LESSON 5.6

stoichiometry on gases

1. A volume of gas A is given and the volume of gas B is sought.
   a. The volumes of both gases are measured under the same conditions of temperature and pressure
   b. The volumes of the two gases are measured under different conditions. Use Gay-Lussac's Law of combining volumes to find the volume of gas B under the condition given for Gas A. Use correction factors to correct this volume of gas B so that it conforms to the final conditions given in the problem.

2. A mass of substance A is given and the volume of gas B is sought.
   a. Find the number of moles of A.
   b. Use this number of moles of A to find the number of moles of B. The mole relationship of B to A is given by the chemical equation.
   c. Find the volume of gas B by substituting in $PV = nRT$; n is the number of moles found in step B; P and T are the conditions under which the volume of B is measured.

3. A volume of gas A is given and the mass of substance B is sought.
   a. Determine the number of moles of A by using $PV = nRT$
   b. Use this number of moles of A to find the number of moles of B. The mole relationship of B to A is given by the chemical equation.
   c. Find the mass of B from the number of moles of B determined in step B. One mole of B is the molecular weight of B in grams.

1. 0.400 g sample of sodium azide, NaN_3 is heated and decomposed
   $2NaN_3 \rightarrow 2Na + 3N_2$
   what volume of $N_2(g)$ measured @ 25°C and 0.980 atm is obtained?

TYPE 2:

STEP 1: Find the number of moles of A

MM
Na: 1 x 23 = 23
N: 3 x 14 = 42
65 g/mol

$$n_{NaN_3} = 0.400\,g\,NaN_3 \times \frac{1\,mol\,NaN_3}{65\,g\,NaN_3}$$

$$= 0.00615\,mol\,NaN_3$$

STEP 2: Find the mole number of B, using mole relationship

MR: $2\,mol\,NaN_3 \rightleftharpoons 3\,mol\,N_2$

$$n_{N_2}: 0.00615\,mol\,NaN_3 \times \frac{3\,mol\,N_2}{2\,mol\,NaN_3} = 0.00923\,mol\,N_2$$

STEP 3: Use $PV = nRT$ to find volume

$$V_{N_2} = \frac{n_{N_2}RT}{P} = \frac{(0.00923\,mol)(0.0821\,atm \cdot L \cdot mol^{-1}K^{-1})(298.15\,K)}{0.980\,atm}$$

$$= 0.231\,L\,N_2(g)$$