Name:_____ Per:___

Ideal Gas Law Problems

I. Ideal Gas Law Concepts

1. a. Under what conditions of pressure and temperature do "ideal" gases behave like "real" gases? Why?

   b. Which type of gas (ideal or real) is most commonly observed in nature & why?

2. Compare the behavior of ideal gases to real gases in the following table:

Ideal Gases (Kinetic Molecular Theory)	Real Gases
➢ Molecules are far apart.	➢
➢	➢ Molecules are attracted to each other (strong intermolecular attraction).
➢ Collisions between molecules are elastic.	➢
➢ Molecules move continuously in rapid, random motion.	➢

3. Determine the # of molecules, volume, & mass of each of the following samples of gas at STP?

Description	*# of Molecules*	*Mass*	*Volume*
a. 2 mole of O_2 gas @ STP			
b. 2 moles of CO_2 gas @ STP			
c. 1 mole of O_2 gas @ STP			
d. 1 moles of CO_2 gas @ STP			
e. 0.5 mole of O_2 gas @ STP			
f. 0.5 mole of CO_2 gas @ STP			

4. Based on your calculations above, does the size (mass) of the molecule affect its volume? Explain!

5. What size (volume) container would be 3.01×10^{23} molecules of N_2 gas occupy at STP?

II. Use the Ideal Gas Law (PV = nRT) to solve these problems. Show: a) the value of each variable b) the re-arranged formula and c) work to solve for the unknown.

1. How many moles are contained in 5.60L Cl_2 at STP? (Ans: .250 mol)

   P = n =

   V = R =

   T =

2. Find the volume, in Liters, of 1.25 moles of CO at STP. (Ans: 28.0L)

   P = n =

   V = R =

   T =

3. Determine the number of moles of a gas contained in 1.25L at 250K and 1.06atm. (Ans: .0646 mol)
   P = n =
   V = R =
   T =
4. Calculate the volume, in Liters, occupied by 4.00 g of O_2 at 57°C and .888 atm.(Ans: 3.81L)
   P = n =
   V = R =
   T =
5. What pressure will be exerted by 25.1 g of CO_2 at a temperature of 25 °C and a volume of 0.5L?
   P = n =
   V = R =
   T =
6. For an unknown quantity of gas at a pressure of 1.2 atm, a volume of 31 liters, and a temperature of 87°C, how many molecules of gas are in the container?
   P = n =
   V = R =
   T =
7. Using the equation **PV=nRT**, calculate the value of "R" for 1 mole of N_2 gas at STP & volume.

III. Use the Ideal Gas Law *OR* Combined Gas Law to solve these problems. Show: Formula & work

1. What would the volume in mL be of an ideal gas, if a 0.85 mole sample had temperature of 21.49K at a pressure of 1.26atm ?

2. At standard temperature, a gas has a volume of 275mL in a flexible container. When the absolute temperature (in Kelvin) is doubled, what is the new volume if the pressure is held constant?

3. If a gas has an initial pressure of .75 atm is allowed to expand to 435mL at .48atm, what was the initial volume?

4. How many grams of oxygen (O_2) will occupy a volume of 2.5 liters at 1.2 atm and 25 °C?

5. My car has an internal volume of 2600 liters. If the sun heats my car from a temperature of 20^0 C to a temperature of 55^0 C. Assume volume in the car stays constant.
   a. What will the pressure inside my car be? Assume the pressure was initially 760 mm Hg.

   b. How many molecules of gas are in the car after it's been heated?