CHM 151 Quiz 6a 25 Pts Fall 2005 Name: Key

SHOW ALL WORK TO RECEIVE CREDIT.

$PV = nRT$, $P_1V_1T_2 = P_2V_2T_1$, $R = 0.0821\ L\cdot atm/mol\cdot K = 62.4\ L\cdot torr/mol\cdot K$

1. 5 pts The volume of a sample of a gas is 405 mL at 10.0 atm and 467 K. What volume will it occupy at 4.29 atm and the same temperature?

$P_1 = 10.0\ atm$ $P_2 = 4.29\ atm$

$V_1 = 405\ mL$ $V_2 = ?$

$T_1 = 467\ K$ $T_2 = 467\ K$

same

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

$$V_2 = \frac{(10.0\ atm)(405\ mL)}{4.29\ atm} = 944\ mL$$

2. 5 Pts The volume of a sample of a gas is 415 mL at 10.0 atm and 35°C. What volume will it occupy at 5.32 atm and 45°C?

$P_1 = 10.0\ atm$ $P_2 = 5.32\ atm$

$V_1 = 415\ mL$ $V_2 = ?$

$T_1 = 35+273 = 308\ K$ $T_2 = 318\ K$

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

$$V_2 = \frac{(10.0\ atm)(415\ mL)(318\ K)}{(5.32\ atm)(308\ K)} = 805\ mL$$

3. (5 Pts) What volume will 12.40 grams of CO_2 occupy at STP (0°C and 1 atm)?

1 mol @ STP (22.4L)

$$12.40\ g \left| \frac{mol}{44.01\ g} \right. = 0.2817\ mol$$

$$0.2817\ mol \left| \frac{22.4\ L}{1\ mol} \right. = 6.31\ L$$

(or) use $PV = nRT$

$$V = \frac{(0.2817\ mol)(0.0821\ L\cdot atm/mol\cdot K)(273\ K)}{1\ atm}$$

$V = 6.31\ L$

4. 5 Pts) What is the molecular weight of a gas if 0.104 gram of the gas occupies 48.7 mL at 5°C and 1 atm?

WANT g/mol

$PV = nRT$

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

$$n = \frac{(1\ atm)(0.0487\ L) \left| mol\cdot K \right.}{0.0821\ L\cdot atm \left| 278\ K \right.} = 0.002134\ mol$$

$$\frac{0.104\ g}{0.002134\ mol} = 48.7\ g/mol$$

5. (5 Pts) How many moles of an ideal gas are contained in 8.21 L at 73°C and 380 torr?

$PV = nRT$

$$n = \frac{PV}{RT} = \frac{380\ torr \left| 8.21\ L \right| mol\cdot K}{62.4\ L\cdot torr \left| 346\ K \right.} = 0.144\ mol$$

CHM 151 Quiz 6b 25 Pts Fall 2005 Name: Key

SHOW ALL WORK TO RECEIVE CREDIT.

PV = nRT, $P_1V_1T_2 = P_2V_2T_1$, R = 0.0821 L.atm/mol.K = 62.4 L.torr/mol.K

1. (5 Pts) The volume of a sample of a gas is 415 mL at 10.0 atm and 35oC. What volume will it occupy at 5.32 atm and 45oC?

$P_1 = 10.0\ atm$ $P_2 = 5.32\ atm$ $V_2 = \frac{P_1 V_1 T_2}{P_2 V_2}$

$V_1 = 415\ mL$ $V_2 = ?$

$T_1 = 35 + 273 = 308K$ $T_2 = 318K$ $V_2 = \frac{(10.0\ atm)(415\ mL)(318\ K)}{(5.32\ atm)(308\ K)} = 805\ L$

2 2.(5 pts) The volume of a sample of a gas is 405 mL at 10.0 atm and 467 K. What volume will it occupy at 4.29 atm and the same temperature?

$P_1 = 10.0\ atm$ $P_2 = 4.29\ atm$ $V_2 = \frac{P_1 V_1 T_2}{P_2 T_1}$ same T

$V_1 = 405\ mL$ $V_2 = ?$

$T_1 = 467\ K$ $T_2 = same$ $V_2 = \frac{(10.0\ atm)(405\ mL)}{4.29\ atm} = 944\ mL$

3 3. (5 Pts) What volume will 12.40 grams of CO occupy at STP (0oC and 1 atm)?

1 mol @ STP (24.4 L)

$12.40\ g \left| \frac{mol}{28.01\ g} \right. = 0.4427\ mol$

$0.4427\ mol \left| \frac{22.4\ L}{mol} \right. = 9.916\ L$

OR use $PV = nRT$

$V = \frac{(0.4427\ mol)\left(0.0821 \frac{L \cdot atm}{mol \cdot K}\right)(273K)}{1\ atm}$

$V = 9.92\ L$

4 4. (5 Pts) How many moles of an ideal gas are contained in 8.21 L at 73°C and 380 torr?

$PV = nRT$

$n = \frac{PV}{RT} = \frac{(380\ torr)(8.21\ L)\left(\frac{mol \cdot K}{62.4\ L \cdot torr}\right)}{346K} = 0.144\ mol$

5 5. (5 Pts) What is the molecular weight of a gas if 0.104 gram of the gas occupies 48.7 mL at 5°C and 1 atm?

WANT g/mol

$PV = nRT$

$n = \frac{PV}{RT} = \frac{(1\ atm)(48.7 \times 10^{-3}\ L)\left(\frac{mol \cdot K}{0.0821 L \cdot atm}\right)}{278K} = 0.00213\ mol$

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$\frac{0.104\ g}{0.00213\ mol} = 48.7\ g/mol$