Example discussed in class but not completed (you were supposed to complete it).

What volume of $N_2(g)$ at STP would be produced by the rx. of 0.86 g of NO(g)?

$$2\ NO(g) + 2\ H_2(g) \text{ ------> } 2\ H_2O(g) + N_2(g)$$

1) **Method 1**

Do a gram to mole stoichiometry problem to convert grams of NO to moles of N_2 and then use the IGL to calc. the volume of N_2.

$$? \text{ mol } N_2 = 0.86 \text{ g NO} \times \frac{1 \text{ mol NO}}{30.01 \text{ g NO}} \times \frac{1 \text{ mol } N_2}{2 \text{ mol NO}} = 0.01\underline{4}33 \text{ mol } N_2$$

Use IGL to calculate the vol. of N_2

$$V = \frac{nRT}{P} = \frac{(0.01\underline{4}33 \text{ mol } N_2)\ (0.0821 \text{ L•atm/mol•K})(273.15 \text{ K})}{(1 \text{ atm})}$$

$$= 0.3\underline{2}13 \text{ L} = 0.32 \text{ L } (3\underline{2}0 \text{ mL}) \text{ of } N_2$$

2) **Method 2**

Convert the grams of NO to moles, use the IGL to get the vol. of NO, then do a vol. to vol. stoichiometry problem.

$$? \text{ mol NO} = 0.86 \text{ g NO} \times \frac{1 \text{ mol NO}}{30.01 \text{ g NO}} = 0.02\underline{8}65 \text{ mol NO}$$

Use IGL to calculate the vol. of NO

$$V = \frac{nRT}{P} = \frac{(0.02\underline{8}65 \text{ mol NO})\ (0.0821 \text{ L•atm/mol•K})(273.15 \text{ K})}{(1 \text{ atm})}$$

$$= 0.6\underline{4}26 \text{ L NO}$$

Do a vol to vol stoich. problem to get volume of N_2 from volume of NO

$$\text{? L } N_2 = 0.6\underline{4}26 \text{ L NO} \times \frac{1 \text{ mol } N_2}{2 \text{ mol NO}} = 0.3\underline{2}13 \text{ L} = 0.32 \text{ L } (3\underline{2}0 \text{ mL}) \text{ of } N_2$$

3) **Method 3**

Use dimensional analysis to convert grams of NO to volume of N_2 using the Standard Molar Volume of 22.41 L/mol. You can do this because the reaction takes place at STP, which stands for Standard Temperature and Pressure (273.15 K and 1 atm).

$$\text{? L } N_2 = 0.86 \text{ g NO} \times \frac{1 \text{ mol NO}}{30.01 \text{ g NO}} \times \frac{1 \text{ mol } N_2}{2 \text{ mol NO}} \times \frac{22.41 \text{ L } N_2}{1 \text{ mol } N_2}$$

$$= 0.3\underline{2}11 \text{ L} = 0.32 \text{ L } (3\underline{2}0 \text{ mL}) \text{ of } N_2$$

This is like method 1 above with 1 extra step. Can only do this (use 22.41L/mol) at STP.