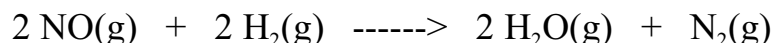


Example discussed in class but not completed (you were supposed to complete it).

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



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 .

$$? \text{ mol } N_2 = 0.86 \text{ g } NO \times \frac{1 \text{ mol } NO}{30.01 \text{ g } NO} \times \frac{1 \text{ mol } N_2}{2 \text{ mol } NO} = 0.01433 \text{ mol } N_2$$

Use IGL to calculate the vol. of N_2

$$V = \frac{nRT}{P} = \frac{(0.01433 \text{ mol } N_2) (0.0821 \text{ L}\cdot\text{atm}/\text{mol}\cdot\text{K})(273.15 \text{ K})}{(1 \text{ atm})}$$
$$= 0.3213 \text{ L} = 0.32 \text{ L (320 mL) of } N_2$$

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.

$$? \text{ mol } NO = 0.86 \text{ g } NO \times \frac{1 \text{ mol } NO}{30.01 \text{ g } NO} = 0.02865 \text{ mol } NO$$

Use IGL to calculate the vol. of NO

$$V = \frac{nRT}{P} = \frac{(0.02865 \text{ mol } NO) (0.0821 \text{ L}\cdot\text{atm}/\text{mol}\cdot\text{K})(273.15 \text{ K})}{(1 \text{ atm})}$$
$$= 0.6426 \text{ L } NO$$

Do a vol to vol stoich. problem to get volume of N₂ from volume of NO

$$? \text{ L N}_2 = 0.6426 \text{ L NO} \times \frac{1 \text{ mol N}_2}{2 \text{ mol NO}} = 0.3213 \text{ L} = 0.32 \text{ L (320 mL) of N}_2$$

3) Method 3

Use dimensional analysis to convert grams of NO to volume of N₂ 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).

$$\begin{aligned} ? \text{ L N}_2 &= 0.86 \text{ g NO} \times \frac{1 \text{ mol NO}}{30.01 \text{ g NO}} \times \frac{1 \text{ mol N}_2}{2 \text{ mol NO}} \times \frac{22.41 \text{ L N}_2}{1 \text{ mol N}_2} \\ &= 0.3211 \text{ L} = 0.32 \text{ L (320 mL) of N}_2 \end{aligned}$$

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