1.) Convert the following pressure measurements to atmospheres.

(A) 151.98 kPa (B) 456 mm Hg (C) 912 torr

(A) $\frac{151.98 \text{ kPa} \mid 1 \text{ atm}}{\mid 101.3 \text{ kPa}}$ = **1.5003 atm**

(B) $\frac{456 \text{ mm Hg} \mid 1 \text{ atm}}{\mid 760 \text{ mm Hg}}$ = **0.600 atm**

(C) $\frac{912 \text{ torr} \mid 1 \text{ atm}}{\mid 760 \text{ torr}}$ = **1.20 atm**

2.) What are the conditions for gas measurement at STP?

0 °C (273 K) and 1 atm

3.) The volume of a sample of methane gas measures 350. mL at 27.0 °C and 810. mm Hg. What is the volume (in liters) at -3.0 °C and 650. mm Hg pressure?

V_1 = 350. mL

T_1 = 27.0 °C --> convert to 300 K

P_1 = 810. mm Hg

T_2 = -3.0 °C --> convert to 270 K

P_2 = 650. mm Hg

V_2 = ? Liters

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

$$\frac{(350)(810)}{300} = \frac{(650)(V_2)}{270}$$

$$\frac{76545000}{195000} = \frac{195000\ V}{195000}$$

393 mL = V

convert to Liters (divide by 1000)

V_2 = **0.393 L**

4.) How many grams of nitrogen gas are contained in a 32.6 liter container at 34.4 °C and 579 torr?

$V = 32.6\ L$

$T = 34.4\ ^oC = 307.4\ K$

$$P = \frac{579\ torr \mid 1\ atm}{\mid 760\ torr} = 0.762\ atm$$

$$(0.762)\ (32.6) = n\ (0.0821)\ (307.4)$$

$$\frac{24.8412}{25.23754} = \frac{25.23754\ n}{25.23754}$$

$$n = 0.984\ moles$$

$$\frac{0.984\ moles \mid 28.0\ g}{\mid 1\ mole} = 27.6\ g$$

5.) A mixture of four gases in a container exerts a total pressure of 955 mm Hg. In this container, there are 4.50 moles of nitrogen gas, 4.25 moles of carbon dioxide gas, 2.75 moles of hydrogen gas, and 2.00 moles of oxygen gas. What is the partial pressure of each gas?

$$P_{N_2} = \frac{4.50\ moles\ N_2}{13.5\ moles} \cdot 955\ mm\ Hg = 318\ mm\ Hg\ N_2$$

$$P_{CO_2} = \frac{4.25\ moles\ CO_2}{13.5\ moles} \cdot 955\ mm\ Hg = 301\ mm\ Hg\ CO_2$$

$$P_{H_2} = \frac{2.75\ moles\ H_2}{13.5\ moles} \cdot 955\ mm\ Hg = 195\ mm\ Hg\ H_2$$

$$P_{O_2} = \frac{2.00\ moles\ O_2}{13.5\ moles} \cdot 955\ mm\ Hg = 141\ mm\ Hg\ O_2$$

6.) Compare the rates of effusion of carbon dioxide gas and carbon monoxide gas.

carbon dioxide = CO_2 --> MM = 44.0 g/mole

carbon monoxide = CO --> MM = 28.0 g/mole

$$\frac{rate\ CO}{rate\ CO_2} = \sqrt{\frac{44.0}{28.0}}$$

CO effuses 1.25 times faster than CO_2.

7.) An unknown gas effuses 1.37 times faster than chlorine gas. What is the molar mass of the unknown gas?

gas A = lighter gas = unknown b/c it effuses faster

gas B = Cl_2

$$\frac{1.37}{1} = \sqrt{\frac{71.0}{x}}$$

$$\frac{1.8769}{1} = \frac{71.0}{x}$$

$$71 = 1.8769\,x$$

$$x = \boxed{37.8\ \text{g/mole}}$$

8.) Given the following unbalanced reaction:

___ C_5H_{12} + _8_ O_2 --> _5_ CO_2 + _6_ H_2O

How many liters of oxygen are needed to produce 45.7 liters of CO_2?

$$\frac{45.7\ \text{L}\ CO_2}{} \Big| \frac{1\ \text{mole}}{22.4\ \text{L}} = 2.04\ \text{moles}\ CO_2$$

$$\frac{2.04\ \text{moles}\ CO_2}{5} = \frac{x\ \text{moles}\ O_2}{8}$$

$$5x = 16.32$$

$$x = 3.264\ \text{moles}\ O_2$$

$$\frac{3.264\ \text{moles}\ O_2}{} \Big| \frac{22.4\ \text{L}}{1\ \text{mole}} = \boxed{73.1\ \text{L}\ O_2}$$

9.) Given the unbalanced equation:

_2_ Mg + ___ O_2 --> _2_ MgO

How many liters of oxygen gas are required to produce 45.8 grams of magnesium oxide?

$$\frac{45.8 \text{ g MgO}}{} \left| \frac{1 \text{ mole}}{40.3 \text{ g}} \right. = 1.14 \text{ moles MgO}$$

$$\frac{1.14 \text{ moles MgO}}{2} = \frac{x \text{ moles } O_2}{1} \qquad 2x = 1.14 \qquad x = 0.57 \text{ moles } O_2$$

$$\frac{0.57 \text{ moles } O_2}{} \left| \frac{22.4 \text{ L}}{1 \text{ mole}} \right. = \boxed{12.8 \text{ L}}$$

10.) An aerosol can contains gases under a pressure of 4.50 atm at 20.0 °C. If the can is left on a hot, sandy beach, the pressure of the gases increases to 4.80 atm. What is the temperature on the beach (in °C)?

$$\frac{P_1 \not{V_1}}{T_1} = \frac{P_2 \not{V_2}}{T_2}$$

$$\frac{4.50 \text{ atm}}{293 \text{ K}} = \frac{4.80 \text{ atm}}{T_2}$$

$$1406.4 = 4.5 \text{ T}$$

$$T_2 = 313 \text{ K}$$

$$313 - 273 = \boxed{40\ ^{o}C}$$