Worksheet – Mole Conversions

Name:

Show all work, including conversion factors and units. Watch sig digs.

I. Practice Problems

A. What is the mass of 1 mole (molar mass) of:

1. H_2 2.02 g
2. $Mg(OH)_2$ 58.33 g
3. CO_2 44.01 g
4. NH_4Cl 53.5 g
5. $CuSO_4$ 159.62 g
6. $AgNO_3$ 169.88 g

B. Convert from grams to moles, or moles to grams

1. How many moles is 12.5 g of magnesium hydroxide? $Mg(OH)_2$

$$\frac{1 \text{ mol } Mg(OH)_2}{58.33 \text{ g } Mg(OH)_2} \times 12.5 \text{ g } Mg(OH)_2 = \boxed{0.214 \text{ mol } Mg(OH)_2}$$

2. How many moles is 1.46 g of hydrogen gas (H_2)?

$$\frac{1 \text{ mol } H_2}{2.02 \text{ g } H_2} \times 1.46 \text{ g } H_2 = \boxed{0.723 \text{ mol } H_2}$$

3. How many grams are in 4.3 moles of ammonium chloride? NH_4Cl

$$\frac{53.5 \text{ g } NH_4Cl}{1 \text{ mol } NH_4Cl} \times 4.3 \text{ mol } NH_4Cl = \boxed{230 \text{ g } NH_4Cl}$$

C. Convert from moles to molecules, or molecules to moles

1. How many molecules are in 2.0 moles of hydrogen gas (H_2)?

$$\frac{6.02 \times 10^{23} \text{ molecules } H_2}{1 \text{ mol } H_2} \times 2.0 \text{ mol } H_2 = \boxed{1.2 \times 10^{24} \text{ molecules } H_2}$$

2. How many moles is 2.0×10^{25} molecules of silver nitrate? $AgNO_3$

$$\frac{1 \text{ mol } AgNO_3}{6.02 \times 10^{23} \text{ molecules } AgNO_3} \times 2.0 \times 10^{25} \text{ molecules } AgNO_3 = \boxed{33 \text{ mol } AgNO_3}$$

D. How many atoms of oxygen are in 2.4×10^{23} molecules of copper(II) sulfate? $CuSO_4$

$$\frac{4 \text{ atoms O}}{1 \text{ molecule } CuSO_4} \times 2.4 \times 10^{23} \text{ molecules } CuSO_4 = \boxed{9.6 \times 10^{23} \text{ atoms O}}$$

II. Application Problems

A. How many molecules are in 96 g of carbon dioxide? CO_2

$$\frac{6.02 \times 10^{23} \text{ molecules } CO_2}{1 \text{ mol } CO_2} \times \frac{1 \text{ mol } CO_2}{44.01 \text{ g } CO_2} \times 96 \text{ g } CO_2 = \boxed{1.3 \times 10^{24} \text{ molecules } CO_2}$$

B. How many oxygen atoms are in 96 g of CO_2?

$$\frac{2 \text{ O atoms}}{1 \text{ molecule } CO_2} \times \frac{6.02 \times 10^{23} \text{ molecules } CO_2}{1 \text{ mol } CO_2} \times \frac{1 \text{ mol } CO_2}{44.01 \text{ g } CO_2} \times 96 \text{ g } CO_2 = \boxed{2.6 \times 10^{24} \text{ atoms O}}$$

C. How many grams would 1.0×10^{25} molecules of copper(II) sulfate weigh? $CuSO_4$

$$\frac{159.62 \text{ g } CuSO_4}{1 \text{ mol } CuSO_4} \times \frac{1 \text{ mol } CuSO_4}{6.02 \times 10^{23} \text{ molecules } CuSO_4} \times 1.0 \times 10^{25} \text{ molecules } CuSO_4 = \boxed{2700 \text{ g } CuSO_4}$$

D. How much does each individual molecule of copper(II) sulfate weigh?

$$\frac{2700 \text{ g } CuSO_4}{1.0 \times 10^{25} \text{ molecules } CuSO_4} = \boxed{2.7 \times 10^{-22} \text{ g/molecule}}$$

Mole conversion worksheet- take 2 **Name:** _____

Use the mole map below to help you on these problems. Locate where you are starting and then follow the arrows to get to where you need to end up. Show all work as I've shown in class and below.

The Mole Map

Molecules, atoms, ions, formula units	**÷ 6.02×10^{23}** → ← **x 6.02×10^{23}**	1 **mole**	**x molecular mass in g** → ← **÷ molecular mass in g**	Grams of substance

Ex. Convert 43.6 g of NaCl to molecules of NaCl.

$$\frac{6.02 \times 10^{23} \text{ molecules NaCl}}{1 \text{ mole NaCl}} \left| \frac{1 \text{ mole NaCl}}{58.5 \text{ g NaCl}} \right| \frac{43.6 \text{ g NaCl}}{} = 4.49 \times 10^{23} \text{ molecules NaCl}$$

Convert the following:

1. 11.5 grams Ethanol, C_2H_5OH, to moles of ethanol

$$\frac{1 \text{ mol } C_2H_5OH}{46.08 \text{ g } C_2H_5OH} \left| \frac{11.5 \text{ g } C_2H_5OH}{} \right. = \boxed{0.250 \text{ mol } C_2H_5OH}$$

2. 8.50 grams of Mercury (II) Nitrate to moles. $Hg(NO_3)_2$

$$\frac{1 \text{ mol } Hg(NO_3)_2}{324.61 \text{ g } Hg(NO_3)_2} \left| \frac{8.50 \text{ g } Hg(NO_3)_2}{} \right. = \boxed{0.0262 \text{ mol } Hg(NO_3)_2}$$

3. 0.846 moles Hydrogen Fluoride to molecules. HF

$$\frac{6.02 \times 10^{23} \text{ molecules HF}}{1 \text{ mol HF}} \left| \frac{0.846 \text{ mol HF}}{} \right. = \boxed{5.09 \times 10^{23} \text{ molecules HF}}$$

4. 64.3 g Lead (II) Bromide to molecules. $PbBr_2$

$$\frac{6.02 \times 10^{23} \text{ molecules } PbBr_2}{1 \text{ mol } PbBr_2} \left| \frac{1 \text{ mol } PbBr_2}{367.00 \text{ g } PbBr_2} \right| \frac{64.3 \text{ g } PbBr_2}{} = \boxed{1.05 \times 10^{23} \text{ molecules } PbBr_2}$$

5. 3.33×10^{25} molecules of I_2 to grams.

$$\frac{253.80 \text{ g } I_2}{1 \text{ mol } I_2} \left| \frac{1 \text{ mol } I_2}{6.02 \times 10^{23} \text{ molecules } I_2} \right| \frac{3.33 \times 10^{25} \text{ molecules } I_2}{} = \boxed{14{,}500 \text{ g } I_2}$$

6. 4.85×10^{25} molecules Copper (I) Sulfide to grams. Cu_2S

$$\frac{159.17 \text{ g } Cu_2S}{1 \text{ mol } Cu_2S} \left| \frac{1 \text{ mol } Cu_2S}{6.02 \times 10^{23} \text{ molecules } Cu_2S} \right| \frac{4.85 \times 10^{25} \text{ molecules } Cu_2S}{} = \boxed{12{,}800 \text{ g } Cu_2S}$$

7. 39.9 grams Manganese (IV) Acetate to moles. $Mn(C_2H_3O_2)_4$

$$\frac{1 \text{ mol } Mn(C_2H_3O_2)_4}{291.14 \text{ g } Mn(C_2H_3O_2)_4} \left| \frac{39.9 \text{ g } Mn(C_2H_3O_2)_4}{} \right. = \boxed{0.137 \text{ mol } Mn(C_2H_3O_2)_4}$$