January 28, 2016   Quiz 1 – Gases   Name___KEY___
Dr. Nancy De Luca   84.122

Clearly indicate your final answer, and make sure it has the correct number of
significant figures and proper units. If asked, clearly show your method, including
cancellation of units, in calculating your final answer. Assume ideal behavior for
all questions.

1. A 5.00 L of an ideal gas in a flexible balloon is subjected to a doubling of
   the external pressure, and a halving of the temperature in Kelvins.
   Calculate the final volume of the gas. Assume the sample size (number of
   particles) is constant. Clearly show your method. (6 pts)

$$5.00 L \left[\frac{1}{2} \right] \left[\frac{1}{2} \right] = 1.25 L$$

   Pressure   Temperature
   factor   factor

                                        Answer: __1.25 L__

2. What happens to the pressure of a gas if it's volume is tripled? Assume
   constant temperature and sample size. Be specific. (4 pts)

$$P = P_{in} \left[\frac{1}{3} \right]$$ the pressure goes
   down by a factor of 3

3. 2.00 L of hydrogen gas and 2.00 L of oxygen gas react completely to form
   2.00 L of a gaseous product. Assuming the pressure and temperature are
   held constant, write the balanced chemical reaction. (6 pts)

$$2 H_{2(g)} + 2 O_{2(g)} \longrightarrow 2 \boxed{H_2 O_2}_{(g)}$$
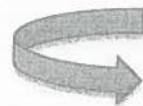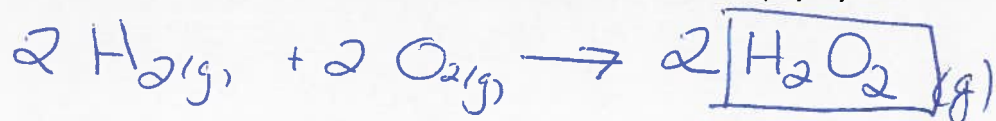
4. A 2.10 L vessel contains 4.65 g of a gas at 1.00 atm and 27.0°C. What is the molar mass of the gas. Clearly show your method. (8 pts)

$$n = \frac{PV}{RT} = \frac{(1.00 atm)(2.10 L)}{.0821 \frac{L \cdot atm}{mol \cdot K}(300K)} = .08526 \, mol$$

$$molar \; mass = \frac{4.65g}{.08526 \, mol} = 54.5 \, g/mole$$

Answer: ___54.5 g/mole___

5. A 5.0 L sample of hydrogen gas and a 5.0 L sample of carbon monoxide are at the same temperature and pressure. Which of the following statements are true? Circle all correct choices. (6 points)

(a) The samples contain the same number of molecules
(b) The molecules in both samples have the same average kinetic energy
c) The samples have the same density
d) The molecules in both samples have the same average velocity
e) The information given is insufficient to answer the question

6. To identify a diatomic gas (X_2), a researcher carried out the following experiment. She weighed an empty 3.5 L bulb, then filled it with the gas at 1.60 atm and 28.0°C, and weighed it again. The difference in mass was 6.3 grams. Identify the gas. Clearly show your work. (10 pts)

$$n = \frac{PV}{RT} = \frac{(1.60 atm)(3.5L)}{(.0821 \frac{L \cdot atm}{mol \cdot K})(301.2K)} = .2285 \, moles$$

$$\frac{6.3g}{.2285 \, mol} = 28 \, g/mole$$

$X_2 = $ ___N_2___