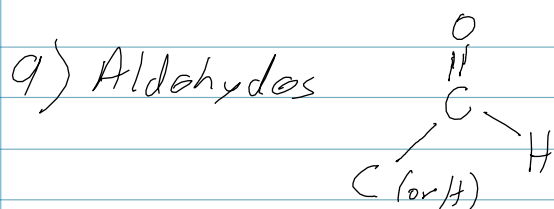
Naming propyl amine
or 1-aminopropane



9 to 13) Carbonyl Function Groups

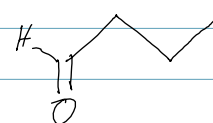


Very polar
rel high b.p. & m.p.

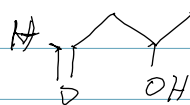


suffix -al

ex) Butanal

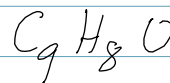
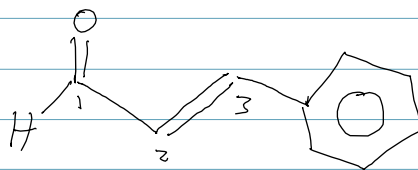


3-hydroxybutanal



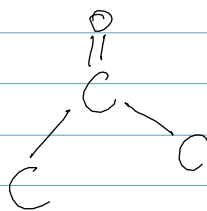
"ene"

Cinnamaldehyde = trans-3-phenyl-2-propenal

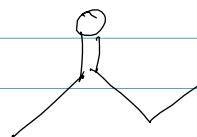


10) Ketone

(solvents)




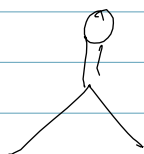
MEK = methyl ethyl ketone



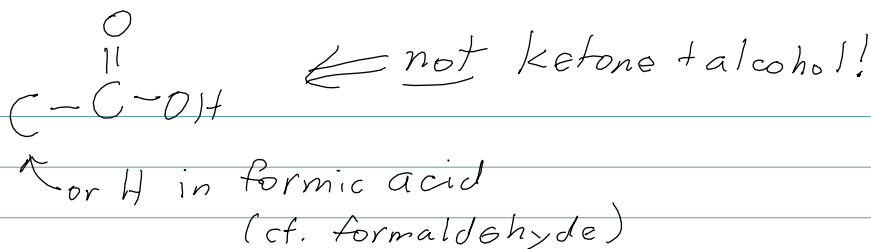
CH_3 adjacent to $C=O$

= 2-butanone

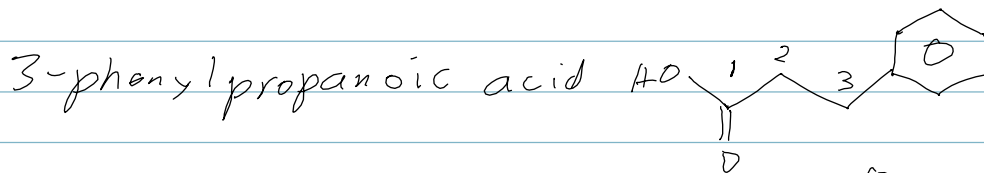
 acetone = 2-propanone



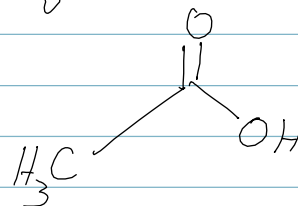
11) Carboxylic Acids



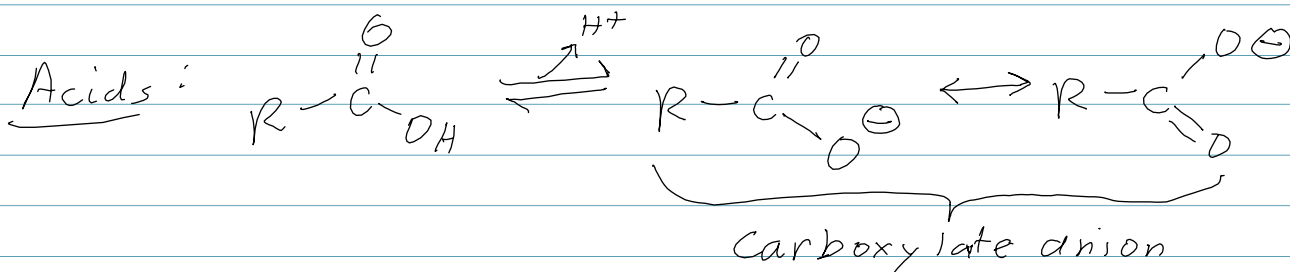
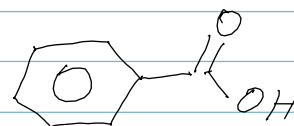
suffix: oic acid



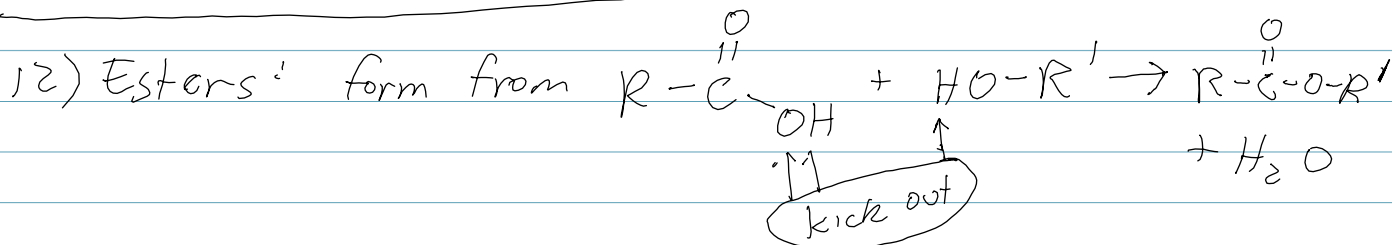
ethanoic acid = acetic acid
CH₃



phenylmethanoic acid = benzoic acid

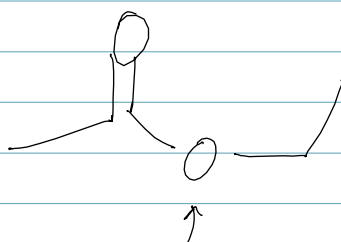
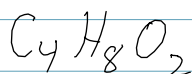


names of anions: 3-phenylpropionate, acetate, benzoate
(-ate suffix)



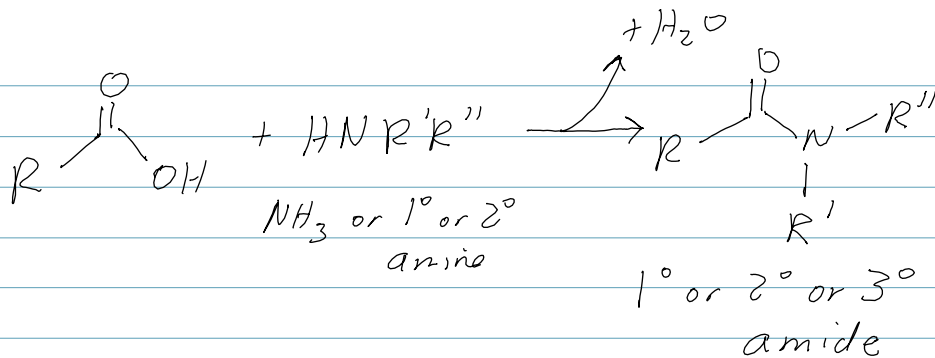
Ex) Ethyl acetate

(solvent)

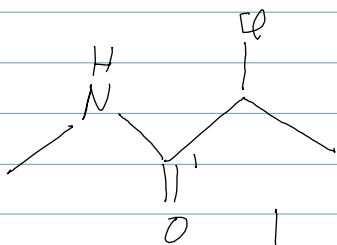


Functional Groups (p 7)

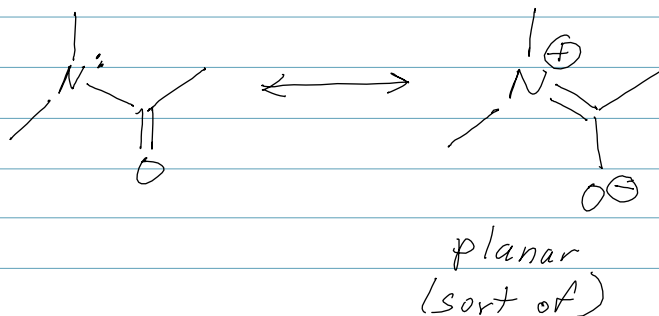
13) Amides



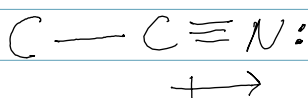
2-chloro-N-methylpropanamide



N,N-dimethylacetamide (DMA)

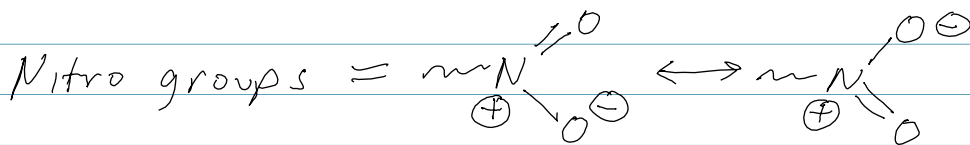


14) Nitriles

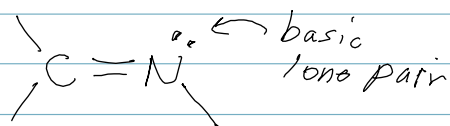


Acetonitrile: CH_3CN
polar solvent

15) Others:

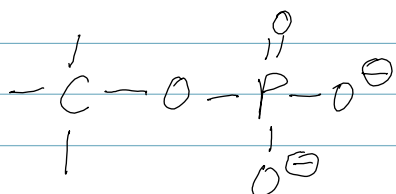


Imine (Schiff base)



Phosphate Esters

monoester



diester:

