*AP Chemistry*

*Gas Stoichiometry: Non-STP Conditions*

STP: Standard temperature and pressure. 0oC, 1 atm pressure (or equivalent)

Molar volume of a gas at STP:

\*Remember, you can only use this conversion for gas volumes at STP!

As with any stoichiometry problem, make sure you have a balanced equation.

**Level 1 Problem**

* C3H8 + 5 O2 → 3 CO2 + 4 H2O
* If 25 liters of oxygen are consumed in the reaction above at STP, what mass of carbon dioxide will be produced?

The Universal Gas Constant

R = $8.314 \frac{L kPa}{mol K}$

R = 0.08206 $\frac{L atm}{mol K}$

What if you are not at STP?

* Mole-mole conversions aren’t affected by pressure or temperature
* Masses aren't affected by pressure or temperature
* Use the ideal gas law OR the combined gas law as well as reaction stoichiometry.
	+ Do you need to calculate moles of a gas first and then do the stoichiometry?
	+ Could you convert to standard conditions and then do the stoichiometry calculation?
	+ Do you need to do the stoichiometry calculations and then use the gas laws?

Let's do this problem together.

* What volume of chlorine gas measured at 19.5oC and 1.03 atm can be produced by the electrolysis of 60.3 g of NaCl to give sodium metal and chlorine gas? Start with a balanced equation!

**Level 2 Problems**

1. How many liters of ozone can be destroyed at 250. K and 110. kPa if 125 g of chlorine gas react completely according to the following equation?

 Cl2(g) + 2 O3(g) → 2 ClO(g) + 2 O2(g)

1. How many liters of hydrogen gas can be collected at 220. K and 0.974 atm if 22.6 g of zinc metal react with excess hydrochloric acid according to the following equation?

 Zn(s) + 2 HCl(aq) → ZnCl2(aq) + H2(g)

1. How many grams of calcium carbonate must react with excess hydrochloric acid to form 98 L of carbon dioxide at 35.0oC and 1.42 atm?

 CaCO3(s) + 2 HCl(aq) → H2O(l) + CO2(g) + CaCl2(aq)

1. If 8.76 L of sulfur dioxide gas are collected at 117.4 kPa and 26.3oC according to the reaction shown below, how many grams of iron(III) oxide will also be produced?

 4 FeS(s) + 7O2(g) → 2 Fe2O3(s) + 4 SO2(g)