Chapter 12 Section 10

Gas Stoichiometry

Very similar to other Stoichiometry problems.

Step 1: Convert Grams to Moles
Step 2: Convert Moles of one substance to Moles of another substance
Step 3: Convert Moles to Grams

For gases most often a volume measure, not grams is used in the lab. The ideal gas law allows you to calculate moles from volume when temperature and pressure are known. We will be simply applying this to Stoichiometry problems.

A Few Terms

*Standard Temperature and Pressure (STP) = 1 atm of Pressure and Zero Degrees Celsius

* Molar Volume of an Ideal Gas = 22.4 L at Standard Temperature and Pressure (STP)

Example:

What volume of oxygen is produced at 1 atm of pressure and 25°C by the complete reaction of 10.5 grams of potassium chlorate ($KClO_3$) according to the following balanced equation: $2\ KClO_3\ (s) \rightarrow 2KCl\ (s) + 3O_2\ (g)$?

Step one: Grams to moles- 10.5 grams $KClO_3$ to moles $KClO_3$ by dividing by molar mass of $KClO_3$. 10.5/122.6 = .0856 mol $KClO_3$

Step two: Moles to Moles- Convert moles of $KClO_3$ to moles of O_2 (g) using the mole ratio from the balanced equation. Ratio of $KClO_3$ to O_2 is 2 to 3.

$$.0856 \text{ mol } KClO_3 \times \frac{3 \text{ mol } O_2}{2 \text{ mol } KClO_3} = .128 \text{ mol } O_2$$

Step three: Moles of O_2 to volume of O_2 using the ideal gas law. PV=nRT

1atm(v)= (.128 mol)(0.0821)(298)

V= 3.13 L of O_2 will be produced.