CHEM 1300/1310

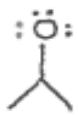
Formal Charges

- either positive or negative charge on a given atom in a compound
- must draw the charge on the atom (if a charge exists)

Formal charge = # of valence e^- (group # on periodic table) − # of e^- atom actually has

or

# of valence e^- − $\frac{1}{2}$ # of shared e^- − # of unshared e^-

Ex: 

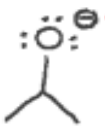
Find the formal charge of the Oxygen atom

FC = 6 valence e^- − 7 e^- it actually has = −1

= 6 valence e^- − $\frac{1}{2}$(2 shared e^-) − 6 unshared e^- = −1

referring to the covalent bonds

referring to the lone pairs

Therefore, it would be drawn like this: 

indicating its formal charge

When carbon has a formal charge:

a positive formal charge
- has one less electron, so only 3 e^-

can only form 3 bonds

vs

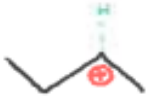
a negative formal charge
- has one more electron, so 5 e^-

can only form 3 bonds b/c #carbon can NEVER have 5 bonds

so the 2 remaining electrons form a lone pair (nonbonding electrons)

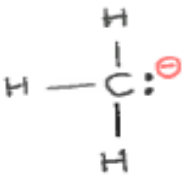
Keeping these rules in mind, it is possible to determine how many H atoms are on the carbon.

NO H atoms



1 H atom

2 H atoms



NO H atoms