

GENERAL & ANALYTICAL CHEMISTRY I
CHMG-141
 With Dr. Bailey

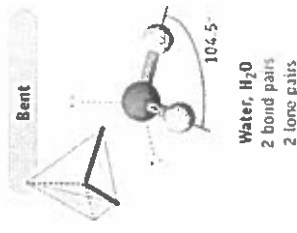
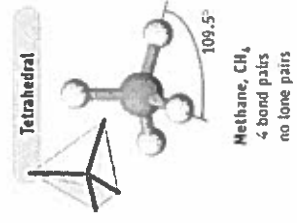
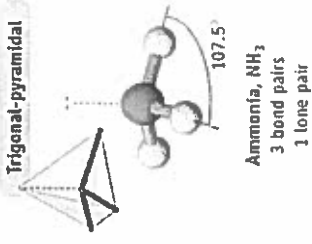
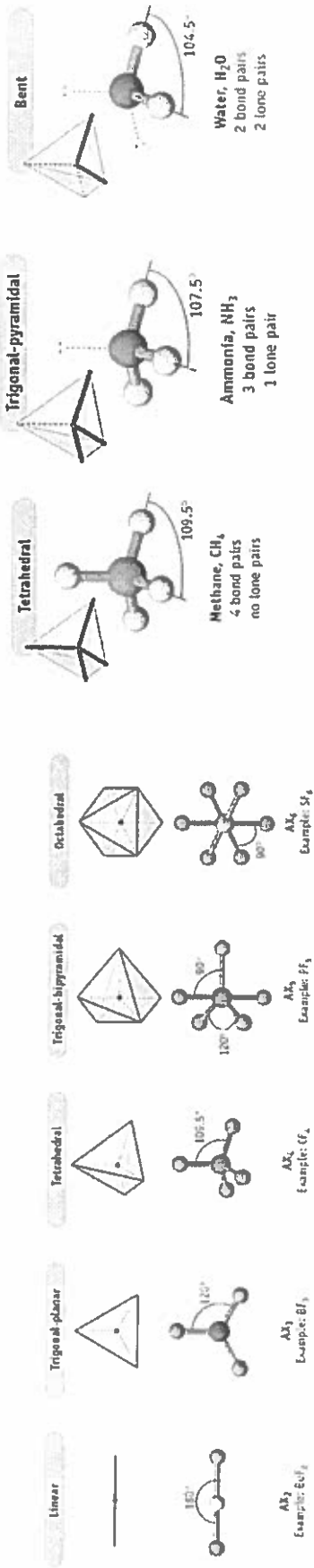
KEY

Name _____

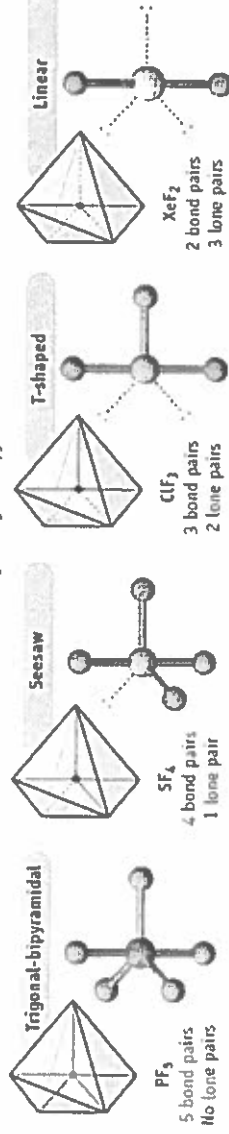
Recitation
 Week 8
Part 1: Molecular geometry

Complete the following table:

Central atom	Total Number of "charged clouds" (electron groups) in central atom	Number of bonding "charge clouds" in central atom	Number of nonbonding electron pairs on central atom	Lowes Dot Structure around central atom	Electron pair geometry of central atom	Bond angles	Molecular geometry of central atom
P	4	3	1	$\begin{array}{c} \\ -P- \\ \cdot\cdot \end{array}$	Tetrahedral	$<109.5^\circ$ ($\sim 107.5^\circ$)	Trigonal pyramidal
P	4	4	0	$\begin{array}{c} \diagup P \diagdown \\ \diagup \quad \diagdown \end{array}$	Tetrahedral	109.5	Tetrahedral
P	5	5	0	$\begin{array}{c} \diagup P \diagdown \\ \quad \diagup \quad \diagdown \end{array}$	Trigonal-bipyramid	90; 120	Trigonal-bipyramid
S	6	6	0	$\begin{array}{c} \diagup S \diagdown \\ \diagup \quad \diagdown \end{array}$	Octahedral	90	Octahedral
S	6	4	2	$\begin{array}{c} \diagup S \diagdown \\ \cdot\cdot \quad \cdot\cdot \end{array}$	Octahedral	<90	Square-planar
S	5	4	1	$\begin{array}{c} \diagup S \diagdown \\ \cdot\cdot \quad \diagup \quad \diagdown \end{array}$	Trigonal-bipyramid	90; 120	Seesaw
S	5	3	2	$\begin{array}{c} \cdot\cdot \quad \diagup S \diagdown \\ \cdot\cdot \quad \diagup \quad \diagdown \end{array}$	Trigonal-bipyramid	<90	T-shaped
S	4	2	2	$\begin{array}{c} \cdot\cdot \quad \cdot\cdot \\ -S- \end{array}$	Tetrahedral	$<109.5^\circ$	Bent
S	3	2	1	$\begin{array}{c} \cdot\cdot \\ -S- \end{array}$	Trigonal planar	$<120^\circ$	Bent
O	4	2	2	$\begin{array}{c} \cdot\cdot \quad \cdot\cdot \\ -O- \end{array}$	Tetrahedral	$<109.5^\circ$ (104.5°)	Bent
C	2	2	0	$\begin{array}{c} -C\equiv \\ \text{OR} \\ =C= \end{array}$	Linear	180	Linear
Xe	5	2	3	$\begin{array}{c} \cdot\cdot \quad \cdot\cdot \\ Xe \\ \cdot\cdot \quad \cdot\cdot \end{array}$	Trigonal-bipyramid	180	Linear

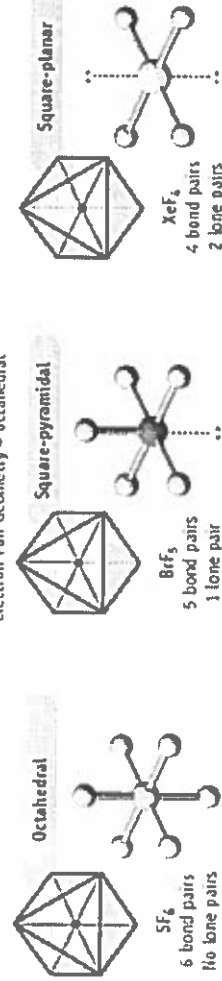


FIVE ELECTRON PAIRS Electron-Pair Geometry = trigonal bipyramid

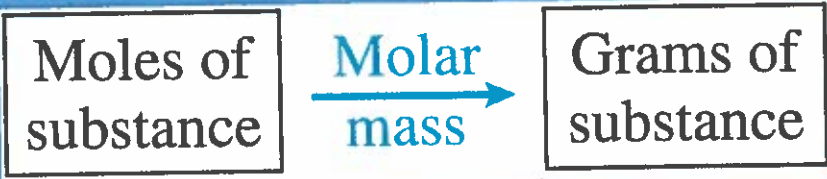


SIX ELECTRON PAIRS

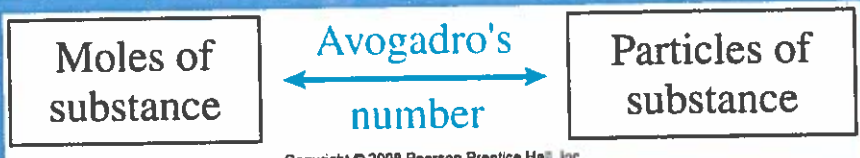
Electron Pair Geometry = octahedral



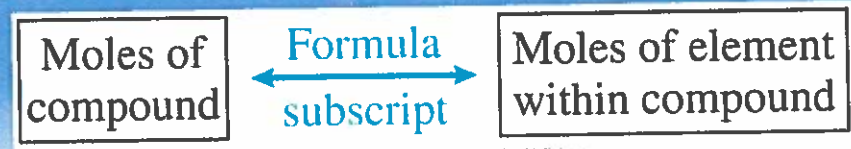
Very common calculation



Copyright © 2008 Pearson Prentice Hall, Inc.



Copyright © 2008 Pearson Prentice Hall, Inc.



Copyright © 2008 Pearson Prentice Hall, Inc.

© 2008 Brooks/Cole - Thomson

PART 2:

1. Mole conversions. Answer the questions, show solutions:

a. How many moles of hydrogen peroxide [H_2O_2] are in 7.35 grams?

$$\text{molar mass } \text{H}_2\text{O}_2 = 2 \cdot (1.008)g + 2 \cdot (16.00)g = 34.00 \frac{g}{\text{mole}}$$

$$7.35g \text{H}_2\text{O}_2 \times \frac{1 \text{ mole}}{34.00g \text{H}_2\text{O}_2} = \boxed{0.216 \text{ mole } \text{H}_2\text{O}_2}$$

b. 9.80 moles of CuSO_4 are how many grams?

$$\text{MM } \text{CuSO}_4 = 1 \cdot (63.55)g + 1 \cdot (32.07) + 4 \cdot (16.00) = 159.6 \frac{g}{\text{mole}}$$

$$9.80 \text{ mole } \text{CuSO}_4 \times \frac{159.6g}{1 \text{ mole } \text{CuSO}_4} = 1560g = \boxed{1.56 \times 10^3 g}$$

c. How many moles of NH_3 are in 5.00×10^{22} molecules?

$$5.00 \times 10^{22} \text{ molec.} \times \frac{1 \text{ mole}}{6.022 \times 10^{23} \text{ molec.}} = \boxed{0.0831 \text{ mole } \text{NH}_3}$$

d. What is the mass of 37.5×10^{27} CO molecules?

$$\text{MM } \text{CO} = 12.01g + 16.00g = 28.00 \frac{g}{\text{mole}}$$

$$\left[37.5 \times 10^{27} \text{ molec. } \text{CO} \times \frac{1 \text{ mole}}{6.022 \times 10^{23} \text{ molec. } \text{CO}} \right] \times \frac{28.00g}{1 \text{ mole } \text{CO}} = \boxed{1.74 \times 10^6 g \text{ CO}}$$

e. There are how many atoms of hydrogen are in 4.20 moles of water?

$$\left[4.20 \text{ mole } \text{H}_2\text{O} \times \frac{6.022 \times 10^{23} \text{ molec.}}{1 \text{ mole } \text{H}_2\text{O}} \right] \times \frac{2 \text{ atoms H}}{1 \text{ molec. } \text{H}_2\text{O}} = \boxed{5.06 \times 10^{24} \text{ atoms H}}$$

f. How many atoms (total) are in 62.0 g SO_2 ?

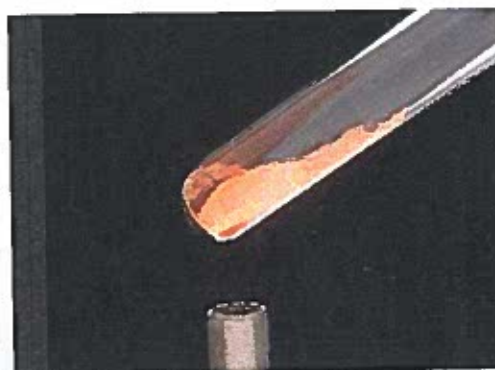
$$\text{MM } \text{SO}_2 = 32.06g + 2 \cdot (16.00)g = 64.05 \frac{g}{\text{mole}}$$

$$\left[62.0g \text{SO}_2 \times \frac{1 \text{ mole}}{64.05g} \right] \times \frac{6.022 \times 10^{23} \text{ molec.}}{1 \text{ mole}} \times \frac{3 \text{ atoms}}{1 \text{ molec. } \text{SO}_2} = \boxed{1.75 \times 10^{24} \text{ atoms Total}}$$

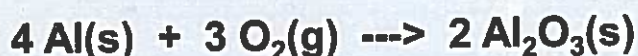


Chemical Equations

Because the same atoms are present in a reaction at the beginning and at the end, the **amount of matter in a system does not change.**



- The **Law of the Conservation of Matter**
- An **equation must be balanced.**
- The numbers in the front are called **stoichiometric coefficients**



Exercises:

2) Balance the equations:

