Covalent Bonding

a strong force of attraction when 2 nonmetals share valence e- (not quite as strong as an ionic bond)

why?

Both nonmetals have high ionization energies (takes a lot of energy to remove an e-) and high electronegativites (desire for another atom's e-). Since neither atom has enough "strength" to steal the e-, the 2 atoms "share" them in a continual tug-o-war.

Properties of Covalently Bonded Molecules

- solids, liquids, or gas @ room temperature
- insulators (nonconductors) of heat & electricity
- low melting & boiling points.

	Ionic	vs.	Covalent
NaCl	800°C (1472°F)	melting pt	0°C (32°F)
	1413°C (2575°F)	boiling pt	100°C (212°F)

4/20

Lewis Structures to show covalent sharing of e-

Steps

1. Add up the total # valence e^- in the molecule.
2. Divide the total # of valence e^- by 2 to get pairs of e^-
3. Determine the center atom. It's always the one w/the lowest electronegativity (usually the one closest to the left & down on the P.T.) EXCEPTION: H is never in the center. Draw the structure.
4. Draw a line b/w the center atom & each end atom. The line is a bonded pair of e^-.
5. To use up the rest of the e^- pair, subtract the # lines (bonded pairs e^-) from the total pairs of e^- in step 2. These are Lone pairs of e^- :. Draw lone pairs around each atom (starting w/ end atoms) to ensure each atom has 4 pairs of e^- around it & move into the center if needed. EXCEPTION - H never gets Lone pairs!
6. When you run out of Lone prs. of e^- & the center atom is NOT stable (have 4 prs. e^- around it), you can create double or triple bonds by erasing a lone pair & writing in a line (bonded pair).

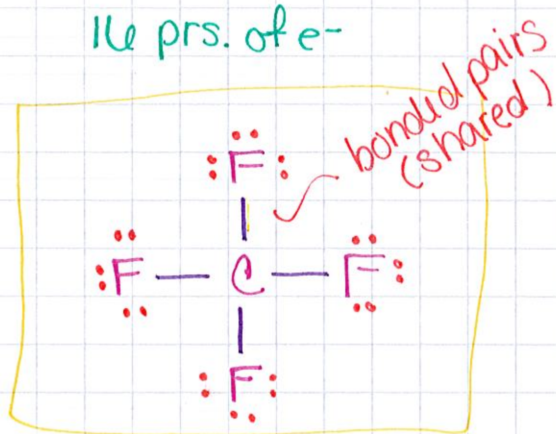
Example - CF_4

$1(4e^-) + 4(7e^-)$

$4e^- + 28e^-$

$32e^- / 2 =$

16 prs. of e^-



16 prs - 4 b. prs. = 12 Lone prs.

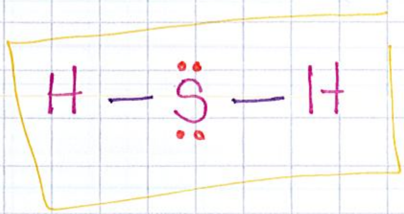
H_2S

$2(1e^-) + 1(6e^-)$

$2e^- + 6e^-$

$\frac{8e^-}{2}$

4 prs. of e^- − 2 b. prs = 2 lone prs

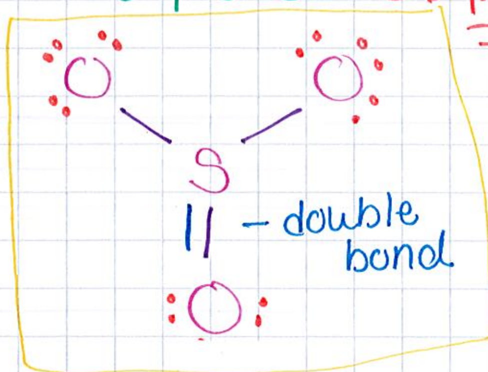


SO_3

$1(6e^-) + 3(6e^-)$

$\frac{24e^-}{2}$

= 12 prs. e^- − 3 b. prs = 9 lone prs



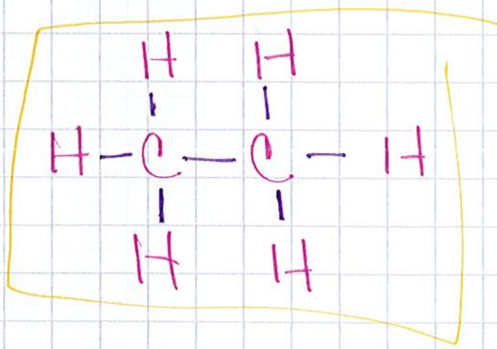
C_2H_6

$2(4e^-) + 6(1e^-)$

$8e^- + 6e^-$

$\frac{14e^-}{2}$

7 prs. e^- − 7 b. prs = 0 lone prs

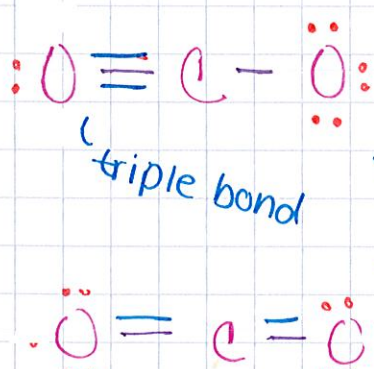


CO_2

$1(4e^-) + 2(6e^-)$

$4e^- + 12e^-$

$\frac{16e^-}{2}$ = 8 prs. e^- − 2 b. prs = 6 lone prs



resonance - more than 1 correct Lewis structure