

Chem 11 final review 4: Stoich

For all questions use the following reaction



- 1) How many grams of ammonia are produced when 12.5 L of nitrogen gas at STP are reacted with excess Hydrogen gas?

$$12.5 \text{ L N}_2 \times \frac{1 \text{ mol}}{22.4 \text{ L}} \times \frac{2 \text{ mol NH}_3}{1 \text{ mol N}_2} \times \frac{17.0 \text{ g}}{1 \text{ mol NH}_3} = 19.0 \text{ g NH}_3$$

- 2) How many Molecules of nitrogen are required to fully react with 19.2 g of Hydrogen?

$$19.2 \text{ g H}_2 \times \frac{1 \text{ mol H}_2}{2.0 \text{ g H}_2} \times \frac{1 \text{ mol N}_2}{3 \text{ mol H}_2} \times \frac{6.022 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 1.93 \times 10^{24} \text{ molecules}$$

- 3) How much energy is produced when 1.63×10^{23} molecules of Hydrogen are reacted with excess Nitrogen?

$$1.63 \times 10^{23} \text{ molecules H}_2 \times \frac{1 \text{ mol H}_2}{6.022 \times 10^{23} \text{ molecules}} \times \frac{91.8 \text{ kJ}}{1 \text{ mol}} = 24.8 \text{ kJ}$$

- 4) 1.20×10^{24} molecules of Nitrogen is reacted with 36.96 L of Hydrogen gas at STP. How many grams of Ammonia will be produced?

If N₂ limits

$$1.20 \times 10^{24} \text{ molecules N}_2 \times \frac{1 \text{ mol}}{6.022 \times 10^{23} \text{ molecules}} \times \frac{2 \text{ mol NH}_3}{1 \text{ mol N}_2} \times \frac{17.0 \text{ g}}{1 \text{ mol NH}_3} = 67.8 \text{ g}$$

If H₂ limits

$$36.96 \text{ L H}_2 \times \frac{1 \text{ mol}}{22.4 \text{ L}} \times \frac{2 \text{ mol NH}_3}{3 \text{ mol H}_2} \times \frac{17.0 \text{ g}}{1 \text{ mol NH}_3} = 18.7 \text{ g}$$

← makes less so H₂ is limiting, N₂ is excess and you can make 18.7 g NH₃