# Quiz 7 – Gas Laws
AP Chemistry

This quiz must be completed and brought to my room <u>before</u> the start of first period on Tuesday. Failure to do so will incur a 25% penalty unless there is a legal reason.

You must <u>show all work</u> in order to receive credit.

1. Consider the hydrocarbon pentane, C_5H_{12} (molar mass 72.15 g).

    (a) Write the balanced equation for the combustion of pentane to yield carbon dioxide and water.

    (b) What volume of dry carbon dioxide, measured at 25°C and 785 mm Hg, will result from the complete combustion of 2.50 g of pentane?

    (c) Under identical conditions, a sample of an unknown gas effuses into a vacuum at twice the rate that a sample of pentane gas effuses. Calculate the molar mass of the unknown gas.

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/l at 509°C and 0.948 atm.
        1. Calculate the molar mass of the hydrocarbon.
        2. Determine the molecular formula of the hydrocarbon.

3. 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.
    (a) Calculate the total pressure of the system after the stopcock is opened. Assume that the temperature remains constant.
    (b) Calculate the pressure of the initial sample of methane using the Vander Waals equation.
    (c) Calculate the rate of diffusion between the two gases.

4. Octane, C_8H_{18}(l), has a density of 0.703 g/mL 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.

$$2\ C_8H_{18}(l) + 25\ O_2\{g)\ à\ 16\ CO_2(g) + 18\ H_2O(g)$$
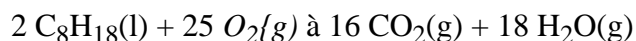
Calculate the total number of moles of gaseous products formed.