Homework - Reactions Worksheet

Determine the number of atoms found in 2.78 moles of carbon.

$$2.78 \text{ mol C} \times \frac{6.02 \times 10^{23} \text{ atoms C}}{1 \text{ mol C}} = \boxed{1.67 \times 10^{24} \text{ atoms C}}$$

**Determine the number of molecules found in 6.09 moles of NH$_3$.**

$$6.09 \text{ mol NH}_3 \times \frac{6.02 \times 10^{23} \text{ molecules NH}_3}{1 \text{ mol NH}_3} = \boxed{3.67 \times 10^{24} \text{ molecules NH}_3}$$

Determine the number of atoms found in 12.6 moles of H$_2$O.

$$12.6 \, \text{mol} \, H_2O \times \frac{6.02 \times 10^{23} \, \text{molecules} \, H_2O}{1 \, \text{mol} \, H_2O} \times \frac{3 \, \text{atoms}}{1 \, \text{molecules} \, H_2O}$$

$$= \boxed{2.28 \times 10^{25} \, \text{atoms}}$$

Calculate the number of moles contained in 45.0g of LiNO₃.

$$450g \; LiNO_3 \times \frac{1 \; mol \; LiNO_3}{68.95 \; g \; LiNO_3} = \boxed{0.653 \, mol \; LiNO_3}$$

$$LiNO_3 \longrightarrow (1 \times 6.94) + (1 \times 14.01) + (3 \times 16.00)$$

$$= 68.95 \, g/mol$$
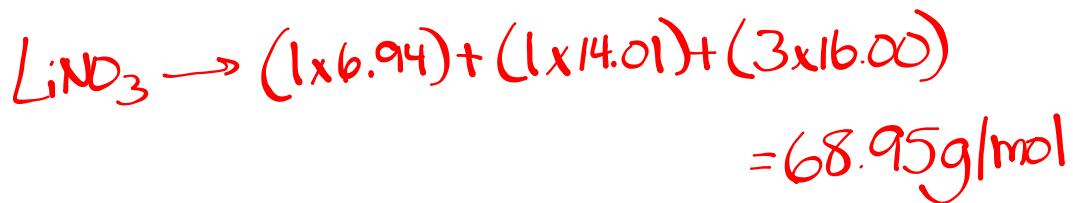
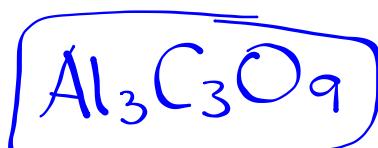**Calculate the volume of 4.58 moles of oxygen gas at STP conditions.**

$$4.58 \, mol \, O_2 \times \frac{22.4 \, L \, O_2}{1 \, mol \, O_2} = 103 \, L \, O_2$$

A compound is composed of 31.0% Al, 13.8% C, and 55.2% O. Determine the empirical and molecular formula of the compound. The molar mass of the compound is 260.93 g/mol.

$$31.0 g \, Al \quad \times \quad \frac{1 \; mol \; Al}{26.98 \; g \; Al} \quad = \quad \frac{1.149 \; mol \; Al}{1.149 \; mol} = 1$$

$$13.8 g \, C \quad \times \quad \frac{1 \; mol \; C}{12.01 \; g \; C} \quad = \quad \frac{1.149 \; mol \; C}{1.149 \; mol} = 1$$

$$55.2 g \, O \quad \times \quad \frac{1 \; mol \; O}{16.00 \; g \; O} \quad = \quad \frac{3.450 \; mol \; O}{1.149 \; mol} = 3$$

EMPIRICAL   MOLECULAR

$$\boxed{AlCO_3}$$ $\xrightarrow{\times 3}$ $\boxed{Al_3C_3O_9}$

86.99 g/mol $\xrightarrow{\times 3}$ 260.93 g/mol

$$AlCO_3 \rightarrow (1 \times 26.98) + (1 \times 12.01) + (3 \times 16.00)$$

$$= 86.99 \; g/mol$$

6.02×10^{23} atoms/mol

6.02×10^{23} molecules/mol

22.4 L/mol

Worksheet