Gas Review

1. Calculate the density of iodine gas at 25ºC and 954 torr.

2. HCN can be form by the reaction of sodium cyanide (NaCN) with hydrochloric acid. What mass of sodium cyanide is needed to form 7.24 L HCN at 30ºC and 95 kPa?

3. Consider the reaction:
   $4NH_{3(g)} + 5O_{2(g)} \rightarrow 4NO_{(g)} + 6H_2O_{(g)}$
   If 9.24 L of ammonia is mixed with 12.84 L of oxygen, what volume of NO is formed?

4. A 0.0712 g sample of X_4H_{10} has a volume of 30.6 ml at 20ºC and 801 mmHg.
   a. Find the molecular mass of the compound.
   b. Find the atomic wt of X and identify it.

5. Calculate the pressure exerted by one mole of nitrogen gas in a 125 ml container at standard temperature using
   a. The ideal gas law
   b. Van der Waals equation

6. Calculate the average speed of a fluorine molecule at -30ºC.

7. Consider a molecule of methane at 80ºC.
   a. At what temp will its average kinetic energy be twice what it is at 80ºC?
   b. At what temp will its speed be half what it is at 80ºC?

8. A 4 L container holds the following mixture of gases- 10 g of oxygen, 10 g of argon, 3 g of hydrogen, and 10 g of nitrogen. The temperature is 30ºC. Find
   a. Total pressure.
   b. Partial pressure of argon.
   c. Which gas would move the fastest
   d. Which gas would move the slowest
   e. In a different container, if oxygen has a speed of 300 m/s, find the velocity of argon.
   f. If nitrogen effuses from a third container in 24 sec, how long does it take argon?

9. Mg is added to excess HCl. 40.5 ml of gas is collected over water at 778 mmHg and 21ºC. Find the dry volume of hydrogen at STP.

10. A mixture of 1 g of each hydrogen, helium, nitrogen and carbon dioxide are in a container at 25ºC and 1 atm. Arrange them in order of increasing
    a. Partial pressure
    b. Molecular speed

11. A 23 g sample of liquid ethanol, C_2H_5OH, is mixed with 2 mol of oxygen gas in a previously evacuated 20 L container. The mixture is ignited then allowed to cool back to 27°C. Find the total pressure in the container at the end of the reaction.

12. Sketch the following graphs
    a. P vs V
    b. V vs T
    c. P vs T
    d. V vs n

13. Sketch the distribution of molecular velocities for two gases, Cl_2 and I_2, at the same temperature. Assume 1 mol of each gas.

14. Under what conditions is the ideal gas law valid?

15. What are the units of R in PV=nRT?

16. What are the units of R in $u_{rms} = \sqrt{\frac{3RT}{mm}}$?