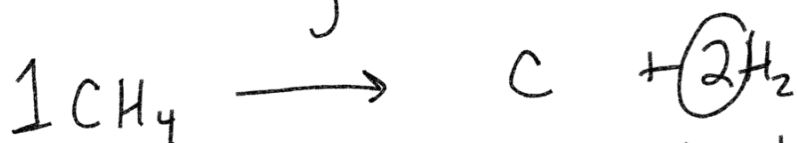


W-GC General Chemistry 1/19

Methane breaks down into carbon and hydrogen gas. How many grams of hydrogen is produced by the complete decomposition of 150. g of methane (CH₄)?



$$150 \text{g CH}_4 \times \frac{1 \text{ mol CH}_4}{16.043 \text{g CH}_4} \times \frac{2 \text{ mol H}_2}{1 \text{ mol CH}_4} \times \frac{2.016 \text{g}}{1 \text{ mol H}_2}$$

$$1 \text{C} = 1 * 12.011 = 12.011$$

$$4 \text{H} = 4 * 1.008 = \frac{4.032}{16.043}$$

37.6g H_2

$$\text{H}_2 = 2 * 1.008 = 2.016$$

How many atoms?

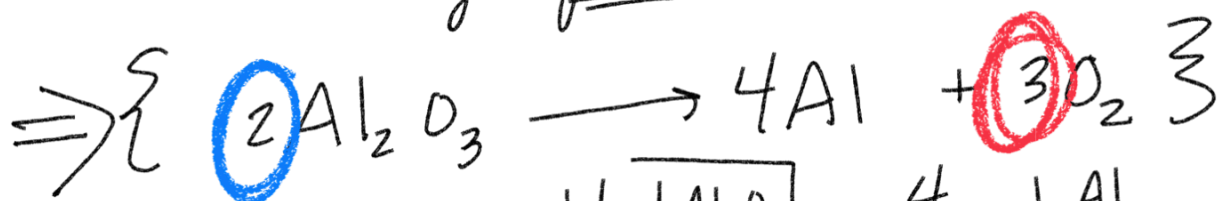
$$150 \text{g CH}_4 \times \frac{1 \text{ mol CH}_4}{16.043 \text{g CH}_4} \times \frac{2 \text{ mol H}_2}{1 \text{ mol CH}_4} \times \frac{6.022 * 10^{23} \text{ atoms}}{1 \text{ mol H}_2}$$

H₂ gas How many liters of H₂?

molar volume → 1 mole of gas is 22.4 L

$$150 \text{g CH}_4 \times \frac{1 \text{ mol CH}_4}{16.043 \text{g CH}_4} \times \frac{2 \text{ mol H}_2}{1 \text{ mol CH}_4} \times \frac{22.4 \text{ L}}{1 \text{ mol H}_2} = \boxed{419 \text{ L}}$$

86 g of Al_2O_3 decomposed into how many grams of Al?



$$86 \text{ g Al}_2\text{O}_3 * \frac{1 \text{ mol Al}_2\text{O}_3}{101.961 \text{ g Al}_2\text{O}_3} * \frac{4 \text{ mol Al}}{2 \text{ mol Al}_2\text{O}_3} * \frac{26.982 \text{ g Al}}{1 \text{ mol Al}}$$

$$\text{Al } 2 * 26.982 = 53.964$$

$$\text{O } 3 * 15.999 = 47.997$$

$$101.961$$

$$\boxed{45.5 \text{ g Al}}$$

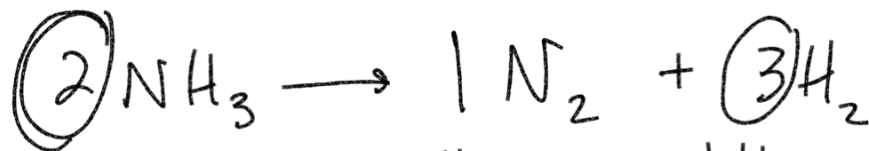
molar volume = 22.4 L

86 g Al_2O_3 produces how many liters of O_2 gas?

$$86 \text{ g Al}_2\text{O}_3 * \frac{1 \text{ mol Al}_2\text{O}_3}{101.961 \text{ g Al}_2\text{O}_3} * \frac{3 \text{ mol O}_2}{2 \text{ mol Al}_2\text{O}_3} * \frac{22.4 \text{ L O}_2}{1 \text{ mol O}_2}$$

$$28.3 \text{ L O}_2$$

Ammonia breaks down into nitrogen and hydrogen gas respectively. How many grams of H₂ would be produced from 200 g of NH₃. How many liters of N₂ gas would be created from the same amount? 22.4 L → 1 mol



$$200 \text{g NH}_3 * \frac{1 \text{ mol NH}_3}{17.031 \text{g NH}_3} * \frac{3 \text{ mol H}_2}{2 \text{ mol NH}_3} * \frac{2.016 \text{g H}_2}{1 \text{ mol H}_2}$$

$$\begin{aligned} 1\text{N}: 1 * 14.007 &= 14.007 \\ 3\text{H}: 3 * 1.008 &= \frac{3.024}{17.031} \end{aligned}$$

$$\boxed{35.5 \text{g H}_2}$$

$$200 \text{g NH}_3 * \frac{1 \text{ mol NH}_3}{17.031 \text{g NH}_3} * \frac{1 \text{ mol N}_2}{2 \text{ mol NH}_3} * \frac{22.4 \text{L N}_2}{1 \text{ mol N}_2}$$

$$\boxed{132 \text{L}}$$