Unit 5 - Chemical Bonding

66. Describe how the electrons are arranged in nonpolar covalent bonds, polar covalent, and ionic bonds.

non-polar → electrons are evenly shared between atoms

polar → electrons are unevenly shared between atoms

ionic → electrons are transferred from one atom to the other

67. Classify the bonds between the following pairs of atoms as ionic, non – polar covalent, or polar covalent (use difference in electronegativity)

a. Al – Cl 1.5 - 3.0 = 1.5 Polar

b. N – O 3.0 - 3.5 = .5 Polar

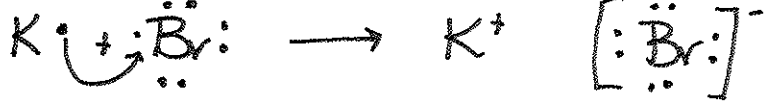
c. K – F .8 - 4.0 = 3.2 Ionic

d. Br – Br 2.8 - 2.8 = 0 Non Polar

e. Fe – O 1.8 - 3.5 = 1.7 polar

f. S – O 2.5 - 3.5 = 1.0 Polar

68. Draw the Lewis Structure for the ionic bond between potassium and bromine.



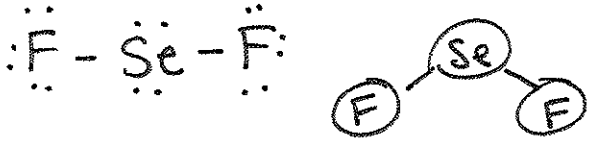
69. Draw the Lewis Structure, name and 3-D model. Label each **molecule** as polar or non-polar for the following molecules and ions:

g. SeF_2, Selenium Difluoride

6 + 2(7) = 20 e⁻

bent

4.0 - 2.4 = 1.6 Polar bonds



Polar molecule

i. CO_2, Carbon Dioxide

4 + 2(6) = 16 e⁻

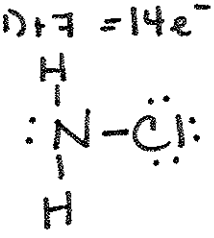
3.5 - 2.5 = 1.0 Polar Bonds

linear

Non Polar Molecule

h. NH_2Cl, Ammonia Monochloramine

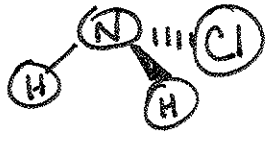
5 + 2(1) + 7 = 14 e⁻



trigonal Pyramidal

N-H: 3.0 - 2.1 = .9 Polar bond

N-Cl: 3.0 - 3.0 = 0 Non Polar bond



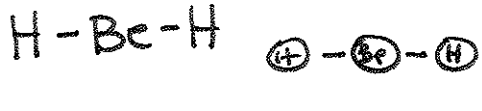
Polar Molecule

j. BeH_2, Beryllium Hydride (exception Be only needs 4 e⁻)

2 + 2(1) = 4 e⁻

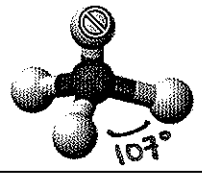
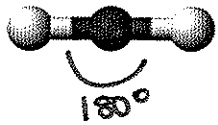
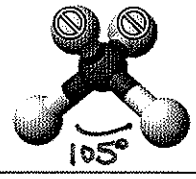
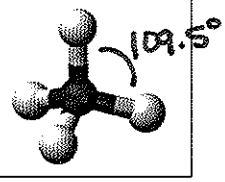
2.1 - 1.5 = .6 Polar Bond

linear



Non Polar Molecule

70. For each formula given below, write the letter and name of the molecular shape (yellow with ⊘ are lone pairs) that best applies to it and name its geometry. Then label the bond angles on the molecular shape.

a.	b.	c.	d.	e.
				

a. H_2O D bent
b. BeF_2 (exception) B linear
c. NH_3 A trigonal pyramidal
d. CH_4 E tetrahedral
a. BF_3 (exception) C trigonal planar

71. Which of the compounds in the previous problem are polar?

A, C

Unit 6 – The Mole

72. What is the mass of 6.9×10^{25} molecules of NO?

$$6.9\times10^{25}\text{ molecules NO} \times \frac{1\text{ mol NO}}{6.022\times10^{23}\text{ molecules}} \times \frac{30.01\text{ g NO}}{1\text{ mol NO}} = 3400\text{ g NO}$$

73. How many Aluminum atoms are in 4.74 moles?

$$4.74\text{ mol Al} \times \frac{6.022\times10^{23}\text{ atoms}}{1\text{ mol}} = 2.85\times10^{24}\text{ atoms}$$

74. How many L are in 70.0 g of CH_4 at STP?

$$70.0\text{ g } CH_4 \times \frac{1\text{ mol } CH_4}{16.05\text{ g}} \times \frac{22.4\text{ L}}{1\text{ mol}} = 97.7\text{ L } CH_4$$

75. How many moles of O_2 fill 54.32 L at STP?

$$54.32\text{ L } O_2 \times \frac{1\text{ mol } O_2}{22.4\text{ L}} = 2.425\text{ mol } O_2$$

76. How many molecules of H_2O vapor fills 13.56 L at STP?

$$13.56\text{ L } H_2O \times \frac{1\text{ mol } H_2O}{22.4\text{ L}} \times \frac{6.022\times10^{23}\text{ molecules}}{1\text{ mol } H_2O} = 3.645\times10^{23}\text{ molecules}$$

77. If a compound contains 1.567 g of Carbon and 4.175 g Oxygen by mass, what is the percent composition?

$\%\ C = \frac{1.567\ g}{5.742\ g} \times 100 = 27.29\%\ C$

$\%\ O = \frac{4.175\ g}{5.742\ g} \times 100 = 72.71\%\ O$

78. Determine the percent composition of C_2H_6

$2(12.01) = 24.02$

$6(1.01) = 6.06$

30.08

$\%\ C = \frac{24.02}{30.08} \times 100 = 79.85\%\ C$

$\%\ H = \frac{6.06}{30.08} \times 100 = 20.15\%\ H$

79. Does the mass percent of a compound change when you change the amount of a compound?

No, a compound always has the same composition

80. A compound contains 0.16556 g of C, 0.02779 g of H, and 0.1103 g of O.

a. Determine the empirical formula of the compound.' C_2H_4O

$.16556\ g\ C \times \frac{1\ mol\ C}{12.01\ g} = \frac{.0138}{.00689} = 2$

$.02779\ g\ H \times \frac{1\ mol\ H}{1.01\ g} = \frac{.0275}{.00689} = 4$

$.1103\ g\ O \times \frac{1\ mol\ O}{16.00\ g} = \frac{.00689}{.00689} = 1$

b. If the molecular mass of the compound is 44.338 g, what is its molecular formula?

$2(12.01) + 4(1.01) + 16$

$\frac{44.338}{44.06} = 1$ C_2H_4O

81. A compound is 40.00% C, 6.713% H and 53.28% O by mass.

a. What is the empirical formula for the compound? CH_2O

$40.00\ g\ C \times \frac{1\ mol\ C}{12.01\ g} = \frac{3.33\ mol\ C}{3.33} = 1$

$6.713\ g\ H \times \frac{1\ mol\ H}{1.01\ g} = \frac{6.65\ mol\ H}{3.33} = 2$

$53.28\ g\ O \times \frac{1\ mol\ O}{16.00\ g} = \frac{3.33\ mol\ O}{3.33} = 1$

b. If the molecular mass of the compound is 60.052 g, what is its molecular formula?

$12.01 + 2.02 + 16.00 = 30.03\ g$

$\frac{60.06}{30.03} = 2$ $C_2H_4O_2$

82. A compound with the empirical formula CH_2 is known to have a molar mass of 56.12 g/mole. What is the molecular formula of the compound?

$12.01 + 2(1.01) = 14.08\ g$

$\frac{56.12}{14.03} = 4$

C_4H_8