Standard #3-3
Bonding Note Taking

look @ N, F

Number of electron domains	Bonded Electron domains	Non-bonded Electron domains	Angle on central atom	hybridization	Symmetrical? Y/N w/ lone pairs	Name of shape
2	2	0	180°	sp	yes	linear
3	3	0	120°	sp^2	yes	trigonal planar
3	2	1	↓	sp^2	no	bent
4	4	0	109.5°	sp^3	yes	tetrahedral
4	3	1	↓	sp^3	no	trigonal pyrimidal
4	2	2	↓	sp^3	no	bent
4	2	same as above				
5	5	0	90° 120°	sp^3d	yes	trigonal bipyrimidal
5	4	1	↓	↓		see saw
5	3	2	↓	↓		T-shape
5	2	3	↓	↓	yes	linear
6	6	0	90°	sp^3d^2	yes	octahedral
6	5	1	↓	↓	no	square pyramid
6	4	2	↓	↓	yes	square planar

Name
Covalent Properties Draw
Standard: (#3-4)

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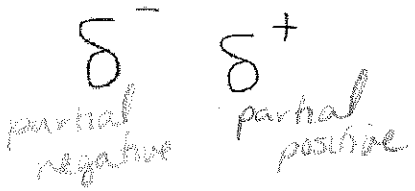
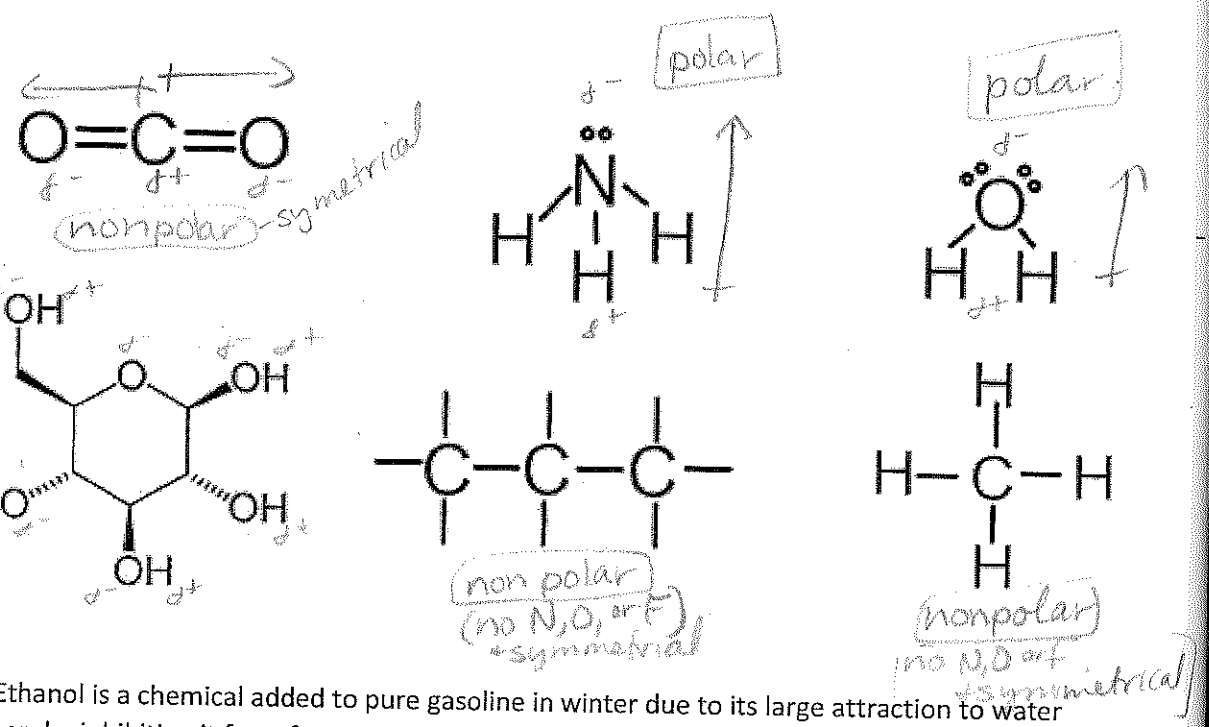
1. What are the three atoms that are extremely electronegative?

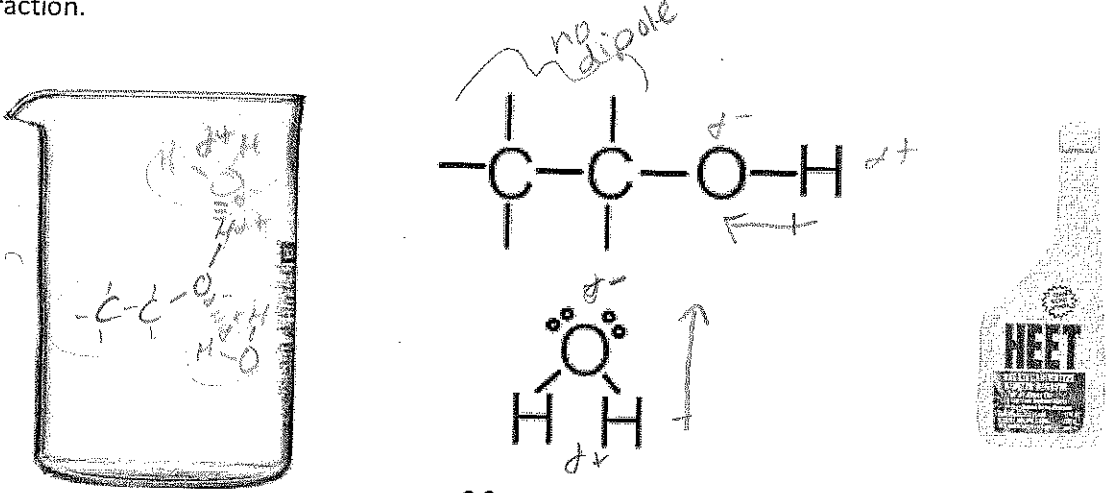
2. What do these symbols (to the right) mean?



3. In the following molecules label the dipole moments with proper notation. Indicate if the molecule is polar.

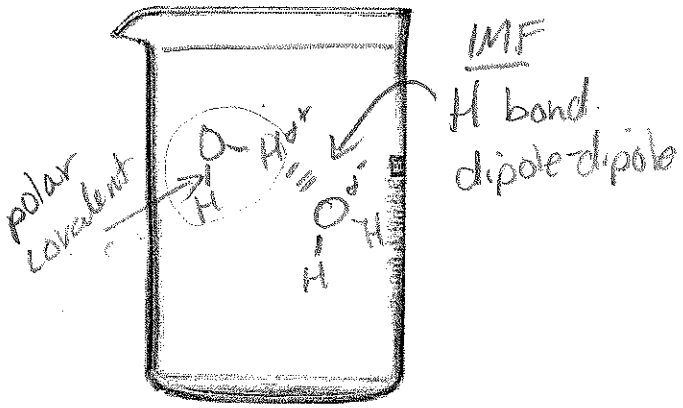


4. Ethanol is a chemical added to pure gasoline in winter due to its large attraction to water thereby inhibiting it from freezing in the gas lines. (that's the theory) Some water and ethanol are poured into the beaker below. Draw one alcohol and several water molecules showing this attraction.

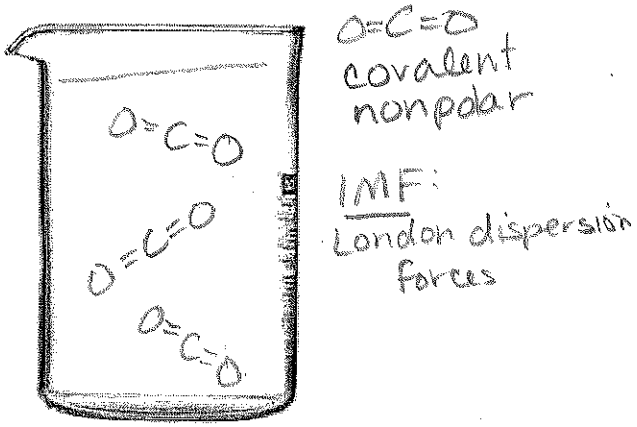


Draw the following substances. Include detailed indications of inter and intra molecular forces.
Notice: Gases are contained inside sealed containers

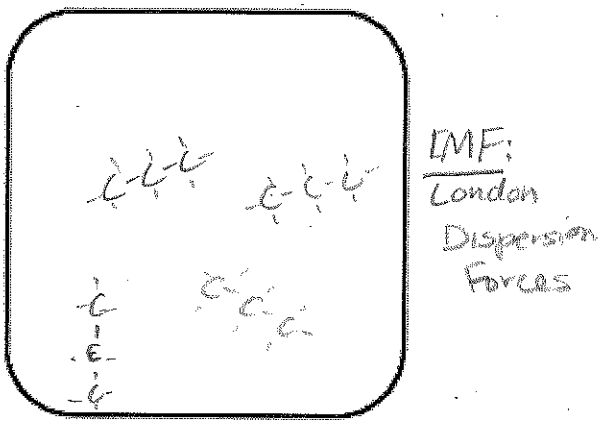
5. Liquid water



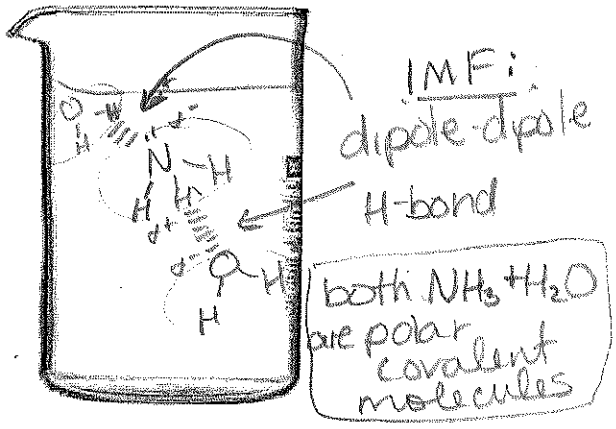
6. Carbon Dioxide dissolved in water



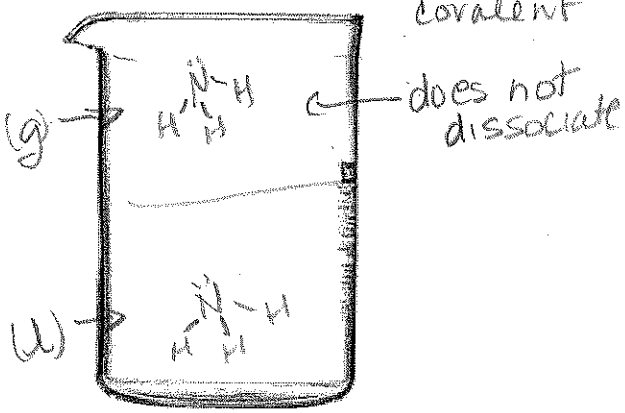
7. Liquid propane (LP)



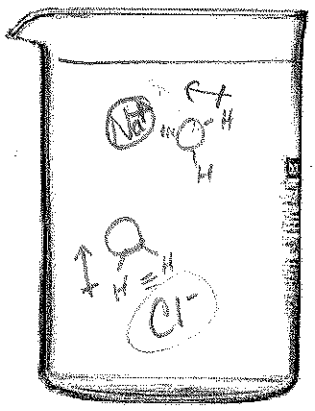
8. Ammonia dissolved in water



9. Liquid ammonia evaporating NH_3 is polar covalent



10. Solid NaCl IMF: ion-dipole



$NaCl \rightarrow Na^+ + Cl^-$
ionic → so dissociates into ions

Standard: #3- 5

Honors Chemistry

Ratios of atoms: covalent molecules vs. ionic crystals

What is the difference between formulas and the percent mass of a substance.

a. Student should be able to determine the percent mass of a compound.

b. Student will be able to determine the percent composition ionic and covalent substances.

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1. What is the difference between an empirical formula and a molecular formula?

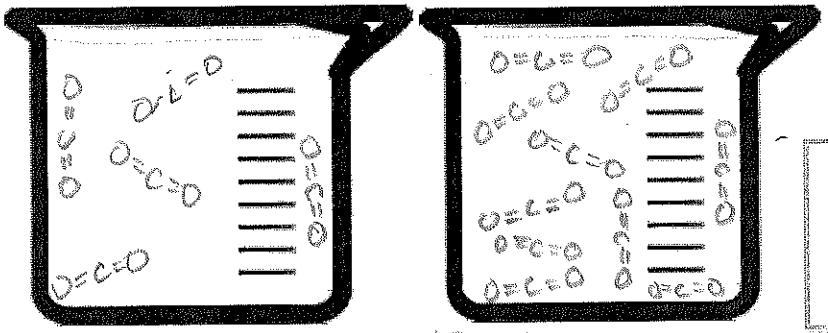
↓ simplest ratio. only ionic some covalent | ↓ simplest molecule - not necessarily simplest ratio. all covalent

2. For each of the following:
   a. Indicate an I or C for bond type.
   b. Indicate an E or a M if formula is an empirical or molecular ratio
   c.

C NO_2 E,M	C CH_4 E M	I $NaNO_3$ E
C $C_6H_{12}O_6$ M	C C_2H_6 M	C $C_2O_4^{-2}$ M
I $AlCl_3$ E	C C_2H_5OH E M	C C_6H_{14} M

   d. Is it possible for an ionic compound to be molecular? no
   e. Is it possible for a covalent compound to be empirical? yes

3. In the beakers below, draw the pictures requested and answer the questions below.



5 CO_2 Beaker 1 | 10 CO_2 beaker 2

Percentage = number of items * 100 / total items

In beaker 1 draw 5 CO_2 molecules, in beaker 2 draw 10 CO_2 molecules

a. In a single molecule of CO_2
   i. 1 C atoms
   ii. 2 O atoms
b. beaker 1
   i. 5 C atoms
   ii. 10 O atoms
c. Beaker 2
   i. 10 C atoms
   ii. 20 O atoms
d. Imagine you had a beaker with 100 carbon dioxide molecules.

In a pure sample of CO_2 what is the percent C atoms and what is the percent O atoms?

$\frac{1 \text{ Carbon}}{3 \text{ total}} \times 100 = 33.3\%$ C

$\frac{2 \text{ Oxygen}}{3 \text{ total}} \times 100 = 66.7\%$ O

Does the sample size matter? Why or why not? Explain

no - always same ratio (fixed ratio)

i. 100 C atoms
ii. 200 O atoms

e. Imagine you had a beaker with 1,000,000 carbon dioxide molecules.
i. 1,000,000 C atoms
ii. 2,000,000 O atoms

4. Glucose, $C_6H_{12}O_6$, what is the percent of all the particles are:
a. Carbons $\frac{6}{24} \times 100 = 25\%$ C
b. Hydrogen: $\frac{12}{24} \times 100 = 50\%$ H
c. Oxygen: $\frac{6}{24} \times 100 = 25\%$ O

100 $C_6H_{12}O_6$

5. If you had 100 molecules that you thought were glucose but were not sure. When analyzed
a. What should be the simplest ratio of carbon: Hydrogen: Oxygen?
1 : 2 : 1
b. What should be the actual number of each element found in the 100 molecule sample?
C: $100 \times 6 = 600$ H: $100 \times 12 = 1200$
O: $100 \times 6 = 600$

Read: We have seen from above that the number of atoms is in a fixed ratio, and each of those atoms also has its own fixed mass. Therefore the ratios of mass should also be fixed! Think about this!

$12 + (2 \cdot 16) = 44$
CO_2

6. A carbon atom has a mass of 12 amu and an oxygen atom has the mass of 16 amu. What is the mass of a single CO_2 molecule? 44 amu
7. What is the percent of C by mass: $\frac{12}{44} \times 100 = 27.3\%$ C
8. What is the percent of O by mass: $\frac{32}{44} \times 100 = 72.7\%$ O
9. If you have a 100g sample of CO_2; how much of that 100 grams is due to C 27.3 g half of this
10. If you have a 50 gram sample of CO_2; How much of that is due to C 13.7 g ?
$\frac{27.3}{100} = \frac{x}{50}$ $x = 13.7$ or

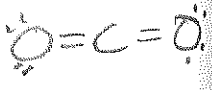
11. CH_4: (C: 12 amu; H 1 amu)
a. What are the percent ratios of particles between C and H
$\frac{1 C}{5 \text{ total}} \times 100 = 20\%$ C
$\frac{4 H}{5 \text{ total}} \times 100 = 80\%$ H
b. What are the percent ratios of mass between these two particles:
Mass of C = 12 amu
Mass of H = 1 · 4 = 4 amu
$\frac{12 \text{ amu C}}{16 \text{ amu total}} \times 100 = 75\%$ C
$\frac{4 \text{ amu H}}{16 \text{ amu total}} \times 100 = 25\%$ H
c. If I have 50 CCl_4 molecules, use appropriate ratio above to determine number of chlorine atoms
Carbon atoms: 50
Cl atoms : 200 (20% C, 80% Cl)
C is 12 amu, Cl is 35.5 amu } for this
d. If I have 50 grams of CCl_4, use the appropriate ratio above to determine the mass of chlorine atoms.
CCl_4
$12 + (4 \cdot 35.5) = 154$
$\frac{142 \text{ amu Cl}}{154 \text{ total}} = \frac{x}{50 g}$ $x = 46.1$ g Cl
e. What can you say about the connection between the percent particles and percent mass of this substance?
not the same!
percent particles ↓ depends on ratio in formula
percent mass ↓ depends on mass + ratio in formula

Topic Reminder Q6
Covalent Bonding and Bond properties

Complete the following nomenclature questions

1. CO = carbon monoxide
2. SO_3 = sulfur tri oxide
3. Xenon tetrachloride = $XeCl_4$
4. Carbon dioxide = CO_2

CO_2
$4 + (2 \cdot 6) = 16$

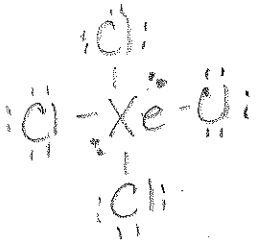


$XeCl_4$
$8 + (4 \cdot 7) = 36e^-$

5. Draw a Lewis structure of each substance above.

CO
$4 + 6 = 10e$

SO_3
$6 + (3 \cdot 6) = 24e$



2 extra lone pairs on Xe

6. What is the name of each electronic structure? (include e- pairs)

CO
linear

SO_3
trigonal planar

$XeCl_4$
octahedral

CO_2
linear

7. What is the name of each molecular structure?

CO
linear

SO_3
trigonal planar

$XeCl_4$
square planar

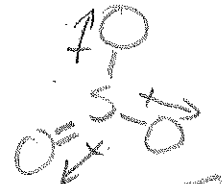
CO_2
linear

8. Are any of the substances above violating the octet rule?

yes - $XeCl_4$

9. Polarity of each?

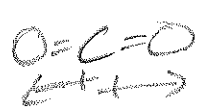
polar
(have O not symmetrical)



nonpolar
(symmetrical)

$XeCl_4$
(no N, O, or F)
nonpolar

CO_2



(have O but symmetrical)
non polar