Mole, Quantum Theory Catalysts

Chemistry

Catalyst 10/28

1. What is the molar mass?
2. What is Avogadro's number? What does it represent?
3. Calculate the molar mass of the following compounds:
   a. NH_3
   b. C_3H_8
   c. $C_6H_{12}O_6$

Catalyst 11/3

Determine the mass percent of each element in sulfuric acid (H_2SO_4)

11/3 Cont.

Rubbing alcohol is an aqueous solution of isopropyl alcohol. Isopropyl alcohol has the formula C_3H_7OH. Determine the mass percent of each element in isopropyl alcohol.

Catalyst 11/8

1. Calculate the mass in grams of 0.251 mol of ethyl alcohol, C_2H_6O.
2. Calculate the mass in grams of 9.31×10^{-4} mol of $MgCl_2$
3. Calculate the molecules present in 1.25×10^{-2} mol of Lead (II) acetate, $Pb(CH_3CO_2)_2$

Catalyst 11-9

1. Calculate the percent by mass of each element in $NaHSO_3$.
2. What is the empirical formula if the compound consists of 21.2%N, 6.1%H, 24.2%S and 48.5% O?
3. A compound used as an additive for gasoline to help prevent engine know shows the following percent composition: 71.65%Cl, 24.27%C and 4.07%H. The molar mass is known to be 98.96g. Determine the empirical formula and molecular formula for this compound.

$N_2H_8SO_4$ → smallest whole # ratio

- What is the empirical formula if the compound consists of 21.2%N, 6.1%H, 24.2%S and 48.5% O?

$$\frac{21.2\text{g N}}{1}\left|\frac{1\text{ mol}}{14.01\text{g N}}\right. = \frac{1.513}{0.754993141} = 2$$

$$\frac{6.1\text{g H}}{1}\left|\frac{1\text{ mol}}{1.01\text{g H}}\right. = \frac{6.039603960}{0.754993141} = 8.0372 = 8$$

$$\frac{24.2\text{g S}}{1}\left|\frac{1\text{ mol}}{32.01\text{g}}\right. = \frac{0.754993141}{0.754993141} = 1$$

$$\frac{48.5\text{g O}}{1}\left|\frac{1\text{ mol O}}{16.00\text{ g}}\right. = \frac{3.03125}{0.754993141} = 4.020 = 4$$

2.005309

- A compound used as an additive for gasoline to help prevent engine know shows the following percent composition: 71.65%Cl, 24.27%C and 4.07%H. The molar mass is ~~known to be 98.96g.~~ Determine the empirical formula and molecular formula for this compound.

$$\frac{71.65\text{g Cl}}{35.45\text{g Cl}} \times \frac{1\text{ mol Cl}}{1} = \frac{2.021156655}{2.020815987} = 1.001 = 1$$

$$\frac{24.27\text{g C}}{12.01\text{g C}} \times \frac{1\text{ mol}}{1} = \frac{2.020815987}{2.020815987} = 1$$

$$\frac{4.07\text{g H}}{1.01\text{g H}} \times \frac{1\text{ mol H}}{1} = \frac{4.029702970}{2.020815987} = 1.9919 = 2$$

EFC HCl_2

12.01 2

2.02 = 49.48g

35.45

$2(CH_2Cl_2) = MF \times (EM) = MM$

$\times 49.48 = 98.96g$

Catalyst 11/10

1. Calculate the number of molecules in 1.058 gram of H_2O

$$1.058\ g\ H_2O \times \frac{1\ mol\ H_2O}{18.02\ g\ H_2O} \times \frac{6.022 \times 10^{23}\ molecules}{1\ mol\ H_2O} = 3.536 \times 10^{22}\ molecules\ H_2O$$

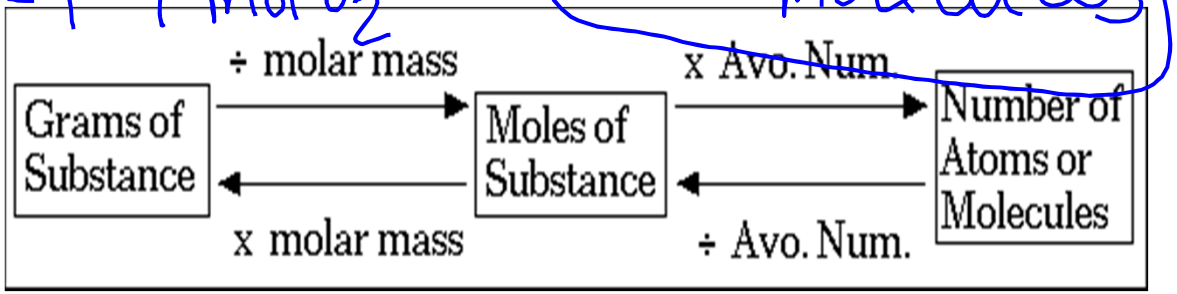
2.02 + 16.00

3.5356×10^{22}

2. Which contains more molecules: 10.0 grams of O_2 or 50.0 grams of iodine, I_2?

$$10.0\ g\ O_2 \times \frac{1\ mol\ O_2}{32.00\ g\ O_2} \times \frac{6.022 \times 10^{23}\ molecules}{1\ mol\ O_2} = 1.88 \times 10^{23}\ O_2\ molecules$$

1.19×10^{23} molecule I_2



Catalyst 11/11

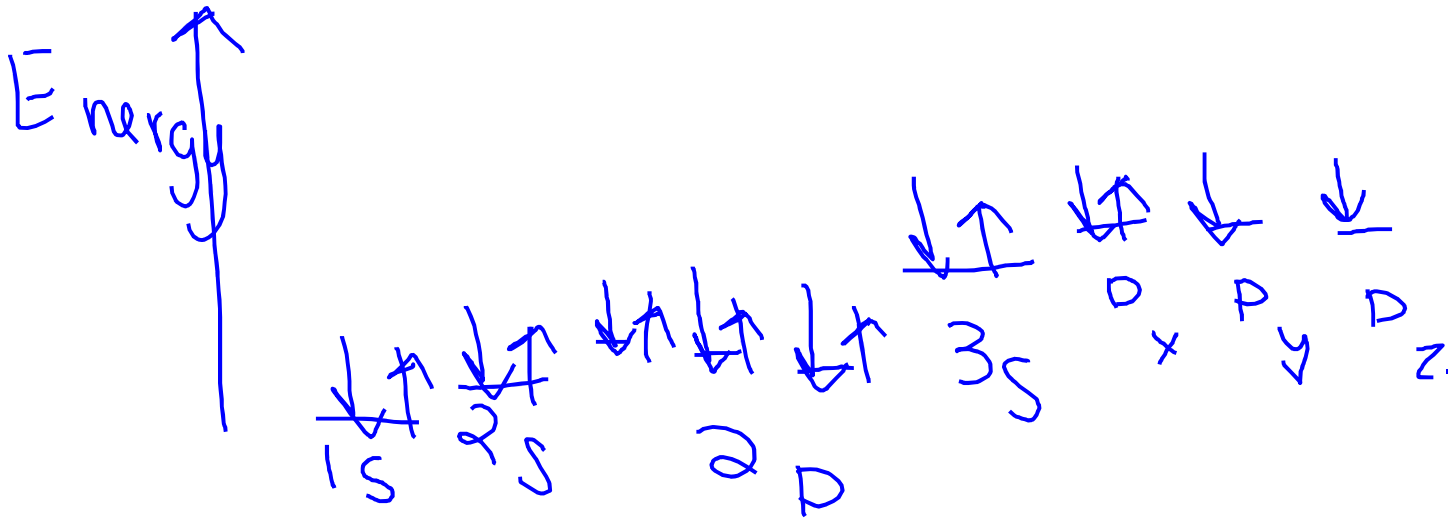
- Write the electron configuration notation for antimony (Sb)

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$ (10)

$4p^6 5s^2 4d^{10} 5p^3$ 51

Catalyst 11/14

1. Write the electron configuration notation for Zn. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$
2. Write the Noble Gas Notation for Lead (Pb). $[Xe]\,6s^2 4f^{14} 5d^{10} 6p^2$
3. Write the Orbital Notation (arrows) for Sulfur



Catalyst 11/15

1. List and paraphrase the three principles/rules that are the basis for electron configuration.
2. List the 4 quantum numbers and what they represent.
3. Write the orbital notation for As

- 3. Write the orbital notation for As (33)