UNIT -- Quantities in Chemical Reactions

LESSON -- Moles and Molar Mass of Compounds **Name: ANSWERS**

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1. Determine the molar mass of the following compounds:

   a. Na_2CO_3

   SOLUTION 1: (23.0g/mol) + (12.0g/mol) + (16.0g/mol) = 51.0g/mol

   SOLUTION 2: 2(23.0g/mol) + (12.0g/mol) + 3(16.0g/mol) = 106.0g/mol

   b. $Ca_3(PO_4)_2$

   SOLUTION 1: 3(40.1g/mol) + 2(31.0g/mol) + 8(16.0g/mol) = 310.3g/mol

   SOLUTION 2: 3(40.1g/mol) + (31.0g/mol) + 8(16.0g/mol) = 279.3g/mol

   c. $CaCl_2$

   SOLUTION 1: 2 (40.1g/mol) + 2(35.5g/mol) = 151.2g/mol

   SOLUTION 2: (40.1g/mol) + 2(35.5g/mol) = 111.1g/mol

   d. NH_4NO_3

   SOLUTION 1: 4(14.0g/mol) + 4(1.0g/mol) + 3(14.0g/mol) + 3(16.0g/mol) = 150.0g/mol

   SOLUTION 2: (14.0g/mol) + 4(1.0g/mol) + (14.0g/mol) + 3(16.0g/mol) = 80.0g/mol

2. A pop can contains around 3.34×10^{23} aluminum atoms. How many moles of aluminum are contained in a pop can?

   SOLUTION 1:

   $$3.34 \times 10^{23} \text{ atoms} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ atoms}} = 5.55 \times 10^{45} \text{ mol of Al}$$

   SOLUTION 2:

   $$3.34 \times 10^{23} \text{ atoms} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ atoms}} = 0.555 \text{ mol of Al}$$

3. The average glass of water contains 235.8 g of water molecules. How many moles of water molecules are in the average glass of water?

SOLUTION 1:

$$235.8\ g \times \frac{1\ mol}{18.0 g} = 13.08\ mol\ H_2O$$

SOLUTION 1:

$$18.0\ g \times \frac{1\ mol}{235.8\ g} = 0.07634\ mol\ H_2O$$

4. Iron (Fe) is a common building material. A standard 2-inch finishing nail contains about 8.55×10^{21} iron atoms. What is the mass of a finishing nail?

SOLUTION 1:

$$8.55 \times 10^{21}\ atoms \times \frac{1\ mol}{55.8 g} \times \frac{6.02 \times 10^{23}\ atoms}{1\ mol} = 9.22 \times 10^{43}\ g\ Fe$$

SOLUTION 1:

$$8.55 \times 10^{21}\ atoms \times \frac{1\ mol}{6.02 \times 10^{23}\ atom} \times \frac{55.8\ g}{1\ mol} = 0.793\ g\ Fe$$

5. An underground cavern is completely filled with 8198 g of methane gas (CH_4). What is the volume (in L) of the underground cavern? (Assume the gas is at STP conditions)

SOLUTION 1:

$$8198\ g \times \frac{1\ mol}{16\ g} \times \frac{22.4\ L}{1\ mol} = 1.148 \times 10^4\ L$$

SOLUTION 1:

$$8198\ g \times \frac{1\ mol}{22.4\ L} \times \frac{16\ g}{1\ mol} = 5.856 \times 10^3\ L$$