Office Hours: M 1:30pm - 3:00pm
(in Park 169) W 11:00am - 12:00pm
or by appointment (email me)
or just email me with questions!

TA Hours w/ Sodtugs: T&Th 7:00pm - 8:00pm
(in Park 273)

Q-center: https://www.brynmawr.edu/inside/offices-services/q-center/q-center-schedule

Drawing and Naming Organic Molecules

9/9/2026

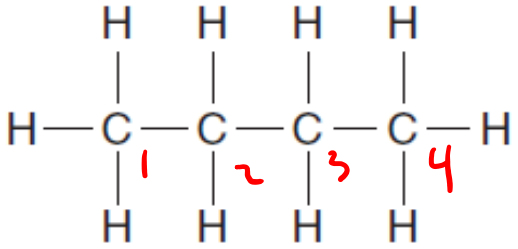
Quiz 1 in Recitation on Friday

everything before functional groups

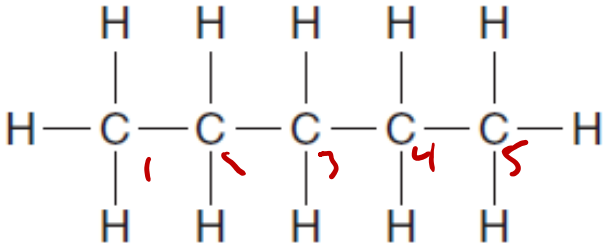
Chemistry ice cream social

This Friday 4pm in Park atrium courtyard

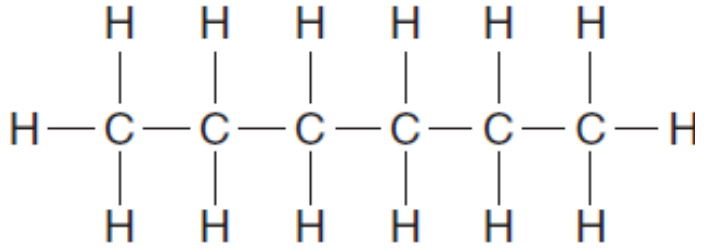
Drawing Molecules: Bond-Line Structures



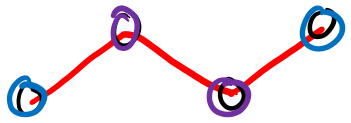
Butane
(C_4H_{10})



Pentane
(C_5H_{12})



Hexane
(C_6H_{14})



The longest Carbon chain is drawn in a "zig-zag" format

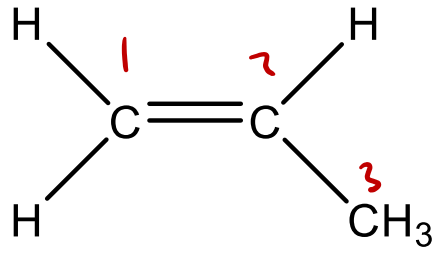
C never makes more than 4 bonds!

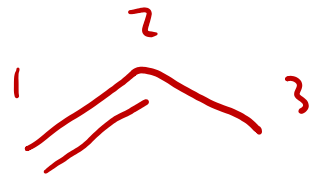
Carbons are represented as endpoints or corners of lines.

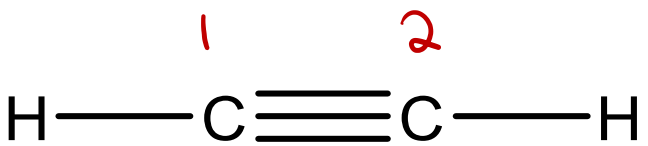
Hydrogens attached to Carbons are not shown.

[Assume each Carbon makes a total of 4 bonds to determine the number of implied Hydrogens]

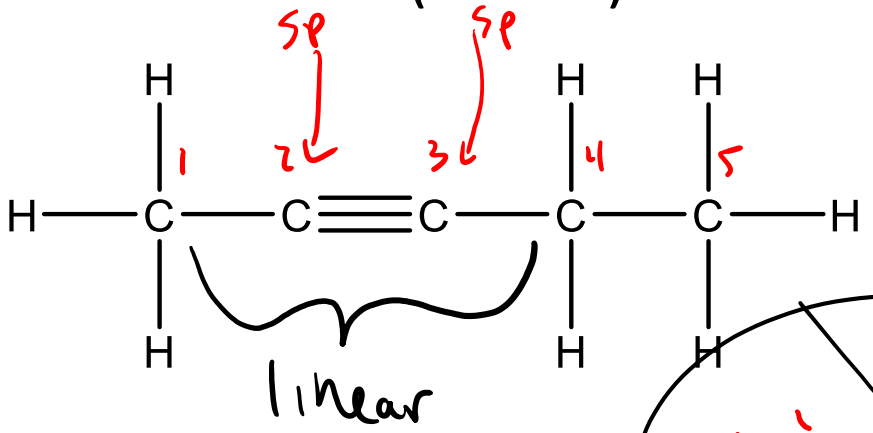
Carbon-Carbon multiple bonds are shown with multiple lines

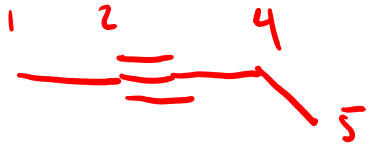


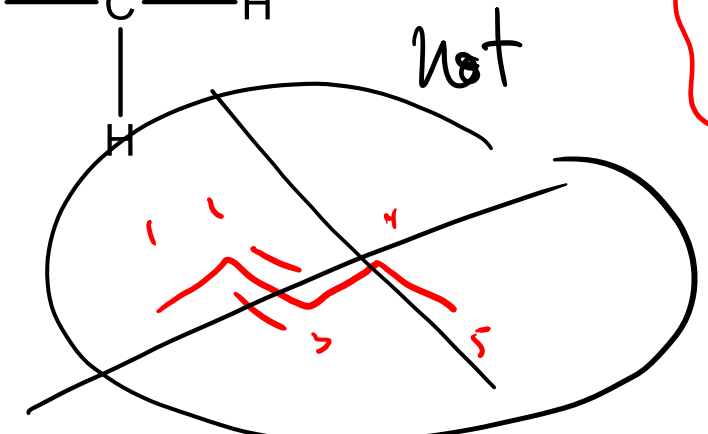


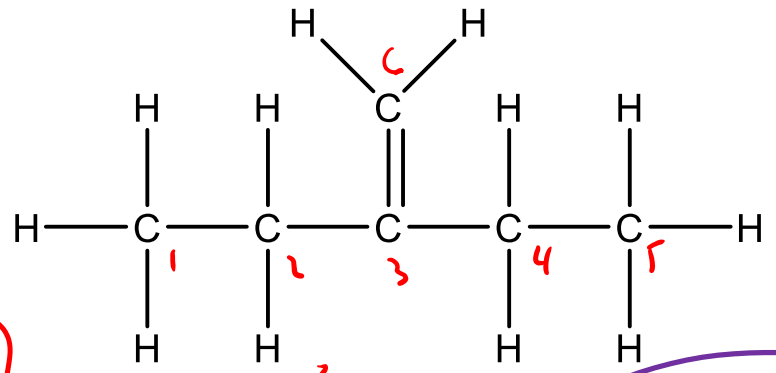


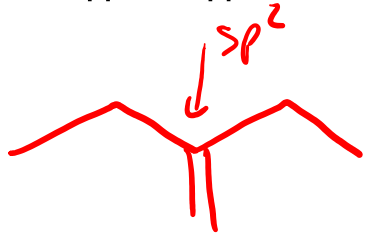
The geometry of the bond-line structure should reflect the hybridization of each carbon! (VSEPR)

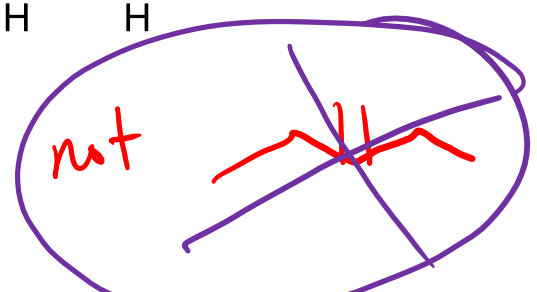






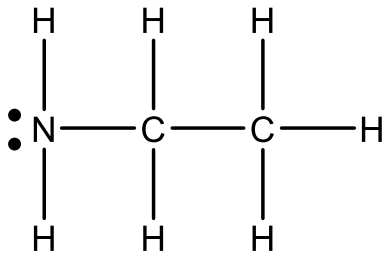


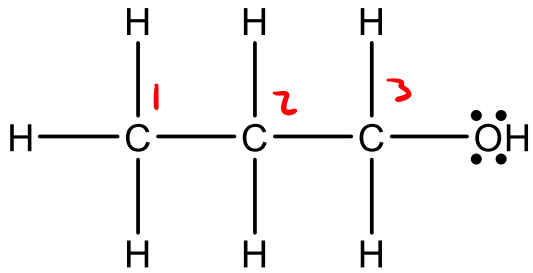




Heteroatoms (not C or H) are always drawn

Heteroatoms always have their number of H's labeled clearly

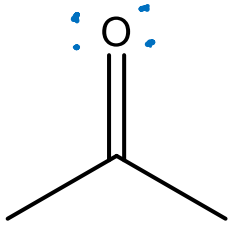


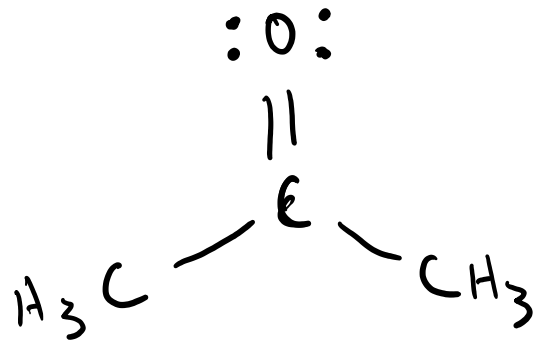


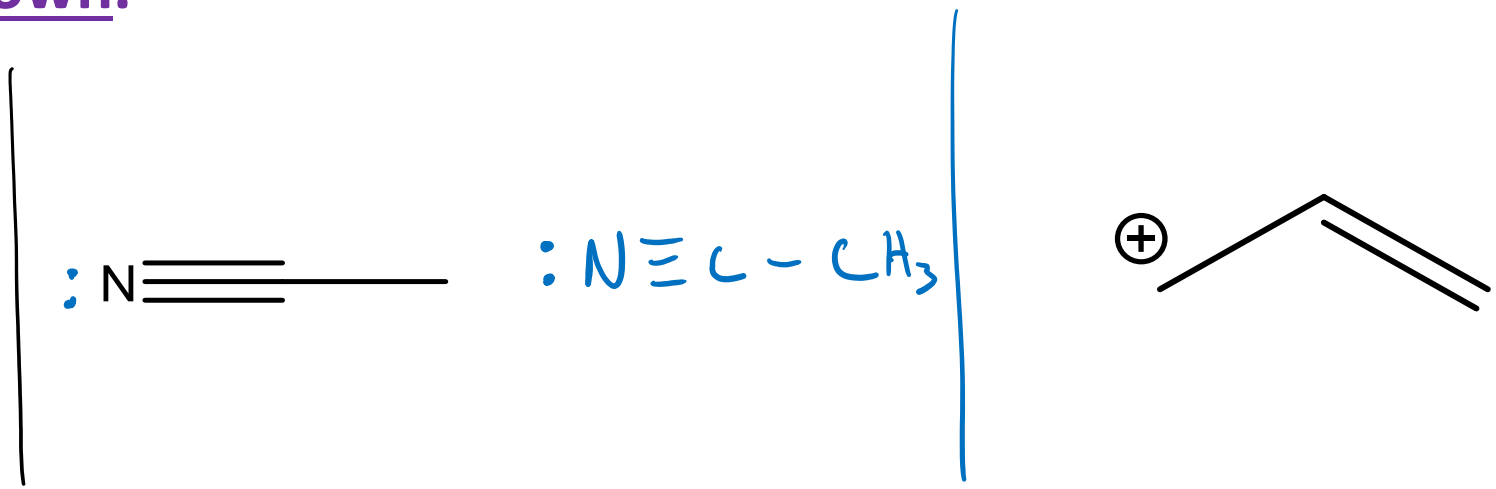
always draw in "implied" lone pairs!

Lone pairs are *not shown* in bond-line structures, but

Formal charges are **always shown.**





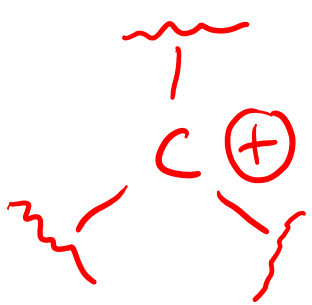


Nonzero formal charges: Carbon

Carbon never makes more than 4 bonds, but sometimes it makes fewer:

carbocation : carbon w/ ⊕ formal charge.

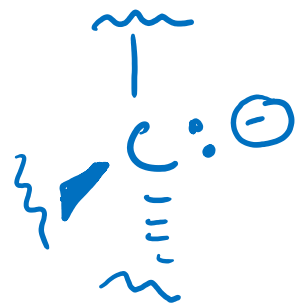
3 bonds, no lone pair



- no lone pair.
- no octet
- sp^2
- trig planar

carbanion : carbon w/ ⊖ formal charge

3 bonds, 1 lone pair

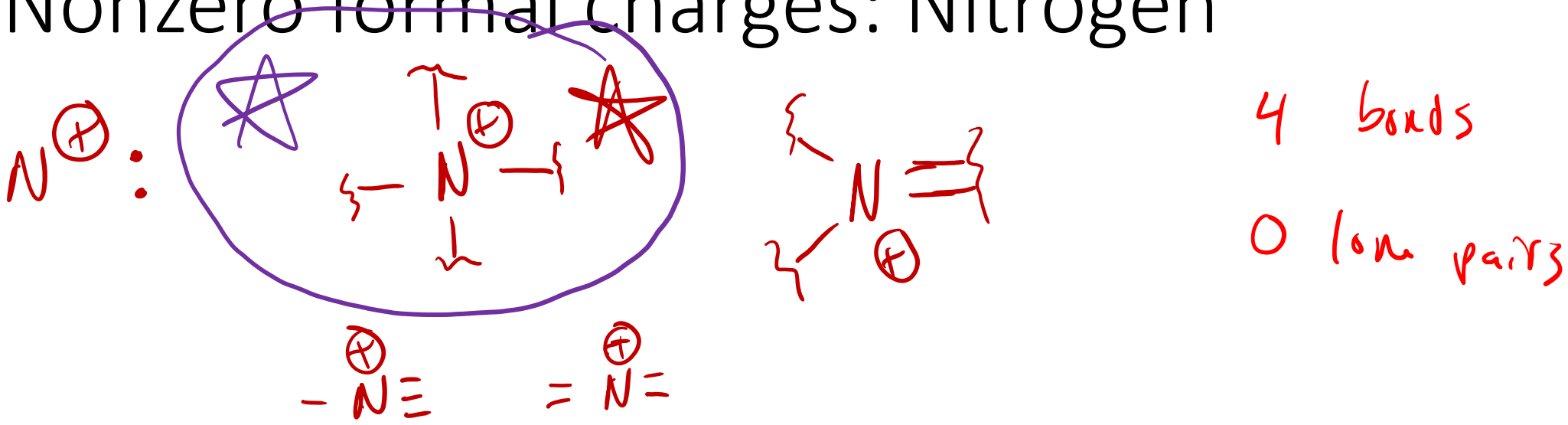


- has lone pair
- has octet
- sp^3
- tetrahedral

a ⊕ or ⊖ on carbon accounts for "one bond" out of 4.

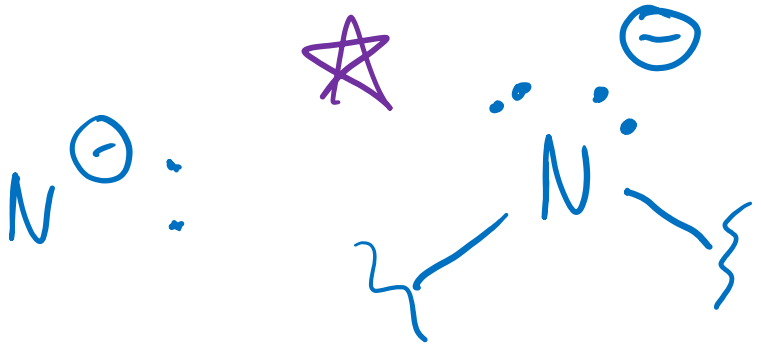
↑ sp hybridized

Nonzero formal charges: Nitrogen



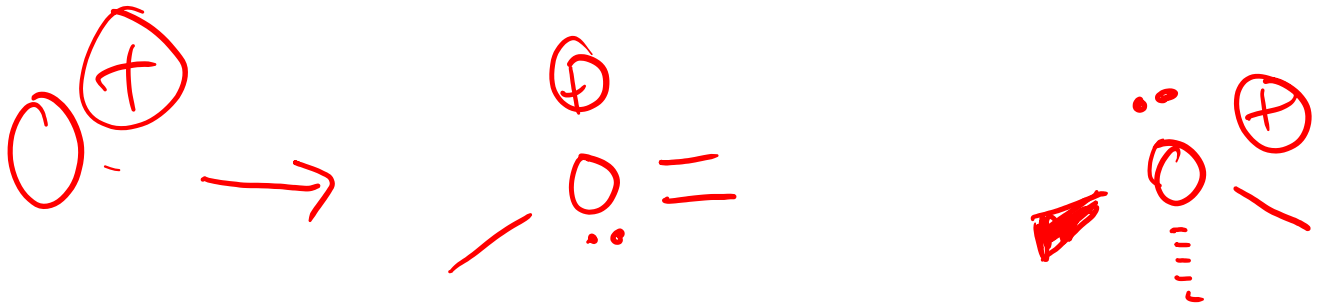
4 bonds

0 lone pairs



2 bonds, 2 lone pairs

Nonzero formal charges: Oxygen



3 bonds,

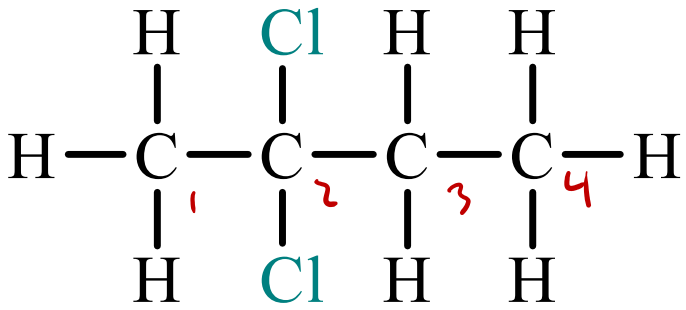
1 lone pair

1 bond

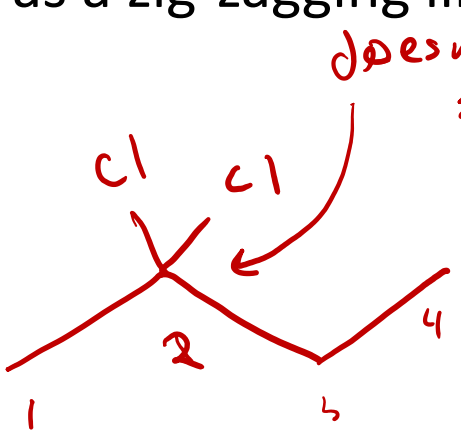
3 lone pairs

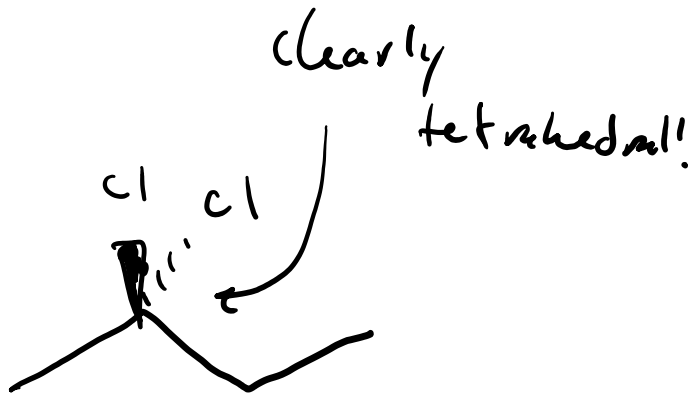
Bond-line structures and 3D geometry

The longest chain of Carbons is drawn as a zig-zagging line



tetrahedral





*both representations are common & correct. Right is more descriptive.

Substituents of **sp³** carbons are often (but not always*) drawn with:

Wedges  (bond is coming out of the plane of the paper, toward you)

&

Dashes  (bond is going into the plane of the paper, away from you)

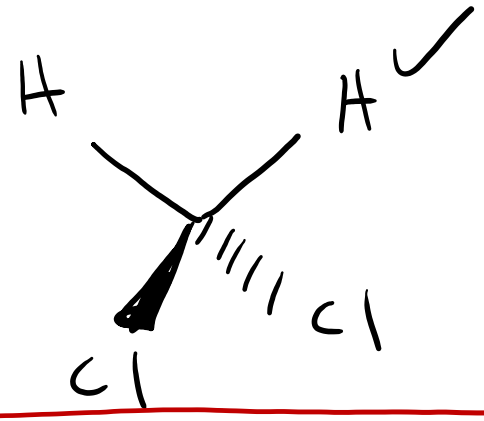
**much discussion of when these must be used and why is coming soon in Chapter 5 (lectures 8-9).*

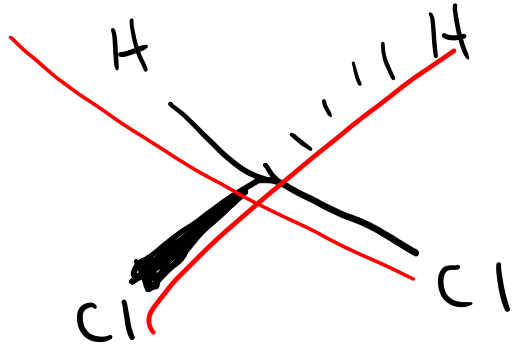
Bond-line structures and 3D geometry

not "across from" each other.

★ Wedges and dashes are always drawn <u>next to</u> each other

CH_2Cl_2

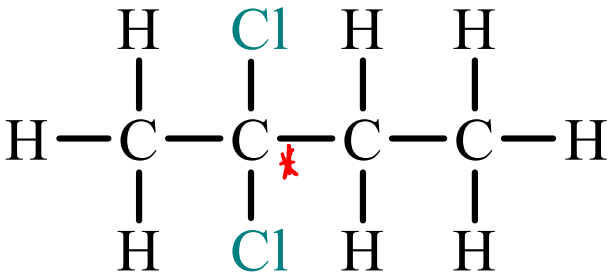


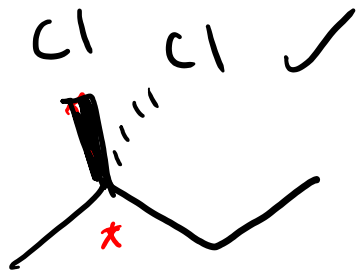


looks like a square planar.

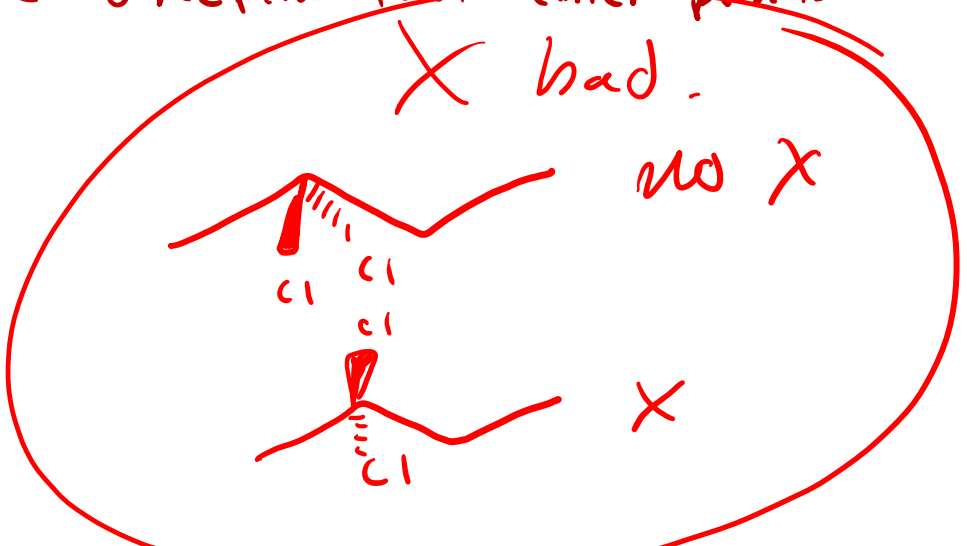
Wedges and dashes point "away from" the rest of the chain in order to represent tetrahedral geometry

↳ in same direction that ~~enter points~~



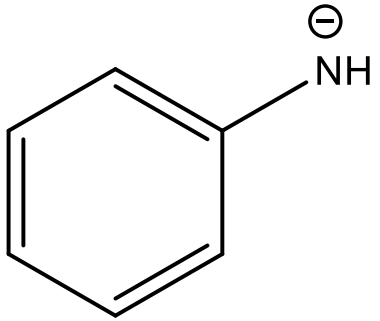


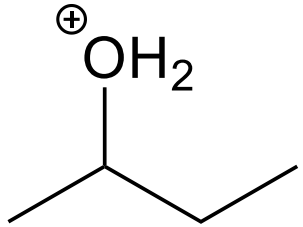
X bad.

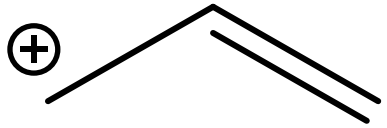


Practice (on your own – answers in annotated slides on Moodle)

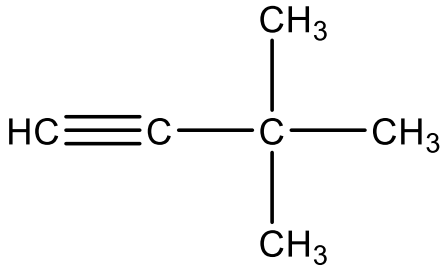
Draw full (or condensed) structures w/lone pairs

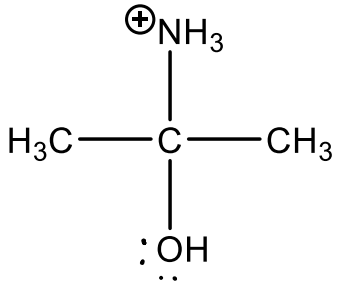


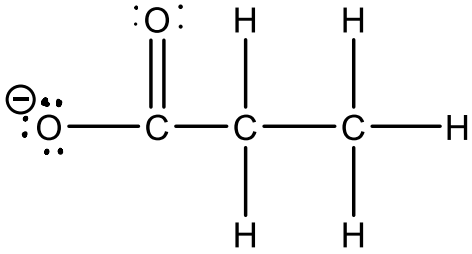




Draw bond-line structures

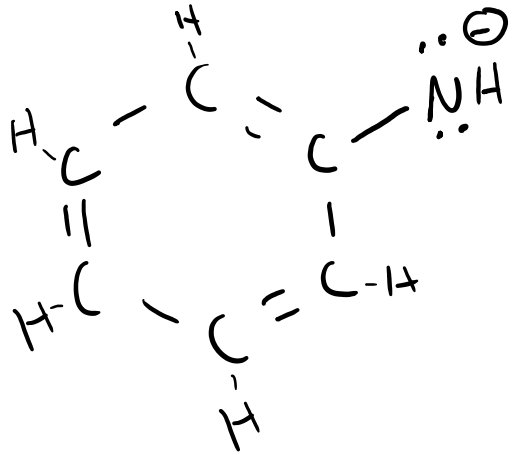


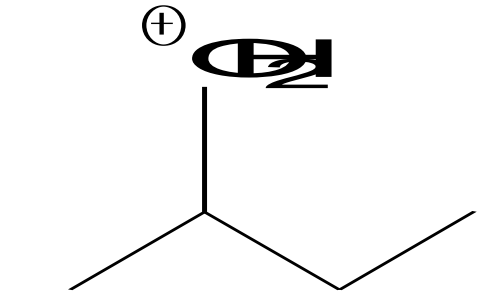


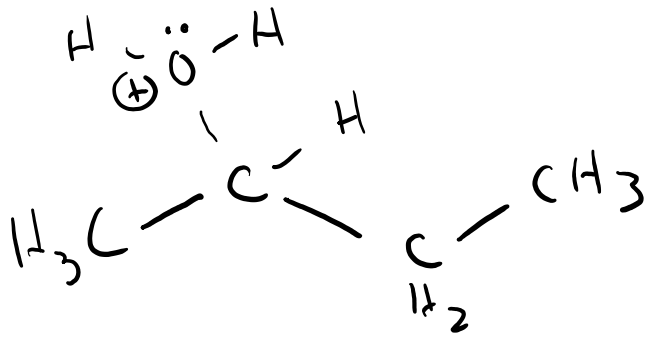


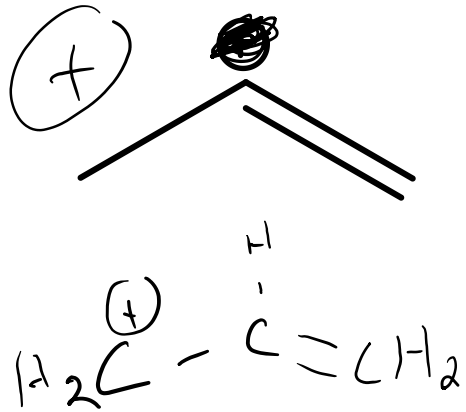
Practice

Draw full structures w/lone pairs

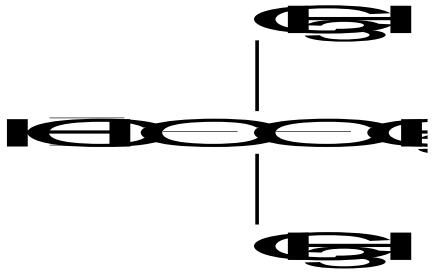


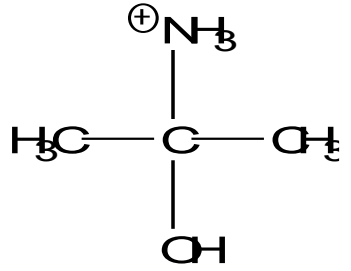


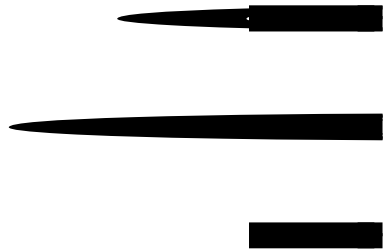


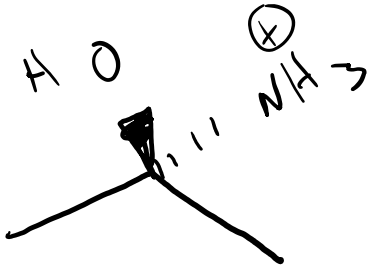


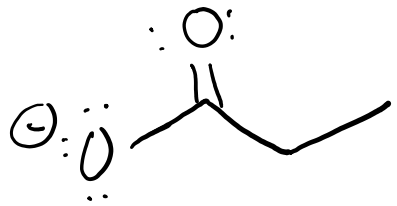
Draw bond-line structures











Functional groups (table 2.1 on page 56 in Klein)

END QUIZ 1 MATERIAL

- Organic molecules are classified via certain bonding motifs among Carbon & friends (C, H, O, N, P, S, X)
- Functional groups determine reactivity (in the lab & in the body)

R = "rest of molecule" - usually means a "carbon fragment"

TABLE 2.1 EXAMPLES OF COMMON FUNCTIONAL GROUPS

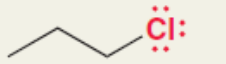
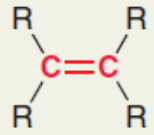
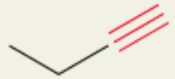
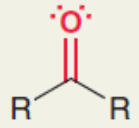
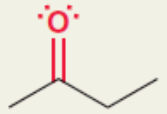
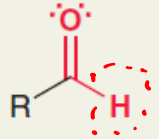
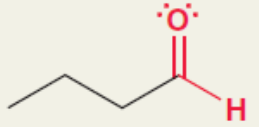
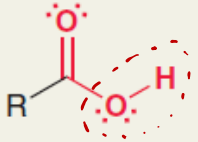
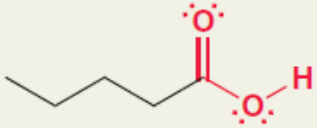
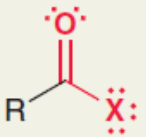
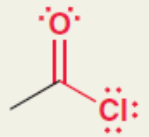
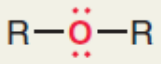
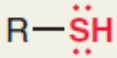
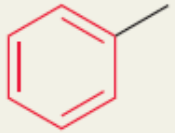
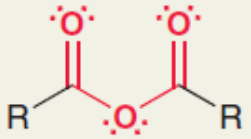
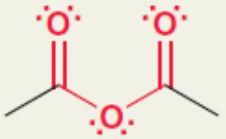
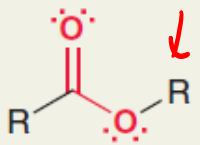
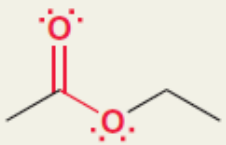
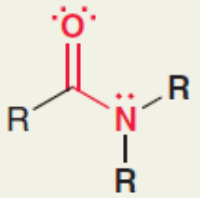
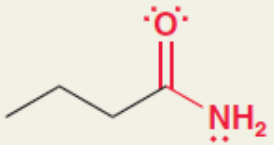
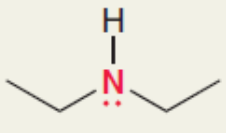
FUNCTIONAL GROUP*	CLASSIFICATION	EXAMPLE	CHAPTER
R—X: (X=Cl, Br, or I)	Alkyl halide	 *n*-Propyl chloride	7
	Alkene	 1-Butene	7, 8
R—C≡C—R	Alkyne	 1-Butyne	9
R—OH	Alcohol	 1-Butanol	12
 R's must be Carbon.	Ketone	 2-Butanone	19
 R can be H	Aldehyde	 Butanal	19
 R can be H	Carboxylic acid	 Pentanoic acid	20
	Acyl halide	 Acetyl chloride	20

TABLE 2.1 EXAMPLES OF COMMON FUNCTIONAL GROUPS

FUNCTIONAL GROUP*	CLASSIFICATION	EXAMPLE	CHAPTER
	Ether	 Diethyl ether	13
	Thiol	 1-Butanethiol	13
	Sulfide	 Diethyl sulfide	13
	Aromatic (or arene)	 Methylbenzene	17, 18

FUNCTIONAL GROUP*	CLASSIFICATION	EXAMPLE	CHAPTER
	Anhydride	 Acetic anhydride	20
	Ester	 Ethyl acetate	20
	Amide	 Butanamide	20
	Amine	 Diethylamine	22

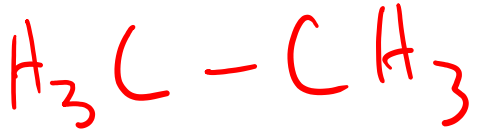
ORGANIC Chemistry

AS A SECOND LANGUAGE

you can do it!

Naming Alkanes

hydrocarbons - compounds composed of C's & H's



alkane

(no π-bonds)

alkene

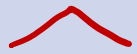
alkyne

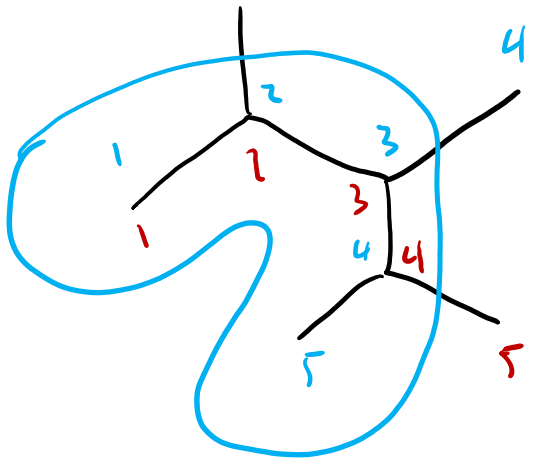
IUPAC systematic naming

1. Identify the longest carbon chain (the **"parent chain"**) in the molecule.

   a. The **prefix** denotes the **number of carbons** in the parent chain.

   b. The **suffix** for naming an **alkane is "-ane".** Other functional groups will get their own suffixes.

# of Carbon atoms in chain	prefix	Name of alkane	Drawing
1	meth-	methane	CH_4
2	eth-	ethane	—
3	prop-	propane	
4	but-	butane	
5	pent-		
6	hex-		
7	hept-		
8	oct-		
9	non-		
10	dec-		
11	undec-		
12	dodec-		



pentane

longest chain may "snake around" - be careful!

Not always straight / left to right.

Poll

pollev.com/timcook653 or text timcook653 to 22333
Or use android/iphone app

The parent chain in this molecule is

A. hexane

B. heptane

C. octane

D. nonane