(15) **Today**

Section 3.1
Functional Groups

Section 3.2
Alkanes and Isomers

Section 3.3
Alkyl Groups

Section 3.4
Nomenclature

Next Class (16)

Section 3.4
Nomenclature

Section 3.5 - 3.7 Properties and
Conformations of Alkanes

Chap 4 Cycloalkanes

(17) **Second Class from Today**

Chap 4 Cycloalkanes

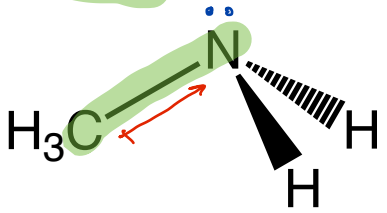
Third Class from Today (18)

Chap 4 Cycloalkanes

Today's office hours postponed to tomorrow.

Tomorrow's office hours 11:15 to 12:45.

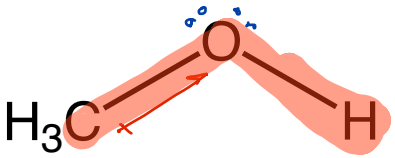
Amines

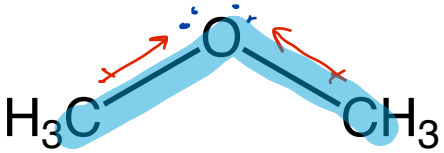


amino acid

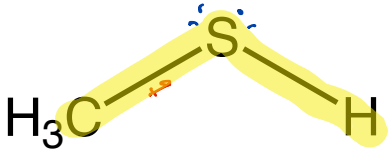
rotting fish makes a lot of amines

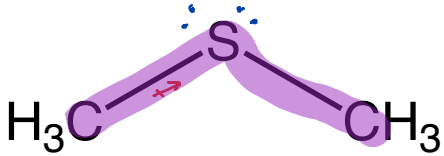
Alcohols and Ethers





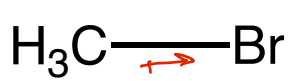
Thiols and Thioethers



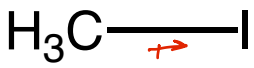


Alkyl Halides

$Cl^{\ominus}$



$Br^{\ominus}$



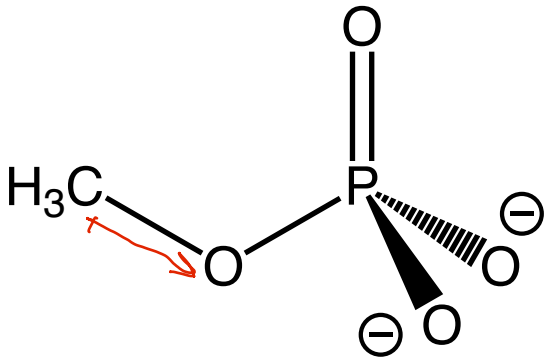
$I^{\ominus}$

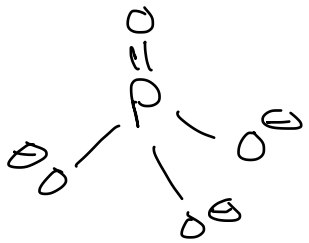
alkyl (adj) form of alkane (n)

C is ⊕

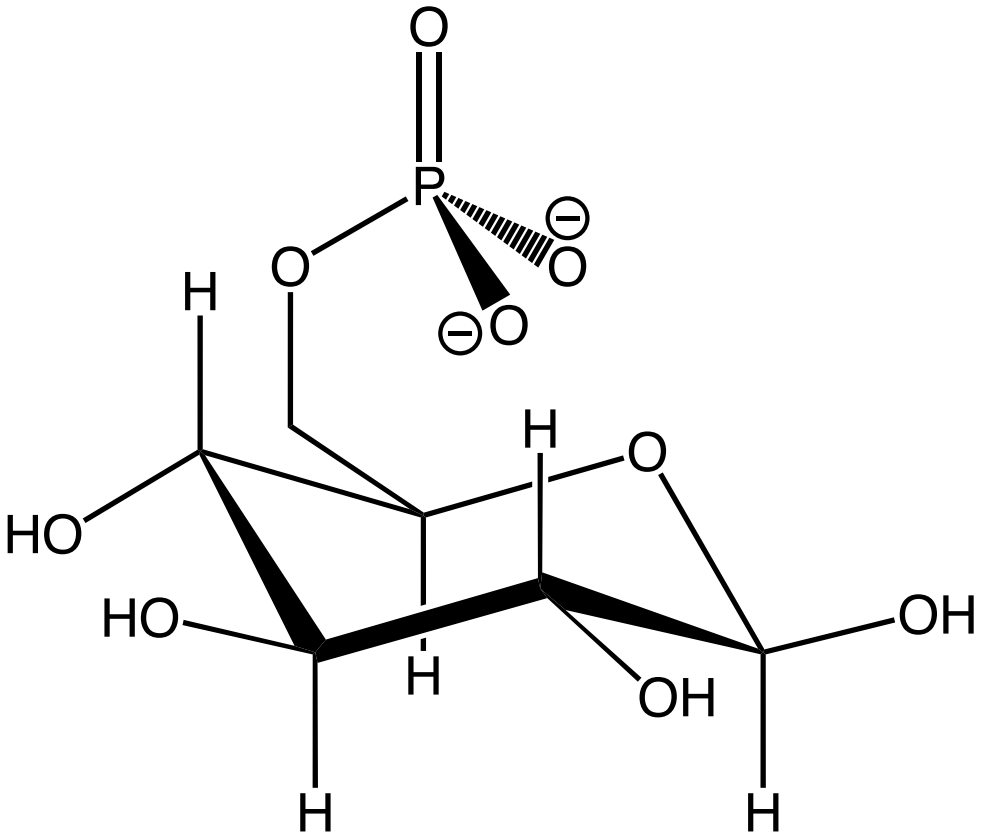
halogens form stable anions

Organophosphates

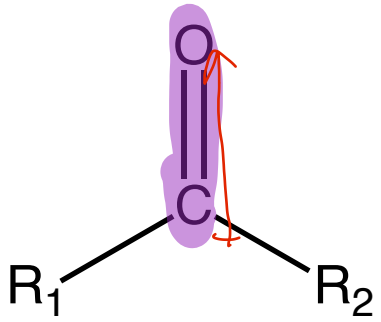


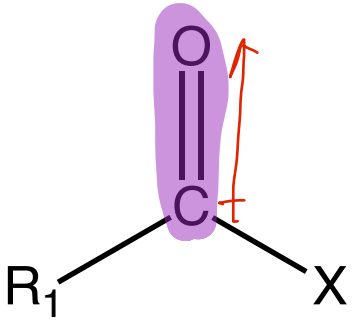


a stable ion



glucose-6-phosphate





$R_1 = CH_3$ $R_2 = CH_3, CH_2CH_3, CH_2CH_2CH_3$

R and X are used as "variables"

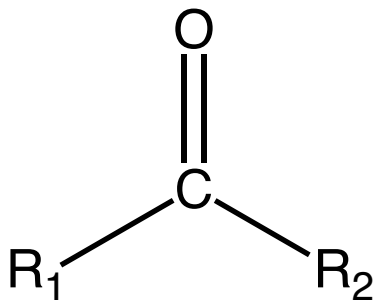
R is used for C or H

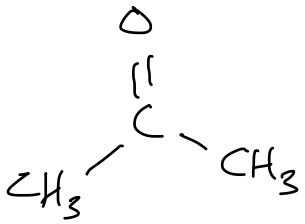
X is used for elements with lp e^-'s

~~F~~, Cl, Br, I, O, N, S

Both groups will have very ⊕ C atoms

Ketones

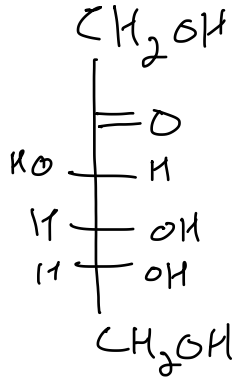




acetone

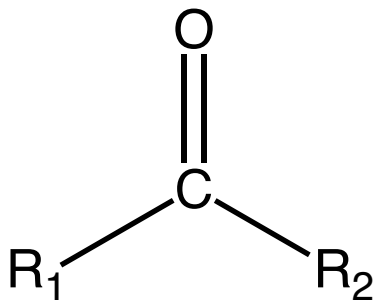
R_1 or $R_2 \neq H$

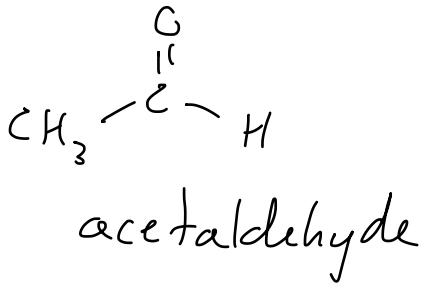
Only C atoms connected to the C=O C atom



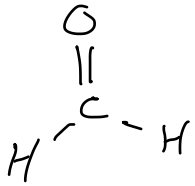
D-Fructose

Aldehydes





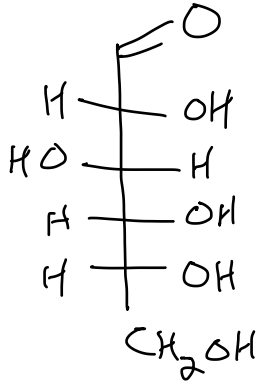
acetaldehyde



Formaldehyde

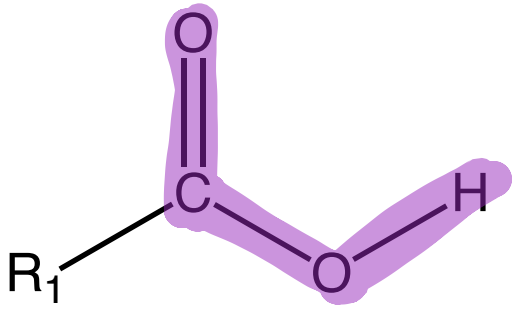
R_1 or $R_2 = H$

At least 1 H atom connected to C=O C atom



D-glucose

Carboxylic Acids and Esters

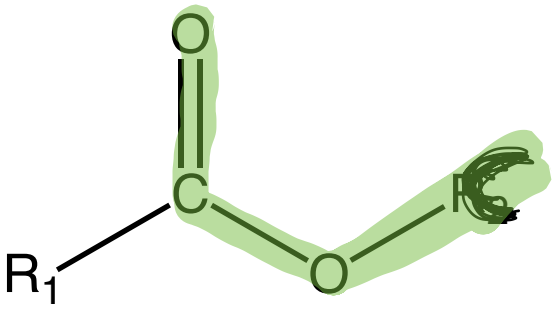


OH on same C as C=O C

amino acid

fatty acids

R_1 = H or $R_1 \neq$ H

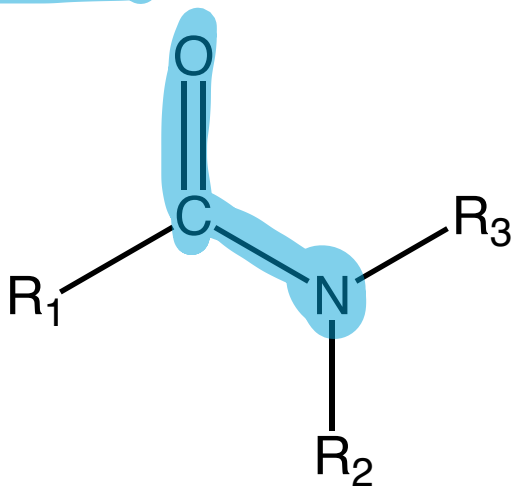


lipids

OC on same C as C=O C

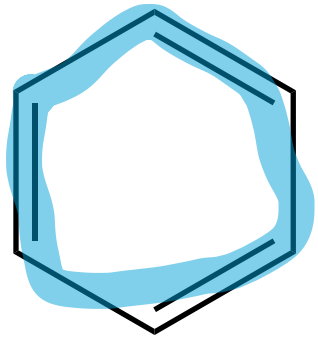
R_1 = H or $R_1 \neq$ H but $R_2 \neq$ H

Amides



N bonded to C of C=O

"peptide bond"



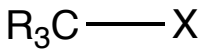
3 pairs of e⁻'s in a ring of π bonds

benzene & substituted benzene rings

Grouped to highlight which ones have similar reactivities

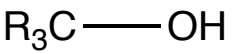
alkenes

alkynes

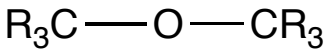


X = Cl, Br, I

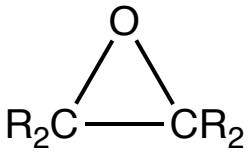
Alkyl Halides



alcohols

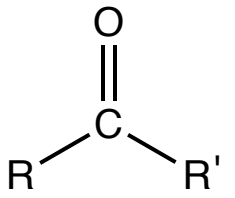


ethers

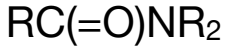


epoxides

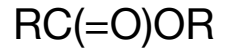
and more…



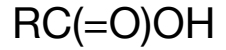
ketones (R, R'≠ H) and aldehydes (R or R' = H)



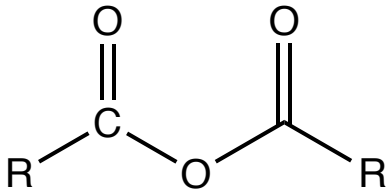
amides



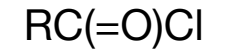
esters (R ≠ H)



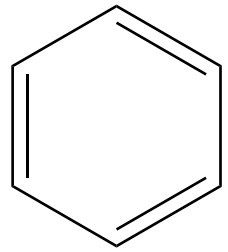
carboxylic acids



anhydrides



acid chlorides



aromatics

and more…

Nomenclature of Alkanes

Early names were based on the number of C atoms in the alkane, and the names came from a variety of places — and we're "stuck" with them for the first four

CH_3OH methanol the name is derived from a word coined by French chemists, Jean-Baptiste Dumas and Eugene Peligot, from "methy" (Greek for alcoholic liquid)" + hȳlē (Greek for "forest, wood, timber, material")[2]

1 C atan

CH_3CH_2OH "eth" to distinguish it from méthylène derived from French and German chemists "äthyl" in German[3]

2 carbons

$CH_3CH_2CO_2H$ based on observation that it was the first (shortest chained) carboxylic acid that behaved like a fatty acid

pro (from protos for first) + pion (from pion for fat) => propionic acid[4]

3 carbons

$CH_3CH_2CH_2CO_2H$ isolated from butter => butyric acid[5]

4 carbon

[2] https://en.wikipedia.org/wiki/Methanol#History

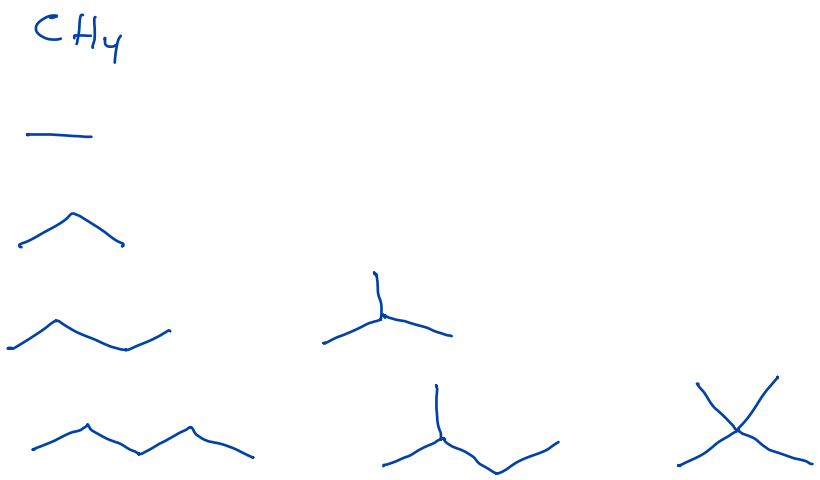
[3] https://chemistry.stackexchange.com/questions/142839/why-is-ethane-in-methane, https://gallica.bnf.fr/ark:/12148/bpt6k6569005x/f15.item

[4] https://en.wikipedia.org/wiki/Propionic_acid

[5] https://en.wikipedia.org/wiki/Butyric_acid

Nomenclature of Alkanes: Original Scheme based names on number of C atoms present

methane	CH_4
ethane	C_2H_6
propane	C_3H_8
butane	C_4H_{10}
pentane	C_5H_{12}
hexane	C_6H_{14}
heptane	C_7H_{16}
octane	C_8H_{18}
nonane	C_9H_{20}
decane	$C_{10}H_{22}$
undecane	$C_{11}H_{24}$
dodecane	$C_{12}H_{26}$



Nomenclature of Alkanes: Original Scheme based names on number of C atoms present

methane	CH_4	1 isomer
ethane	C_2H_6	1 isomer
propane	C_3H_8	1 isomer
butane	C_4H_{10}	2 isomers
pentane	C_5H_{12}	3 isomers
hexane	C_6H_{14}	5 isomers
heptane	C_7H_{16}	...
octane	C_8H_{18}	
nonane	C_9H_{20}	
decane	$C_{10}H_{22}$	
undecane	$C_{11}H_{24}$	
dodecane	$C_{12}H_{26}$	

bad idea

names will be based on the longest string of C atoms