

2. A 2.55 g sample of Magnesium Chloride, MgCl_2 , is dissolved into a 150ml volume of water.

- a. Determine the resulting concentration of the solution. (3)

$$\frac{2.55 \text{ g}}{95.21 \text{ g/mol}} = 0.02678 \text{ mol}$$

$$M = \frac{(24.31 \text{ g/mol}) + 2(35.45 \text{ g/mol})}{95.21 \text{ g/mol}}$$

$$C = \frac{n}{V} = \frac{0.02678 \text{ mol}}{0.15 \text{ L}} = \boxed{0.18 \text{ M}}$$

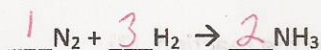
- b. If the solution were diluted to a final volume of 650 ml, what would be the concentration of the new solution. (3)

$$C_i V_i = C_f V_f$$

$$C_f = \frac{C_i V_i}{V_f}$$

$$= \frac{(0.18 \text{ M})(0.15 \text{ L})}{0.65 \text{ L}} = \boxed{0.042 \text{ M}}$$

3. Nitrogen gas and Hydrogen gas are mixed together to form Ammonia, NH_3 . If 6.00L of Nitrogen and 14.0L of Hydrogen are mixed together at STP, determine the limiting reactant. ($V_m = 22.4 \text{ L/mol}$) (6)



$$n_{\text{H}_2} = \frac{14.0 \text{ L}}{22.4 \text{ L/mol}} = 0.625 \text{ mol}$$

$$n_{\text{NH}_3} = 0.625 \text{ mol H}_2 \times \frac{2 \text{ mol NH}_3}{3 \text{ mol H}_2} = \boxed{0.417 \text{ mol NH}_3}$$

$$n_{\text{N}_2} = \frac{6.00 \text{ L}}{22.4 \text{ L/mol}} = 0.2679 \text{ mol N}_2 \quad \left| \quad n_{\text{NH}_3} = 0.2679 \text{ mol} \times \frac{2 \text{ mol NH}_3}{1 \text{ mol N}_2} = \boxed{0.536 \text{ mol NH}_3} \right.$$

$$\therefore \text{LR} = \text{H}_2$$