CHM151 Quiz 5a 25 Pts Spring 2008 Name: Key
Molar Masses: H 1.008, C 12.01, O 16.00

1. A small bubble rises from the bottom of a lake, where the temperature and pressure are 4°C and 3.0 atm, to the water's surface, where the temperature is 25°C and pressure is 0.95 atm. Calculate the final volume of the bubble if its initial volume was 2.1 mL.

$P_1 V_1 T_{②} = P_2 V_2 T_{①}$

$P_1 = 3.0\ atm$ $\quad P_2 = 0.95\ atm$

$V_1 = 2.1\ mL$ $\quad V_2 = ?$

$T_1 = 4 + 273 = 277 K$ $\quad T_2 = 298 K$

$V_2 = \frac{P_1 V_1 T_{②}}{P_2 T_{①}}$

$V_2 = \frac{(3.0\ atm)(2.1\ mL)(298 K)}{(0.95\ atm)(277 K)}$

$V_2 = 7.13\ mL \Rightarrow$ **7.1 mL**

2. Calculate the density, in g/L, of CO_2 gas at 27°C and 0.50 atm pressure.

$P = 0.50\ atm$

$V = ?$

$n =$ use 1 mole (44.01 g)

$R = 0.0821\ L \cdot atm / mol \cdot K$

$T = 27 + 273 = 300 K$

$PV = nRT$

$V = \frac{(1\ mol)(0.0821\ L \cdot atm / mol \cdot K)(300 K)}{(0.50\ atm)} = 49.26 L$

$D = \frac{44.01\ g}{49.26\ L} =$ **0.89 g/L**

3. Calculate the volume occupied by 35.2 g of methane gas (CH_4) at 25°C and 1.0 atm. R = 0.0821 L·atm/K·mol.

$n = \frac{35.2\ g \mid 1\ mol}{\mid 16.042\ g} = 2.194\ mol$

$PV = nRT$

$V = \frac{nRT}{P}$

$P = 1.0\ atm$

$V = ?$

$T = 298 K$

$V = \frac{2.194\ mol \mid 0.0821\ L \cdot atm \mid 298 K}{\mid mol \cdot K \mid 1.0\ atm}$

$V = 53.7 =$ **54 L**

4. If 30.0 L of oxygen are cooled from 200°C to 1°C at constant pressure, what is the new volume of oxygen?

$~~P_1~~ V_1 T_{②} = ~~P_2~~ V_2 T_{①}$

$(30.0 L)(274 K) = V_2 (473 K)$

$V_2 = 17.4\ L$

5. Determine the molar mass of Freon-11 gas if a sample weighing 0.597 g occupies 100 cm^3 at 95°C, and 1,000 mmHg. (Have)

molar mass = g/mol

$P = 1000\ torr$

$V = 100\ cm^3 = 0.100\ L$

$n = ?$

$R = \frac{62.4\ L \cdot torr}{mol \cdot K}$

$T = 368 K$

$PV = nRT$

$n = \frac{PV}{RT}$

$n = \frac{(1000\ torr)(0.100\ L)\ mol \cdot K}{62.4\ L \cdot torr\ (368 K)}$

$n = 0.00435..\ mol$

then: $\frac{0.597\ g}{0.00435\ mol} =$ **137 g/mol**