**HomeWork 14**

**Due Monday 11/9/15**

**Your name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_/6**

**NOTE: R=0.08206 atm L/K mol**

**An unknown gas can have one of six identities:**

**O2 N2 CO2 H2O SO2 H2**

**MW 32 28 44 18 64 2**

**A 1.0 gram sample of the gas occupies 1.00 L at 300 K and a pressure of 0.879 atm. Which gas are you working with and why (show work.)**

**n=PV/RT= 0.879\*1/(0.08206\*300) =0.03571 mol**

**convert 1.00 g of the gas to moles using the various MW above:**

**O2 N2 CO2 H2O SO2 H2**

 **1 1 1 1 1 1**

**32 28 44 18 64 2**

 **n= 0.0312 0.0357 0.0227 0.0555 0.0156 0.5**

 **best match to ideal gas law n prediction \_\_N2\_\_ gas ID**

**A nitrogen oxide compound NxOy decomposes to form N2 and O2.**

**The possible choices for the compound are:**

**NO2🡪 ½ N2 + O2**

**NO 🡪 ½ N2 + ½ O2**

**N2O4 🡪 N2 + 2O2**

**The magic Ideal Gas fairy informs you that 1 mole of the mystery gas decomposes to N2 and O2 which then occupies 73.854 L at 1 atm and 300 K. What is the identity of the original NxOy compound and why ? (show work)**

**n= PV/RT= 1\*73.854/(0.08206\*300)=3 moles of gas from decomposition.**

**1 mol N2O4=> 3 mol( N2 + O2) N2O4 is the mystery gas \_\_\_N­2O4\_\_\_\_ NxOy ID**

**3) A sample of an unknown SxOy compound initial occupies 22.4 L at 300 K and 1.099 atm. It can decompose to form one of three possible forms:**

**SO2 (g)🡪 S(g) + O2(g) SO3 (g) 🡪 S(g) + 3/2 O2 SO🡪 S(g) + ½ O2(g)**

**When it does decompose, the final products produce a new net pressure of 2.7475 atm in the same volume at the same temperature . What is the identity of the SxOy compound and why ? (Show work): Hint – how many moles of SxOy are present initially ?**

**Initial mole count = n1= P 1V1/RT1= 1.099\*22.4/(300\*0.08206)=1**

**After decomposition n2=P2V1/RT1= 2.7475\*22.4/(0.08206\*300) =2.5**

**Comparing the decomposition gas moles to the original product volumes above**

**We find:**

**SO2 (g)🡪 S(g) + O2(g) SO3 (g) 🡪 S(g) + 3/2 O2 SO🡪 S(g) + ½ O2(g)**

 **1 mol 2.5 mol 1.5 mol**

 **\_\_SO3\_\_\_\_\_\_ = SxOy ID**