Ideal Gas Properties and the Ideal Gas Law

Law of Combining Volumes: when gases react, the volumes of the reactants and products are always in whole number ratios.

$$2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(g)}$$

Law of Multiple Proportions: the masses of the elements that combine can be expressed in whole number ratios.

Avogadro's Hypothesis: Equal volumes of all ideal gases at the same temperature and pressure contain the same number of moles.

Molar Volume: The volume of 1 mole of a gas

At STP, all ideal gases have the same molar volume, 22.4 L/mol

Ex 1a) At STP, a sample of O_2 has a volume of 63.7 L. How many moles are there?

b) If you add 3.76 mol of O_2 to the original sample, what will the final volume be?

* Remember to use this equation we are assuming we have an ideal gas……

Ideal Gas Law

If we combine Avogadro's Hypothesis with the Combined Gas Law:

For 1 mol of ideal gas at STP, R =?

* You can use different units, but then R does not equal 8.31. See pg 485.

Ex 2. What volume would 2.32 mol of H_2 gas have if held at 105.3 kPa and 25 ºC?

Ex 3. How many moles of CO_2 are there in a sample of gas with a volume of 18.2 L at SATP?