Assignment 8: Unit Review Worksheet

Show all your work on these problems. If a question involves stoichiometry, be sure to balance the equation

1. Calculate the heat needed to heat 100 g of water from 26 ºC to 100 ºC. Then calculate the amount of heat needed to vaporize it.

2. Calculate the amount of water that is needed to cool a 485 g block of aluminum from 277 ºC to 25 ºC, if the water was originally at 20 ºC. (Specific heat of aluminum is 0.22 cal/gC^{o}).

3. A gas in a 600.0 mL cylinder is under a pressure of 650 mm Hg at 298 K. What will be the temperature of the gas if the pressure is increased to 3230 mm Hg?

4. A syringe contains an enclosed gas that has a volume of 10.0 cm^3 at a pressure of 14.7 psi. What pressure is needed to compress the gas to 2.00 cm^3?

5. For an ideal gas, calculate the following quantities:
   a. the pressure of the gas if 1.34 moles occupies 3.28 L at 25.0 ºC
   b. the volume occupied by 6.72 x 10^{-3} mol at 145 ºC and a pressure of 59.0 torr
   c. the number of moles in 2.50 L at 37.0 ºC and 725 mm Hg
   d. the temperature which 0.270 mol occupies 15.0 L at 1.88 atm

6. A mixture of gases contains 3.50 g of N_2, 2.15 g of H_2 and 5.27 g of NH_3. If the total pressure of the mixture is 2.50 atm, what is the partial pressure of each component? (Hint: percent composition is not by mass but by mole)

7. A quantity of N_2 gas originally held at 3.80 atm pressure in a 1.00 L container at 26.0 ºC is transferred into a 10.0 L container at 20.0 ºC. A quantity of O_2 gas originally at 4.75 atm and 26.0 ºC in a 5.00 L contains is transferred into the same new container. What is the total pressure in the new container?

8. Magnesium metal reacts with oxygen gas (O_2) to produce magnesium oxide. How many liters of oxygen gas at 35.0 ºC and a pressure of 1.00 atm are required to react with 28.4 g of magnesium?

9. Calcium hydride (CaH_2) reacts with water to form hydrogen gas and calcium hydroxide [$Ca(OH)_2$]. How many grams of CaH_2 are needed to generate 10.0L of H_2 gas if the pressure is 740 torr at 23.0 ^oC?

10. The metabolic breakdown of glucose, $C_6H_{12}O_6$, in our bodies produces carbon dioxide, which is expelled from our lungs when we breath:

    $C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ H_2O + 6\ CO_2$

    Calculate the volume of dry CO2 produced at body temperatures (37 ^oC) and 1.00 atm when 5.00 g of glucose is consumed in this reaction.

11. Calculate the density (D = mass/volume) of chlorine gas at STP. (Hint: assume you have 1 mole of Cl_2)

12. A chemist isolated a gas in a glass bulb with a volume of 255 mL at a temperature of 25.0 ^oC and a pressure of 10.0 torr. The gas weighed 12.1 mg. What is the molar mass of the gas

13. What will be the effusion rate (v_1/v_2) of helium versus sulfur dioxide (SO_2)? (Hint: use Grahams Law)

14. Ammonia effuses at a rate that is 2.93 times faster than an unknown gas. What is the molecular mass of the unknown gas?

15. A sample of an unknown gas with a mass of 3.620 g was made to decompose inot 2.172 g of O_2 and 1.448 g of Sulfur. Prior to the decomposition, this sample occupied a volume of 1120 mL at 750 torr and 25.0 ^oC.
    a. What is the percentage composition of the elements in this gas?
    b. What is the empirical formula of the gas?
    c. What is its molecular formula?