Sharing of e^- gets no charge designation

Covalent

2 ve^-

Ba

Ba^{+2}

cation (+) ion

give away 2 ve^- becoming +2 cation

7 ve^-

I

I^{-1} b/c easier to take 1 e^- = anion

1 ve^-

K

K^{+1} b/c easier to give 1 e^- = cation

transferring (give or take) of e^- gets a charge & is called a cation or anion

Ionic

H_2

* each stick/line = 2 e^-

H—H

single (sharing 2 e^- ... 1 e^- from each H)

Linear Diatomic

180°

F_2

single bond

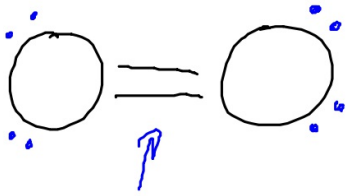
each F has 3 non-bonding sites & 1 bonding site

* Must always Draw the NBPs

Linear Diatomic

180°

O_2



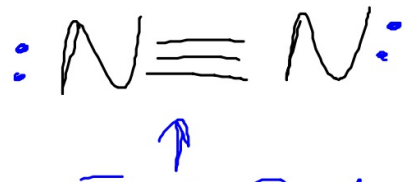
Double Bond

* 2 NBPs on each

Linear Diatomic

180°

N_2



Triple Bond

* 1 NBP on each N

Linear Diatomic

180°

H_2O

Central Atom = O

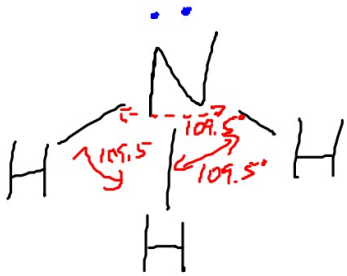
2 NBPs on O

2 Single Bonds

Bent

120°

NH_3



central atom = N

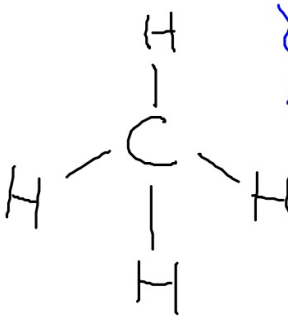
1 NBP on N

3 Single Bonds

Pyramidal

109.5°

CH_4



central atom = C

4 NBPs

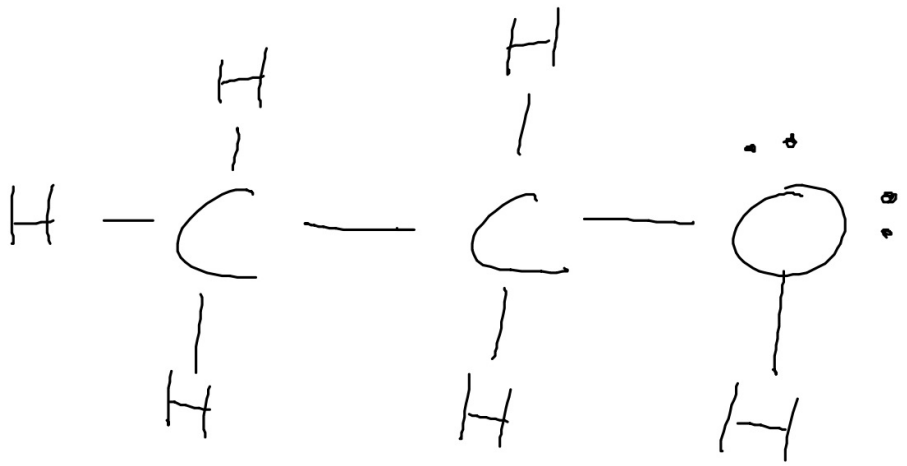
4 single bonds

Tetrahedral

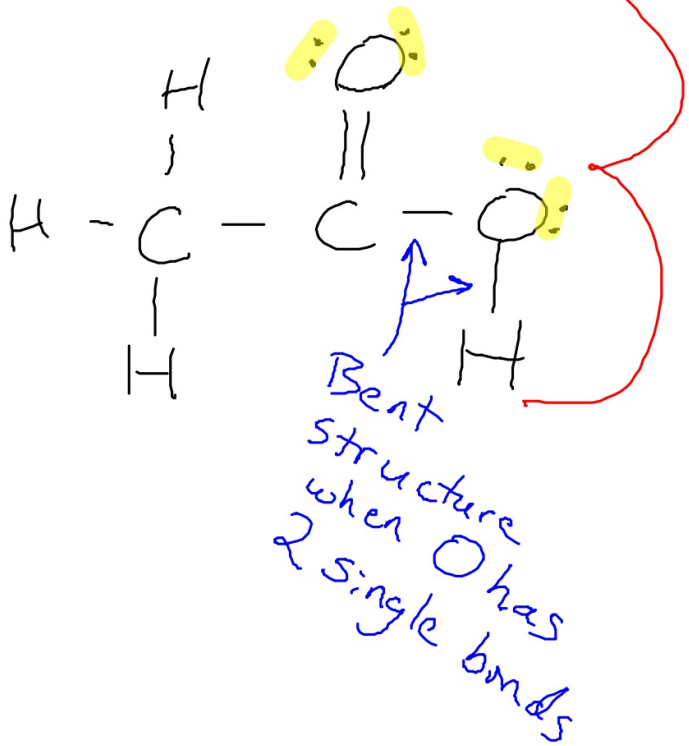
109.5°

CH_3CH_2OH

*2 + Carbons = C-backbone structure



CH_3COOH



CO_2

C is central atom b/c it has the most available bonding sites

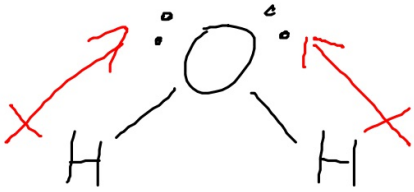
arrow points to atom w/ higher e⁻N

Linear Triatomic
180°

Each C=O bond is polar (unequal sharing ... 1 atom pulls with a higher e⁻N than the other) ... But overall CO_2 is nonpolar (equal sharing) b/c each C=O bond is pulling in opposite directions

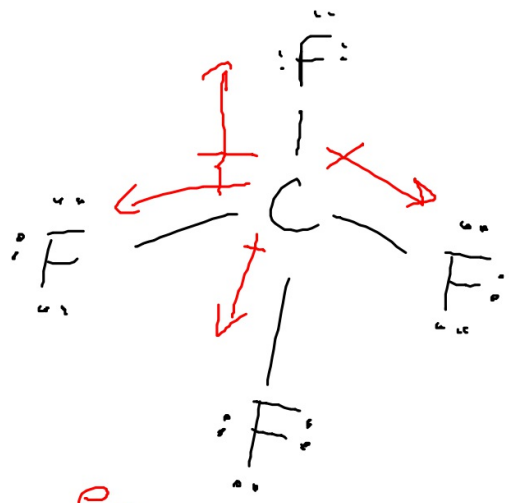
Polar

H_2O



Nonpolar

CF_4



Equal pulling

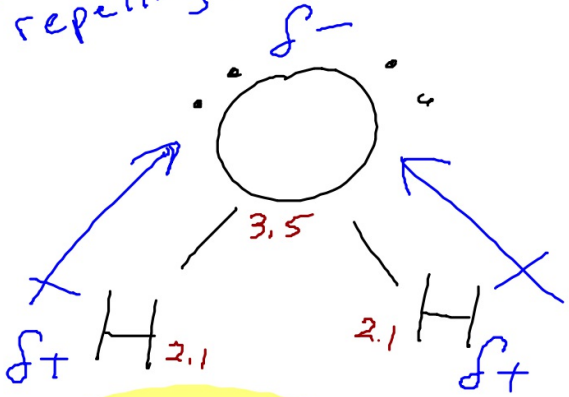
H_2O

Bent → b/c 2 NBP are repelling the single bonds

120°

Polar

(unequal sharing)



Calculating Individual Bond Polarity:

H-O → 2.1 − 3.5 = 1.4

H-O → 2.1 − 3.5 = 1.4 → Very Polar Covalent

Do for each bond

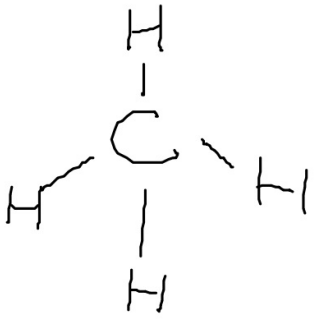
δ+ partial (+) charge

δ− partial (−) charge

→ Point to the more e^- N atom in the bond

Tetrahedral

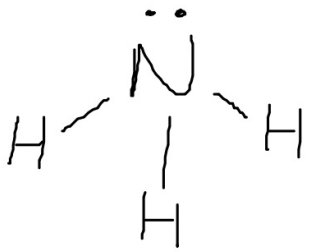
CH_4



109.5°

Pyramidal

NH_3

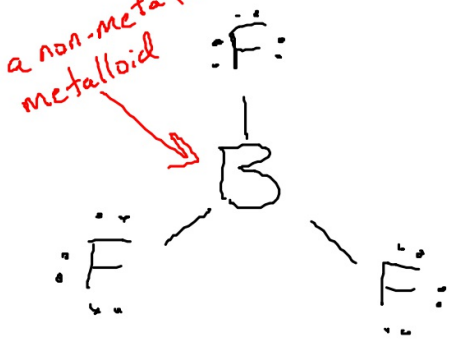


107°

the 1 NBP has a slightly strong push to the single bonds

Trigonal Planar

BF_3



120°

b/c B is an exception w/ NO NBPs & will only need 6 total e^-

Intermolecular Attractions

What type of bond is it?

Ionic
(metal + atom)

Covalent
Molecular
(2 nonmetals)

van der Waals
(weakest attraction btwn molecules)

Dispersion Forces
-weakest of ALL interactions
-caused by motion of electrons
-inc strength as # of electrons inc
⇒ Nonpolar compounds

Dipole Interactions
-polar molecules attracted to one another
-similar to Ionic Bonds but much weaker

Hydrogen Bonds
(H covalently bonded to VERY electronegative atom & bonded weakly to unshared electron pair of an electronegative atom in same molecule or nearby molecule

H bonded O, F, N, Cl

Rank 'em from strongest to weakest ~

Ionic – Hydrogen – Dipole – Dispersion

Van der Waals