Chapter 10 Exam Blank

1. Which of the diatomic molecules are gases?
2. What is the difference between a gas and a vapor?
3. A liquid and a gas are moved to large containers (let's keep the volume the same for both containers). How does their behavior differ once they are moved from a small container to a larger container?
4. Although liquid water and carbon tetrachloride (CCl_4) do not mix, their vapors form a homogeneous mixture. Give an explanation based on the behavior of liquids and gases to explain this phenomenon.
5. **(4 points)** An ideal gas initially at 710 torr and 30.59°C occupies 2600 mL. Calculate the final temperature in °C, if the conditions are changed to a pressure **(4 points)** A gas cylinder with a volume of 6.00L contains 1.00 g of Ar and 2.00 g of Ne. The temperature of the two gases is 294K.
    a. Find the partial pressure of each gas.
    b. Find the mole fraction of each gas.
6. of 1.20 atm and volume of 3.25 L
7. **(6 points)** A 23.5-mL volume of hydrochloric acid reacts completely with a solid sample of $MgCO_3$. The volume of CO_2 formed is 154 mL at 25.98°C and 731.6 mmHg. What is the molarity of the acid solution?

    $2HCl_{(aq)} + MgCO_{3(s)} \rightarrow CO_{2(g)} + H_2O_{(l)} + MgCl_{2(aq)}$
8. **(6 points)** Cyanogen, a highly toxic gas, is composed of 46.2 g% C and 53.8% N by mass. At 25°C and 750 torr, 1.05 g of cyanogen occupies 0.500 L. What is the molecular formula of cyanogen.
9. **(5 points)** The rate of effusion of oxygen gas at 0°C is $4{,}61X10^2$m/sec, What is the rate of SO_2 gas at the same pressure and temperature?
10. **(4 points**) Suppose you were marooned on a tropical island and had to make a primitive barometer using sea water (density = 1.10 g/mL). What height would the water reach in your sea water barometer when a mercury barometer would reach 77.5 cm? d (Hg) = 13.6g/mL.
11. **(4 points)** A gas cylinder with a volume of 6.00L contains 1.00 g of Ar and 2.00 g of Ne. The temperature of the two gases is 294K.
    c. Find the partial pressure of each gas.
    d. Find the mole fraction of each gas.
12. **(8 points)** A sample of nitrogen gas is at STP. The volume of the container is decreased while keeping the temperature constant. Use kinetic-molecular theory to explain whether each of the following would increase, decrease, or remain constant and WHY.

a) the average KE

b) the average speed

c) the frequency of the collisions

d) the frequency of collisions per unit area

e) The pressure of the gas

13. **(4 points)** A bicycle tires filled with air to a pressure of 100. PSI at a temperature of 19°C. Riding the bike on a hot day increases the temperature of the tire to 58°C. The tire volume increases by 4.00%. What is the new pressure in the tire?
14. (**6 points)** Automobiles are equipped with airbags. Many that inflate with N_2 use the rapid reaction of NaN_3 + Fe_2O_3 which is initiated by a spark. How many grams of NaN_3 sodium azide) would be required to provide 75.0L of N_2 at 25.0°C and 748 mmHg?
$6NaN_{3(s)} + Fe_2O_{3(s)} \rightarrow 3Na_2O_{(s)} + 2Fe_{(s)} + 9N_{2(g)}$
15. (6 points) Two flasks of equal volume are filled with a gas. Flask A contains H_2 at 0°C and 1 atm pressure. Flask B contains CO_2 at 25°C and 2 atm pressure. Compare these two gases, using the postulates of KMT, with respect to each of the following: [hint: start with a definition]

    a. The average kinetic energy per molecule

    b. The average molecular velocity.

    c. The number of molecules

    d. The mass of the gas.

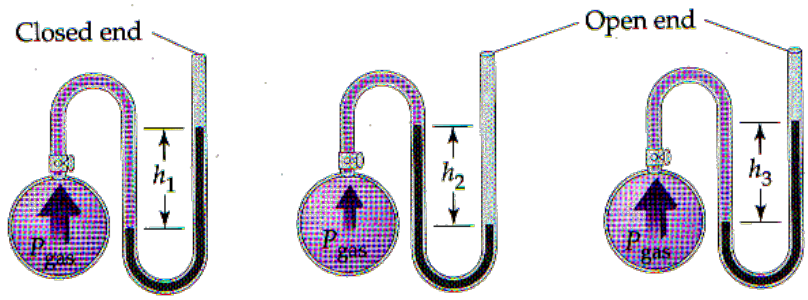
16. (4 points) An incandescent light bulb is filled with 6.00×10^{-5} mol of argon. The bulb has a volume of 800.0 mL. What is the pressure of the argon in the light bulb at 75°C?

17. (12 points) A quantity of Neon gas originally at 5.25 atm in a 2.00-L container at 26.0°C is transferred to a 12.5 L container at 20°C. A quantity of He originally at 5.25 atm and 26.0°C in a 5.00-L container is transferred to the same container (12.5L) containing the neon.

    a. (3 points) What is the pressure of the neon in the new container?
    b. (3 points)What new pressure of the He gas?
    c. (2 points) What is the total pressure of the new container?
    d. (4 points) What are the mole fractions of He and Ne in the new container?
18. (6 points) If the atmospheric pressure is 0.995 atm, what is the pressure of the enclosed gas in each of the two open ended manometers. Assume the grey material is mercury. [1]

H_1 52 cm H_2 = 67 cm H_3=10.3 cm

[1] http://www2.chemistry.msu.edu/courses/cem152/snl_cem152_SS12/_images/manometer.gif



19. (4 points) What is the molar mass of a compound that takes 2.0 times longer to effuse through a porous plug than it did for the same amount of XeF_2 at the same temperature and pressure?

20. (4 points) An ideal gas initially at 1,209 mmHg and 30.00°C occupies 2,600. mL. Calculate the final temperature in **°C**, if the conditions are changed to a pressure of 1.50 atm and volume of 5.32 L

21. (6 points) A self-contained breathing apparatus uses canisters containing potassium superoxide, KO_2. The superoxide consumes the CO_2 exhaled by a person and replaces it with oxygen. What mass of potassium superoxide is required to react with 8.00 L of carbon dioxide at 22.0°C and 767 mmHg?

$$4KO_{2(s)} + 2CO_{2(g)} \rightarrow 2K_2CO_{3(s)} + 3O_{2(g)}$$