Name_____

1. Under what conditions do gases deviate the most from ideal behavior?
   (1) High temperature only
   (2) High temperature, low pressure
   (3) Low temperature, high pressure
   (4) High pressure only
   (5) Low temperature, low pressure

2. Which of the following gases is most like ideal?
   (1) CO
   (2) H_2O
   (3) SO_2
   (4) He
   (5) Br_2

3. A 0.821 L container at 273.°C contains 10.0 moles of neon gas. What is the pressure inside the container?
   (1) 137. atm
   (2) 273. atm
   (3) 410. atm.
   (4) 27.3 atm
   (5) 546. atm

4. 1.00 gram of propene gas occupies what volume at 147.°C and 1.00 atm?
   (1) 0.821 L
   (2) 0.420 L
   (3) 0.082 L
   (4) 1.64 L
   (5) 0.411

5. The gaseous pressure in a 500 mL flask is 250 mmHg at 284 K. What is the number of moles of gas present in the flask?
   (1) 0.00143 mole
   (2) 7.05 moles
   (3) 143 moles
   (4) 0.00705 mole
   (5) 181 moles

6. At 25°C He gas (molar mass 4.00 grams) effuses at a rate of 0.100 mole per minute. What is the rate of effusion of O_2 (molar mass 32.0 grams)?
   (1) 0.035 mole per minute
   (2) 0.20 mole per minute
   (3) 0.40 mole per minute
   (4) 0.10 mole per minute
   (5) 0.025 mole per minute

7. A sealed container contains 0.500 mol of methane gas, 0.400 mol of ethane gas, and 0.100 mol propane gas. If the total pressure of the mixture is 3.00 atm, what is the partial pressure of the propane?
   (1) 3.00 atm
   (2) 0.300 atm
   (3) 1.50 atm
   (4) 0.600 atm
   (5) 1.00 atm

8. Hydrogen gas is collected over water at 29°C. The total pressure of the system is 773 torr. If the vapor pressure of water at 29°C is 30 torr, what is the partial pressure of the hydrogen gas?
   (1) 773 torr
   (2) 803 torr
   (3) 753 torr
   (4) 30 torr
   (5) 743 torr

9. Find the partial pressure of Hydrogen gas collected over water at 18°C if the the vapor pressure of water at 18°C is 15.5 torr, and the total pressure of the sample is 745 torr.
   (1) 745 torr
   (2) 727 torr
   (3) 15.5 torr
   (4) 760.5 torr
   (5) 729.5 torr

10. Equal numbers of moles of $CO_2(g)$, $NH_3(g)$, $SO_2(g)$ are placed into 3 separate identical containers. If each container has an identical pinhole leak, which of the following is true about the moles of gas remaining in each container after some time has elapsed?
    (1) mol CO_2 < mol NH_3 < mol SO_2
    (2) mol NH_3 < mol SO_2 < mol CO_2
    (3) mol CO_2 < mol SO_2 < mol NH_3
    (4) mol SO_2 < mol CO_2 < mol NH_3 <
    (5) mol NH_3 < mol CO_2 < mol SO_2

11. What is the total pressure after 1.00 mole of H_2 (g), 1.00 mole of N_2 (g), 1.00 mole of O_2 (g) and 3.00 moles of CO_2(g), are injected into a rigid 22.4 L container at 273 K?
    (1) 63,500 mmHg
    (2) 760 mmHg
    (3) 9,120 mmHg
    (4) 2,280 mmHg
    (5) 4,560 mmHg

AP Chemistry
Gas Laws

GAS LAWS Packet

Name _____

1. How many moles of CO_2 are required to fill a 5.00 L balloon to a pressure of 2.5 atm. at 5.0°C?

2. What is the pressure in atmospheres of 10.0 moles of methane when stored at 22°C in a 25.0 L Tank?

3. Determine the molar mass of Chloroform gas if a sample weighing .495 g is collected as a gas in a flask of volume 127 ml at 98°C. The pressure of the chloroform vapor at this temp. in the flask was determined to be 754 mm Hg.

4. A mixture of 40.0 g O_2 and 40.0 g He has a total pressure of .900 atm. What are the partial pressures of O_2 and He in the mixture?

2. A sample of a pure, gaseous hydrocarbon is introduced into a previously evacuated rigid 1.00 L vessel. The pressure of the gas is 0.200 atm at a temperature of 127°C.

   (a) Calculate the number of moles of the hydrocarbon in the vessel.

   (b) $O_2(g)$ is introduced into the same vessel containing the hydrocarbon. After the addition of the $O_2(g)$, the total pressure of the gas mixture in the vessel is 1.40 atm at 127°C. Calculate the partial pressure of $O_2(g)$ in the vessel.

   The mixture of the hydrocarbon and oxygen is sparked so that a complete combustion reaction occurs, producing $CO_2(g)$ and $H_2O(g)$. The partial pressures of these gases at 127°C are 0.600 atm for $CO_2(g)$ and 0.800 atm for $H_2O(g)$. There is $O_2(g)$ remaining in the container after the reaction is complete.

   (c) Use the partial pressures of $CO_2(g)$ and $H_2O(g)$ to calculate the partial pressure of the $O_2(g)$ consumed in the combustion.

   (d) On the basis of your answers above, write the balanced chemical equation for the combustion reaction and determine the formula of the hydrocarbon.

   (e) Calculate the mass of the hydrocarbon that was combusted.

   (f) As the vessel cools to room temperature, droplets of liquid water form on the inside walls of the container. Predict whether the pH of the water in the vessel is less than 7, equal to 7, or greater than 7. Explain your prediction.

Answer EITHER Question 2 below OR Question 3 printed on page 8. Only one of these two questions will be graded. If you start both questions, be sure to cross out the question you do not want graded. The Section II score weighting for the question you choose is 20 percent.

2. Answer the following questions related to hydrocarbons.

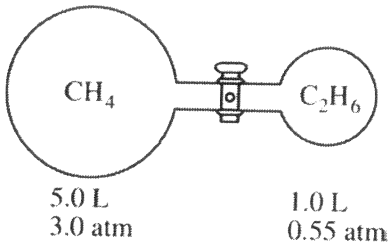
(a) Determine the empirical formula of a hydrocarbon that contains 85.7 percent carbon by mass.

(b) The density of the hydrocarbon in part (a) is 2.0 g L^{-1} at 50°C and 0.948 atm.

(i) Calculate the molar mass of the hydrocarbon.

(ii) Determine the molecular formula of the hydrocarbon.

(c) Two flasks are connected by a stopcock as shown below. The 5.0 L flask contains CH_4 at a pressure of 3.0 atm, and the 1.0 L flask contains C_2H_6 at a pressure of 0.55 atm. Calculate the total pressure of the system after the stopcock is opened. Assume that the temperature remains constant.



(d) Octane, $C_8H_{18}(l)$, has a density of 0.703 g mL^{-1} at 20°C. A 255 mL sample of $C_8H_{18}(l)$ measured at 20°C reacts completely with excess oxygen as represented by the equation below.

$$2\ C_8H_{18}(l) + 25\ O_2(g) \rightarrow 16\ CO_2(g) + 18\ H_2O(g)$$

Calculate the total number of moles of gaseous products formed.