

Stoichiometry Review Assignment

**Example 1: Calculate the mass of a magnesium, Mg, atoms in grams.**

$$\frac{24.035 \text{ g Mg}}{1 \text{ mol Mg}} \cdot \frac{1 \text{ mol Mg}}{6.02 \times 10^{23} \text{ molecules}} \cdot \frac{1 \text{ molecule Mg}}{1 \text{ atom Mg}} = 4.04 \times 10^{-23} \text{ g/Mg atom}$$

**Example 2: Calculate the number of atoms in one-millionth of a gram of magnesium, Mg.**

$$1 \times 10^{-6} \text{ g Mg} \cdot \frac{1 \text{ mol Mg}}{24.30 \text{ g Mg}} \cdot \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol Mg}} \cdot \frac{1 \text{ atom Mg}}{1 \text{ molecule Mg}} = 2.48 \times 10^{16} \text{ atoms}$$

**Example 3: How many atoms are in 1.67 moles of magnesium?**

$$1.67 \text{ mol Mg} \cdot \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol Mg}} \cdot \frac{1 \text{ atom Mg}}{1 \text{ molecule Mg}} = 1.01 \times 10^{24} \text{ atoms}$$

**Example 4: How many moles of magnesium are in 73.4 grams of magnesium?**

$$73.4 \text{ g Mg} \cdot \frac{1 \text{ mol Mg}}{24.30 \text{ g Mg}} = 3.02 \text{ mol Mg}$$

**Example 7: Calculate the number of propane, C<sub>3</sub>H<sub>8</sub> molecules, in 74.6 grams of propane.**

$$74.6 \text{ g C}_3\text{H}_8 \cdot \frac{1 \text{ mol C}_3\text{H}_8}{44 \text{ g C}_3\text{H}_8} \cdot \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol C}_3\text{H}_8} = 1.02 \times 10^{24} \text{ molecules C}_3\text{H}_8$$

**Example 8: What is the mass of 10.0 billion molecules of propane?**

$$10 \times 10^9 \text{ molecules C}_3\text{H}_8 \cdot \frac{1 \text{ mol C}_3\text{H}_8}{6.02 \times 10^{23} \text{ molecules}} \cdot \frac{44 \text{ g C}_3\text{H}_8}{1 \text{ mol C}_3\text{H}_8} = 7.31 \times 10^{-13} \text{ g C}_3\text{H}_8$$

**Example 9: How many moles, molecules, and oxygen atoms are contained in 60-g sample of ozone O<sub>3</sub>?**

$$60 \text{ g O}_3 \cdot \frac{1 \text{ mol O}_3}{48 \text{ g O}_3} \cdot \frac{3 \text{ mol O}}{1 \text{ mol O}_3} = 0.417 \text{ mol O}$$

$$1.25 \text{ mol O}_3 \cdot \frac{3 \text{ mol O}}{1 \text{ mol O}_3} \cdot \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol O}} = 2.51 \times 10^{23} \text{ molecules O} = 2.51 \times 10^{23} \text{ atoms O}$$

**Example 13: What mass of phosphorous is contained in 45.3 grams of (NH<sub>4</sub>)<sub>3</sub>PO<sub>4</sub>?**

$$45.3 \text{ g (NH}_4)_3\text{PO}_4 \cdot \frac{1 \text{ mol (NH}_4)_3\text{PO}_4}{149.09 \text{ g (NH}_4)_3\text{PO}_4} \cdot \frac{1 \text{ mol P}}{1 \text{ mol (NH}_4)_3\text{PO}_4} \cdot \frac{30.97 \text{ g P}}{1 \text{ mol P}} = 9.41 \text{ g P}$$

**Example 14: What mass of ammonium phosphate would contain 15.0 g of nitrogen?**

$$15.0 \text{ g N} \cdot \frac{1 \text{ mol N}}{14 \text{ g N}} \cdot \frac{1 \text{ mol (NH}_4)_3\text{PO}_4}{1 \text{ mol N}} \cdot \frac{149.09 \text{ g (NH}_4)_3\text{PO}_4}{1 \text{ mol (NH}_4)_3\text{PO}_4} = 53.22 \text{ g P(NH}_4)_3\text{PO}_4$$

**Example 15: What mass of propane, C<sub>3</sub>H<sub>8</sub>, contains the same mass of carbon as is contained in 1.35 grams of barium carbonate, BaCO<sub>3</sub>?**

$$1.35 \text{ g BaCO}_3 \cdot \frac{1 \text{ mol BaCO}_3}{149.09 \text{ g BaCO}_3} \cdot \frac{1 \text{ mol C}}{1 \text{ mol BaCO}_3} \cdot \frac{1 \text{ mol C}_3\text{H}_8}{3 \text{ mol C}} \cdot \frac{44 \text{ g C}_3\text{H}_8}{1 \text{ mol C}_3\text{H}_8} = 0.097 \text{ g C}_3\text{H}_8$$