Unit 2 Ch. 10 Review

Key

g/mol

13g/mol

$m \cdot n = \frac{m}{M}$ M

10 Multiple choice questions

Topics to be included on this section of the test:

- Combined gas law $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$
- Kinetic theory of matter
- PV=nRT
- Partial Pressures (Dalton's Law) $P_T = P_1 + P_2 + P_3 \ldots$
- Mole fractions $X = \frac{\text{moles of individual}}{\text{Total moles}}$
- Real Gases: Deviations from ideal behavior **READ or REVIEW SECTION 10.9 PG 427**
- Graham's Law of Effusion $\frac{r_1}{r_2} = \sqrt{\frac{M_2}{M_1}}$
- Know how to convert between different pressure units $\text{Density} = \frac{P\,mm}{RT}$
- Boyle's law $P_1 \times V_1 = \text{constant}$
- Charles's law $\frac{V_1}{T_1} = \frac{V_2}{T_2}$
- Gay-Lussac's law $P_1/T_1 = P_2/T_2$
- Using PV=nRT to calculate density and Molar Mass

Molar mass: $MM = \frac{gRT}{PV}$ or $\frac{dRT}{V}$

Two Free Response Questions: One will be long and one will be short with you answering short answer questions.

Examples of what you may see on this test

1. The *Hindenburg* was a hydrogen-filled dirigible that explode in 1937. If the *Hindenburg* held 2.0×10^5 m^3 of hydrogen gas at 23 degrees Celsius and 1.0 atm, what mass of hydrogen was present?

Convert to liters $= 2.0 \times 10^8$ L

$n = \frac{PV}{RT} = \frac{(1.0\text{ atm})\, 2.0 \times 10^8 \text{ L}}{.0821 \frac{L \cdot atm}{mol \cdot K}\; 296\text{ K}} = 8.2299 \times 10^6$ moles

Convert to grams

$8.2299 \times 10^6 \text{ moles } H_2 \times \frac{2.02\text{ g } H_2}{1 \text{ mol } H_2} = 1.66 \times 10^7$ g

2.Equal masses(0.500 g each) of hydrogen and oxygen are placed in an evacuated 4.00 L flask at 25°C. The mixture is allowed to react to completion and the flask is returned to 25°C and allowed to come to equilibrium. The equilibrium vapor pressure of water at 25°Cis 23.76 torr.

a. write and balance an equation for the reactions.

$2H_2 + O_2 \rightarrow 2H_2O$

b. What is the total pressure inside the flask before the reactions begins?

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

Find moles of Reactants, then use $P = \frac{nRT}{V}$

(1) $.500\text{ g } H_2 \times \frac{1 \text{ mol } H_2}{2.02\text{ g } H_2} = .2475 \text{ mol } H_2$ $\quad .500\text{ g } O_2 \times \frac{1 \text{ mol } O_2}{32.0\text{ g } O_2} = .0156 \text{ mol } O_2$

(2) $\frac{(.2475 + .0156)(.0821)(298)}{4.0 \text{ L}} = 1.62$ atm

.0312 atm

c. What is the mass of the water vapor in the flask at equilibrium? .005101

$n = \frac{PV}{RT} = \frac{(4.0 L)}{(.0821 \frac{L \cdot atm}{mol \cdot K})(298)}$ = .005101 moles H_2O

need to add in H_2O pressure

= .0918 g H_2O

d. What is the total pressure inside the flask at equilibrium?

3. Explain, using the Kinetic Molecular Theory, how an increase in temperature of a gas confined to a sealed, rigid container causes an increase in the pressure of the gas.

As the temp. ↑ the particles will move faster. when the particles move faster they will take up more space, and hit the side of the container more often and harder which will ↑ the pressor

= .0875 mol HBr

4. If 27.2 grams of potassium carbonate is reacted with 125 ml of .700 M hydrobromic acid in 3.5 L vessel at a temperature of 22.00°C and a pressure of 757 torr-

H_2CO_3 Breaks down into CO_2 (g)

a. Write the overall reaction for the equation.

$K_2CO_3 + 2HBr \rightarrow H_2O + CO_2 + 2KBr$

b. give the net ionic equation for the reaction $2K^+ + CO_3^{2-} + 2H^+ + 2Br^- \rightarrow H_2O + CO_2 + 2K^+ + 2Br^-$

$CO_3^{2-} + 2H^+ \rightarrow H_2O + CO_2$

c. What is the limiting reagent in the reaction?

L.R

$\frac{27.2 g\ K_2CO_3}{} \cdot \frac{1 mol\ K_2CO_3}{138.28 g\ K_2CO_3} \cdot \frac{1 mol\ CO_2}{1 mol\ K_2CO_3}$ = .1967 mol CO_2

$\frac{.0875 mol\ HBr}{} \cdot \frac{1 mol\ CO_2}{2 mol\ HBr}$ = .04375 mol CO_2

smallest so HBr is L.R

d. How many liters of CO_2 will be created? Assume the vapor pressure for water at 20°C is 22.34 torr.

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

$\frac{.04375 mol\ CO_2 (.0821 \frac{L \cdot atm}{mol \cdot K})(295)}{\left(\frac{757 - 22.34}{760}\right)}$

$\frac{757-22.34}{760}$ = .9666 atm

= 1.096 L