Unit 8 Stoichiometry
Intro to 1 Step Conversions

Name _____

Block # ____

Part A: Converting with Atoms and Moles

1. Explain how to convert from atoms to moles.

$$6.022 \times 10^{23} \text{ atoms} = 1 \text{ mole}$$

2. Calculate the number of atoms in 0.50 mole of carbon.

$$\frac{0.50 \text{ mole C}}{1} \left| \frac{6.022 \times 10^{23} \text{ atoms}}{1 \text{ mole}} \right. = 3.0 \times 10^{23} \text{ atoms C}$$

3. Calculate the number of atoms in 1.75 moles of neon gas.

$$\frac{1.75 \text{ moles Ne}}{1} \left| \frac{6.022 \times 10^{23} \text{ atoms}}{1 \text{ mole}} \right. = 1.05 \times 10^{24} \text{ atoms Ne}$$

4. Calculate the number of moles in 3.47×10^{25} atoms of beryllium.

$$\frac{3.47 \times 10^{25} \text{ atoms Be}}{1} \left| \frac{1 \text{ mole}}{6.022 \times 10^{23} \text{ atoms}} \right. = 57.6 \text{ moles Be}$$

5. Calculate the number of moles in 1.25×10^{19} atoms of gold.

$$\frac{1.25 \times 10^{19} \text{ atoms Au}}{1} \left| \frac{1 \text{ mole}}{6.022 \times 10^{23} \text{ atoms}} \right. = 2.08 \times 10^{-5} \text{ moles Au}$$

Part B: Converting with Molecules and Moles

6. Explain how to convert from molecules to moles.

$$6.022 \times 10^{23} \text{ molecules} = 1 \text{ mole}$$

7. Calculate the number of molecules in 7.4 moles of oxygen gas.

$$\frac{7.4 \text{ mole } O_2}{1} \left| \frac{6.022 \times 10^{23} \text{ molecules}}{1 \text{ mole}} \right. = 4.5 \times 10^{24} \text{ molecules } O_2$$

8. Calculate the number of molecules in 3.15 moles of propane gas.

$$\frac{3.15 \text{ mole } C_3H_8}{1} \left| \frac{6.022 \times 10^{23} \text{ molecules}}{1 \text{ mole}} \right. = 1.90 \times 10^{24} \text{ molecules } C_3H_8$$

9. Calculate the number of moles in 2.80×10^{17} molecules of phosphorus trichloride.

$$\frac{2.80 \times 10^{17} \text{ molecules}}{1} \left| \frac{1 \text{ moles}}{6.022 \times 10^{23} \text{ molecules}} \right. = 4.65 \times 10^{-7} \text{ moles } PCl_3$$

10. Calculate the number of moles in 1.09×10^{24} molecules silicon dioxide.

$$\frac{1.09 \times 10^{24} \text{ molecules}}{1} \left| \frac{1 \text{ moles}}{6.022 \times 10^{23} \text{ molecules}} \right. = 1.81 \text{ moles } SiO_2$$

Part C: Converting with Grams and Moles

11. Explain how to convert from grams to moles.

Use the atomic mass from the periodic table to calculate the total molar mass. Molar mass = # of grams/ 1 mole for that substance.

12. Calculate the number of grams in 1.23 moles of aluminum hydroxide.

Aluminum is in Group 13 so it has an oxidation # of +3. Hydroxide is OH^{-1}. When aluminum and hydroxide combine, the ions bond in a 1:3 ratio to form $Al(OH)_3$. The molar mass of $Al(OH)_3$ is approximately 78 grams/ 1 mole.

Al = 1 x 27 = 27 g
O = 3 x 16 = 48 g **Total molar mass = 78 grams/mole**
H = 3 x 1 = 3 g

$$\frac{1.23 \text{ mole } Al(OH)_3}{1} \left| \frac{78 \text{ grams}}{1 \text{ mole}} = 95.9 \text{ grams } Al(OH)_3 \right.$$

13. Calculate the number of grams in 0.089 moles of water.

The formula for water is H_2O, and the molar mass is approximately 18 grams/1 mole.

H = 2 x 1 = 2 g **Total molar mass = 18 grams/mole**
O = 1 x 16 = 16 g

$$\frac{0.089 \text{ mole } H_2O}{1} \left| \frac{18 \text{ grams}}{1 \text{ mole}} = 1.6 \text{ grams } H_2O \right.$$

14. Calculate the number of moles in 200.0 grams of sodium chloride.

The sodium ion is +1, and the chloride ion is a -1. The ionic bond forms NaCl, and the molar mass is approximately 58.5 grams/ 1 mole.

Na = 1 x 23.0 = 23.0 g **Total molar mass = 58.5 grams/mole**
Cl = 1 x 35.5 = 35.5 g

$$\frac{200.0 \text{ grams NaCl}}{1} \left| \frac{1 \text{ mole}}{58.5 \text{ grams}} = 3.42 \text{ moles NaCl} \right.$$

15. Calculate the number of moles in 75.20 grams of ammonia.

The formula for ammonia is NH_3, and the molar mass is approximately 17 grams/ 1 mole.

N = 1 x 14 = 14 g **Total molar mass = 17 grams/mole**
H = 3 x 1 = 3 g

$$\frac{75.20 \text{ grams } NH_3}{1} \left| \frac{1 \text{ mole}}{17 \text{ grams}} = 4.424 \text{ moles } NH_3 \right.$$

Part D: Converting with Liters and Moles

1. Explain how to convert from liters to moles.

22 Liters of any gas at STP = 1 Mole

2. Calculate the number of liters in 2.5 moles of hydrogen gas.

$$\frac{2.5 \text{ mole } H_2}{1} \left| \frac{22.4 \text{ liters}}{1 \text{ mole}} = 56 \text{ L } H_2 \right.$$

3. Calculate the number of liters in 0.017 moles of water vapor.

$$\frac{0.017 \text{ mole } H_2O}{1} \left| \frac{22.4 \text{ liters}}{1 \text{ mole}} = 0.38 \text{ L } H_2O \right.$$

4. Calculate the number of moles in 56.0 liters of butane gas.

$$\frac{56.0 \text{ liters } C_4H_{10}}{1} \left| \frac{1 \text{ mole}}{22.4 \text{ liters}} = 2.50 \text{ moles } C_4H_{10} \right.$$

5. Calculate the number of moles in 0.00280 liters of nitrogen gas.

$$\frac{0.00280 \text{ liters } N_2}{1} \left| \frac{1 \text{ mole}}{22.4 \text{ liters}} = 0.000125 \text{ moles } N_2 \right.$$