Name _____

Gas Laws + Partial Pressures

1. How many nitrogen molecules are contained in 1.00L of nitrogen gas at 1.00atm and 298K?

   2.46×10^{22} molecules

2. If a mixture of 4.00mol of nitrogen and 1.00mol of oxygen is placed in a 5.00L container at 27.0˚C, what pressure (in atm) is exerted by the gas mixture.

   24.6atm

3. A 7.20L flask contains 20.0g of an unknown gas at a pressure of 1.02 atm and a temperature of 87.0˚C. What is the molar mass of the gas?

   80.5g/mol

4. A piece of solid CO_2, with a mass of 7.8g is placed in a 4.0L otherwise empty container at 27.˚C. What is the pressure (in mmHg) in the container after all of the carbon dioxide vaporizes?

   830mmHg

5. At 0.00˚C a 1.00L flask contains 5.00×10^{-2} mol N_2, 1.50×10^{2} mg O_2 and NH_3 at a concentration of 5.00×10^{18} molecules/ml. What is the partial pressure of each gas, and what is the total pressure in the flask in atm?

   P_{N2}=1.12atm, P_{O2}=0.105atm, P_{NH3}=0.186atm, P_{tot}=1.41atm

6. Calculate the pressure in an evacuated 250.ml container at 0.00˚C when the O_2 if 3.20 cm^3 of liquid oxygen evaporates. Assume that liquid oxygen has a density of 1.118g/cm^3.

   10.0atm

7. A child has a lung capacity of 2.2L. How many grams of air do her lungs hold at a pressure of 100.0kPa and at a normal body temperature of 37˚C. Air is a mixture but you may assume a molar mass of 29g/mol for air.

   2.5g

8. Two 1.00L flasks at 25°C are connected and the gases in them kept separated by a stopcock. One flask contains oxygen gas at 1.0atm of pressure, the other flask contains nitrogen gas at 0.50atm of pressure. What will the final pressure be when in the two flasks when the stopcock is opened?

   0.75atm

9. A sample of solid $KClO_3$ was heated in a test tube and decomposed according to the following reaction: $2KClO_{3(s)} \rightarrow 2KCl_{(s)} + 3O_{2(g)}$

   The oxygen produced was collected by water displacement at 22.0˚C at a total pressure of 754mmHg. The volume of the gas collected was 0.650L. The water vapor pressure at 22.0˚C is 21.0mmHg.

   a. Calculate the partial pressure of O_2 in the gas collected. **733mmHg**
   b. Calculate the moles of oxygen produced. **0.0259 moles O_2**
   c. Calculate the mass of $KClO_3$ that was decomposed. **2.12g $KClO_3$**

10. A sample of methane gas (CH_4) having a volume of 2.80L at 25.0˚C and 1.65atm was mixed with excess oxygen. The mixture was then ignited to form CO_2 and water. Calculate the volume of CO_2 formed at a pressure of 2.50atm and a temperature of 125˚C

    2.47L

11. Every year thousands of tons of limestone ($CaCO_3$) are decomposed by heating into CO_2 and CaO (quicklime) according to the following reaction:

    $CaCO_{3(s)} \rightarrow CO_{2(g)} + CaO_{(s)}$

    How many liters of CO_2 at 1.03atm and a temperature of 950˚C will be produced if 1.00kg of $CaCO_3$ is decomposed?

    974L