CHM 151 Quiz # 5a 25 Pts Fall 2002 Name: Key

SHOW WORK TO RECEIVE CREDIT. $P_1V_1T_2 = P_2V_2T_1$ $PV = nRT$

$\mathbf{R = 0.0821\frac{L \bullet atm}{mol \bullet k} = 62.4\frac{L \bullet torr}{mol \bullet K}}$ Atomic Masses: N 14.01, O 16.00

1. (5 Pts) A 10.0 cm^3 container of helium is sealed at 22.0 °C and 1.00 atm pressure. What pressure would be exerted by the helium if the container were heated to 220 °C?

$$P_2 = \frac{P_1 V_1 T_{②}}{V_2 T_{①}} = \frac{(1.00\ atm)(10.0\ cm^3)(220+273\ K)}{(10.0\ cm^3)(22+273\ K)}$$

$P_2 = 1.67\ atm$

2. (5 Pts) A 1200 mL sample of helium gas is at a pressure of 350 mmHg and a temperature of 300 K. What volume will this gas sample occupy if the pressure is increased to 700 mmHg and the temperature is increased to 400 K?

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

$$V_2 = \frac{(350\ torr)(1200\ mL)(400\ K)}{(700\ torr)(300\ K)} = 800\ mL$$

3. (5 Pts) A 5.00 L container contains 2.00 grams of O_2 and 4.00 grams of N_2. If the temperature is 25°C, what is the pressure?

$$P = \frac{nRT}{V} = \frac{\left(2.00\ g\ O_2 \left|\frac{mol}{32.0\ g}\right. + 4.00\ g\ N_2 \left|\frac{mol}{28.02\ g}\right.\right)\left(0.0821\ \frac{L \cdot atm}{mol \cdot K}\right)(298\ K)}{5.00\ L}$$

$P = 1.00\ atm$ or $760\ torr$

4. (5 Pts) What is the volume of 2.00 mol of helium gas at 27 °C and 3.00 atm?

$$V = \frac{nRT}{P} = \frac{(2\ mol)(0.0821\ L \cdot atm)(300\ K)}{(3.00\ atm)} = 16.4\ L$$

5. (5 Pts) If 6.60 g of a gaseous compound occupy a volume of 1.20 L at 27 °C and 0.967 atm, what is the molar mass of the compound?

molar mass = g/mol

$$n = \frac{PV}{RT} = \frac{(0.967\ atm)(1.20\ L)}{(0.0821\ L \cdot atm / mol \cdot K)(300\ K)} = 0.0471\ mol$$

$$\text{molar mass} = \frac{6.60\ g}{0.0471\ mol} = 140\ g/mol$$

CHM 151 Quiz # 5b 25 Pts Fall 2002 Name: Key

SHOW WORK TO RECEIVE CREDIT. $P_1V_1T_2 = P_2V_2T_1$ $PV = nRT$

$\mathbf{R = 0.0821\frac{L \bullet atm}{mol \bullet k} = 62.4\frac{L \bullet torr}{mol \bullet K}}$ Atomic Masses: N 14.01, O 16.00

1. (5 Pts) A 10.0 cm^3 container of helium is sealed at 220.0 °C and 1.50 atm pressure. What pressure would be exerted by the helium if the container were cooled to 25.0 °C?

$$P_2 = \frac{P_1 V_1 T_2}{V_2 T_1} = \frac{(1.50\ atm)(10.0\ cm^3)(25+273)K}{(10.0\ cm^3)(220+273)K} = 0.907\ atm$$

2. (5 Pts) A 1200 mL sample of helium gas is at a pressure of 350 mmHg and a temperature of 300 K. What volume will this gas sample occupy if the pressure is increased to 900 mmHg and the temperature is increased to 400 K?

$$V_2 = \frac{P_1 V_1 T_2}{P_2 T_1}$$

$$V_2 = \frac{(350\ torr)(1200\ mL)(400\ K)}{(900.\ torr)(300K)} = 622\ mL$$

3. (5 Pts) A 6.00 L container contains 3.00 grams of O_2 and 4.00 grams of N_2. If the temperature is 25°C, what is the pressure?

$PV = nRT$

$$P = \frac{nRT}{V} = \frac{\left(\frac{3.00\ g\ O_2}{32.0\ g/mol} + \frac{4.00\ g\ N_2}{28.02\ g/mol}\right)\left(0.0821\ \frac{L \cdot atm}{mol \cdot K}\right)(298\ K)}{(6.00\ L)}$$

0.2365 mol

$P = 0.964\ atm$ or $733\ torr$

4. (5 Pts) What is the volume of 4.00 mol of helium gas at 27 °C and 2.00 atm?

$$PV = nRT$$

$$V = \frac{(4.00\ mol)\left(0.0821\ \frac{L \cdot atm}{mol \cdot K}\right)(300\ K)}{(2.00\ atm)} = 49.3\ L$$

5. (5 Pts) If 4.60 g of a gaseous compound occupy a volume of 1.20 L at 27 °C and 0.967 atm, what is the molar mass of the compound?

molar mass = g/mol

$$n = \frac{PV}{RT} = \frac{(0.967\ atm)(1.20\ L)}{\left(0.0821\ \frac{L \cdot atm}{mol \cdot K}\right)(300\ K)} = 0.4711\ mol$$

$$\text{molar mass} = \frac{4.60\ g}{0.4711\ mol} = 97.62\ \frac{g}{mol}$$