CHM151 Quiz 6 25 Pts Fall 2009 Name: Key

SHOW ALL WORK TOF RECEIVE CREDIT.

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $P_1V_1T_2 = P_2V_2T_1$ $PV = nRT$ $R = \frac{62.37\,L \cdot Torr}{mol \cdot K} = \frac{0.0821\,L \cdot atm}{mol \cdot K} = \frac{8.314\,J}{mol \cdot K}$

Molar masses: C = 12.01, N = 14.01, F = 19.00, O = 16.00, S = 32.07

1. (5 Pts) A sample of nitrogen gas at 278 K and 745 torr has a volume of 37.42 L. What volume will it occupy if the pressure is increased to 994 torr at constant temperature?

$P_1V_1T_② = P_2V_2T_①$

$V_2 = \frac{P_1V_1}{P} = \frac{(745\,torr)(37.42\,L)}{994\,(torr)} = 28.0\,L$

2. (5 Pts) A sample of carbon dioxide gas at 125°C and 248 torr occupies a volume of 275 L. What will the gas pressure be if the volume is increased to 321 L at 345°C?

$P_1V_1T_② = P_2V_2T_①$

$P_2 = \frac{P_1V_1T_②}{V_2T_①} = \frac{(248\,torr)(275\,L)(345+273\,K)}{(321\,L)(125+273\,K)} = 330\,torr$

3. (5 Pts) Calculate the density in g/L of gaseous SF_6 at 60.0°C and 650. torr.

Density = g ÷ L use PV = nRT to find volume of 1 mole, then use mass of 1 mole and the volume to find Density

n = 1 mol (146.06 g)
P = 650 torr
V = ?
T = 60+273 K
R = 62.37 L·torr / mol·K

$V = \frac{nRT}{P} = \frac{(1\,mol)(62.37\,L \cdot atm)(333\,K)}{(mol \cdot K)(650\,torr)} = 31.95\,L$

$\frac{146.06\,g}{31.95\,L} = 4.57\,g$

4. (5 Pts) A sample of nitrogen gas is confined to a 16.0 L container at 375 torr and 37.0°C. How many moles of nitrogen are in the container?

PV = nRT
P = 375 torr
V = 16.0 L
n = ?
R = 62.37 L·torr / mol·K
T = 310 K

$n = \frac{PV}{RT} = \frac{(375\,torr)(16.0\,L)(mol \cdot K)}{(62.37\,L \cdot torr)(310\,K)}$

n = 0.310 mol

5. (5 Pts) A flask with a volume of 3.16 L contains 9.33 grams of an unknown gas at 32.0°C and 1.10 atm. What is the molar mass of the gas?

molar mass = g ÷ mol Find moles and use 9.33 grams

P = 1.10 atm
V = 3.16 L
n = ?
R = 0.0821 L·atm / mol·K
T = 32+273 = 305 K

$n = \frac{PV}{RT} = \frac{(1.10\,atm)(3.16\,L)(mol \cdot K)}{(0.0821\,L \cdot atm)(305\,K)}$

n = 0.139 moles

molar mass = $\frac{9.93\,g}{0.139\,moles} = 67.2\,g/mol$