

Name ANSWERS Date _____ Teacher _____ Block _____
 Chemistry I: *Worksheet on All Kinds of Mole Problems*
SHOW ALL WORK!!!

- 1) What is the mass of 134 L of O₂ gas at STP?

$$134 \text{ L} \times \frac{1 \text{ mol}}{22.4 \text{ L}} \times \frac{32.0 \text{ g}}{1 \text{ mol}} = 191 \text{ g}$$

- 2) How many molecules are there in 1.00 g of water?

$$1.00 \text{ g} \times \frac{1 \text{ mol}}{18.0 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 3.34 \times 10^{22} \text{ molecules}$$

- 3) What mass of zinc is there in 34.8 g of zinc phosphate?

$\text{Zn}_3(\text{PO}_4)_2 \leftarrow \text{molar mass} = 386.2$

$$\% \text{ Zn} = \frac{196.2}{386.2} \times 100 = 50.8\%$$

$$34.8 \text{ g} \times 0.508 = 17.7 \text{ g}$$

- 4) How many grams of O₂ must react with 983.4 g of carbon to make C₆H₁₂O₆?

$$\frac{72}{180} = 40\% \text{ C} \quad \frac{96}{180} = 53\% \text{ O} \quad \frac{983.4}{x} = \frac{40}{53} \quad x = 1303 \text{ g}$$

- 5) What is the percent composition of each element in ammonium acetate?

$(\text{NH}_4)(\text{CH}_3\text{COO})$ molar mass = 77.0

$$\text{N} = \frac{14.0}{77.0} \times 100 = 18.18\% \quad \text{C} = \frac{24.0}{77.0} \times 100 = 31.17\%$$

$$\text{H} = \frac{7.0}{77.0} \times 100 = 9.09\% \quad \text{O} = \frac{32.0}{77.0} \times 100 = 41.56\%$$

- 6) What is the percent composition of each element in aluminum sulfate?

$\text{Al}_2(\text{SO}_4)_3$ molar mass = 342.3

$$\text{Al} = \frac{54.0}{342.3} \times 100 = 15.78\% \quad \text{S} = \frac{96.0}{342.3} \times 100 = 28.13\%$$

$$\text{O} = \frac{192.0}{342.3} \times 100 = 56.09\%$$

- 7) A compound is 26.28% carbon, 3.68% hydrogen, and the rest is oxygen. The molecular weight is 548.32 g/mole. What are the empirical and molecular formulas?

$$\text{C} = 548.32 \text{ g} \times 0.2628 = 144 \text{ g} \quad \frac{144 \text{ g}}{12.0 \text{ g/mol}} = 12 \text{ mol}$$

$$\text{H} = 548.32 \text{ g} \times 0.0368 = 20.18 \text{ g} \quad \frac{20.18 \text{ g}}{1.0 \text{ g/mol}} = 20 \text{ mol}$$

$$\text{O} = 548.32 \text{ g} \times 0.7004 = 384.04 \text{ g} \quad \frac{384.04 \text{ g}}{16.0 \text{ g/mol}} = 24 \text{ mol}$$

$$\text{M.F.} = \text{C}_{12}\text{H}_{20}\text{O}_{24}$$

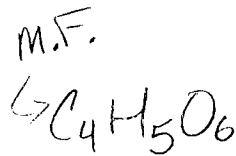
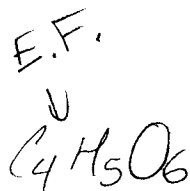
$$\text{E.F.} = \text{C}_3\text{H}_5\text{O}_6$$

- 8) A sample of a compound is decomposed into its constituent elements, to give 150.9 g carbon, 15.87 g hydrogen, and 301.6 g oxygen. The molecular weight is 149.09 g/mole. What are the **empirical** and **molecular formulas**?

$$C = \frac{150.9g}{12.0g/mol} = 12.58 \text{ mol} \quad \frac{12.58}{12.58} = 1 \times 4 = 4$$

$$H = \frac{15.87g}{1.0g/mol} = 15.87 \text{ mol} \quad \frac{15.87}{12.58} = 1.26 \times 4 = 5$$

$$O = \frac{301.6g}{16.0g/mol} = 18.85 \text{ mol} \quad \frac{18.85}{12.58} = 1.50 \times 4 = 6$$



- 9) A compound is 17.15% carbon, 2.88% hydrogen, and the rest is oxygen. The molecular weight is 280.12 g/mole. What are the **empirical** and **molecular formulas**?

$$C - \frac{17.15}{12.00} = 1.43 \quad \left| \quad \frac{1.43}{1.43} = 1 \times 2 = 2 \quad \text{E.F.} \quad \text{E. mass} = 140$$

$$H - \frac{2.88}{1.00} = 2.88 \quad \left| \quad \frac{2.88}{1.43} = 2 \times 2 = 4 \quad \text{C}_2\text{H}_4\text{O}_7 \quad 280/140 = 2$$

$$O - \frac{79.97}{16.00} = 4.998 \quad \left| \quad \frac{4.998}{1.43} = 3.5 \times 2 = 7 \quad \therefore \text{M.F.} = \text{C}_4\text{H}_8\text{O}_{14}$$

- 10) 987.0 g of a gas occupies 168.4 L at STP. What is the ^{molar mass} molecular weight of the gas?

$$168.4 \text{ L} \times \frac{1 \text{ mol}}{22.4 \text{ L}} = 7.518 \text{ mol}$$

$$\frac{987.0g}{7.518 \text{ mol}} = 131.3g/mol$$

- 11) A compound, "A₃N₂" is 91.93% mystery element A, and the rest is nitrogen. What is the atomic weight of A? What is the identity of A?

$$N = 8.07\% \quad 2 \times N = 28.0g$$

$$\frac{28.0g}{\text{molar mass}} = \frac{8.07}{100}$$

$$\text{molar mass} = 346.96 \text{ g/mol}$$

$$\text{mass of } 3 \times A = 346.96$$

$$\begin{array}{r} - 28.0 \\ \hline 318.96 \end{array}$$

$$\text{mass of } A = 106.3g \leftarrow \text{Pd}$$