Dalton's Law of Partial Pressures:

ex> Mixtures of helium and oxygen can be used in scuba diving tanks to help prevent "the bends." For a particular dive, 46 L of helium gas at 25.0 °C and 1.0 atm and 12 L of oxygen gas at 25.0 °C and 1.0 atm were pumped into a tank with a volume of 5.0 L. Calculate the partial pressure of each gas and the total pressure of the tank at 25 °C. [$P_{TOTAL} = P_{helium} + P_{oxygen}$ = 9.3 atm + 2.4 atm = 11.7 atm]

Collecting Gases over Water:

ex> Ammonium nitrite decomposes to form nitrogen gas and water. When a sample of ammonium nitrite is decomposed, 511 mL of nitrogen gas are collected over water at 26.0 °C and 745 torr total pressure. How many grams of ammonium nitrite were decomposed? [1.26 g]

Partial Pressure Problems

1) A gaseous mixture made from 6.00 g oxygen and 9.00 g methane is placed in a 15.0 L vessel at 0 °C.
   (a) What is the partial pressure of each gas? [0.281 atm oxygen, 0.838 atm methane]
   (b) What is the total pressure in the vessel? [1.119 atm]

2) A piece of dry ice (solid carbon dioxide), with a mass of 7.8 g, was placed in a 4.0-L empty container at 27.0 °C.
   (a) What is the pressure in the container after all the carbon dioxide vaporizes? [1.1 atm]
   (b) If 7.8 g of dry ice were placed in the same container but it already contained air at 740 torr, what would be the partial pressure of carbon dioxide and the total pressure in the container after the carbon dioxide vaporizes? [$P_{carbon\ dioxide}$ = 1.1 atm; P_{TOTAL} = 2.1 atm]

Collecting Gases over Water Problems

3) A sample of $KClO_3$ was heated in a test tube and decomposed by the following reaction:

$$KClO_3 \text{ -----> } KCl + O_2$$

The oxygen produced was collected by water displacement at 22.0 °C at a total pressure of 754 torr. The volume of the gas collected was 0.650 L. Calculate the partial pressure of O_2 in the gas collected and the mass of $KClO_3$ in the sample that was decomposed. [P_{oxygen} = 734 torr; 2.12 g $KClO_3$]

4) Another sample of $KClO_3$ was partially decomposed, producing O_2 gas collected over water. The volume of the gas collected was 250. mL at 26.0 °C and a total pressure of 765 torr.

(a) How many moles of O_2 were collected? [9.92×10^{-3}]

(b) How many grams of $KClO_3$ were decomposed? [0.811 g]

5) Small quantities of hydrogen gas can be prepared in the laboratory by the addition of aqueous hydrochloric acid to metallic zinc. Typically, the hydrogen gas is bubbled through water for collection and becomes saturated with water vapor. Suppose 240. mL of hydrogen gas is collected at 30.0 °C and has a total pressure of 1.032 atm by this process.

(a) What is the partial pressure of hydrogen gas in the sample? [0.990 atm]

(b) How many grams of zinc must have reacted to produce this quantity of hydrogen? [0.625 g]

6) Helium was collected over water at 25.0 °C and 1.00 atm total pressure. What total volume of gas must be collected to obtain 0.586 g of helium?

7) At elevated temperatures, sodium chlorate decomposes to produce sodium chloride and oxygen gas. A 0.8765-g sample of impure sodium chlorate was heated until the production of oxygen gas ceased. The oxygen gas collected over water occupied 57.2 mL at a temperature of 22.0 °C and a pressure of 734 torr. Calculate the mass percent of pure sodium chlorate in the original sample. [18.0 %]

Additional book practice:

p. 459-460 #5-6 [answers in back of book]

p. 472 #35, 36, 37 [a. 711 mL, b. 0.351 L, c. 8.09 m^3, d. 1020 mL], 38 [7.95 mL]

Concepts for final gas quiz/test on Monday
(questions will be a mix of multiple choice, writing, and problems - no repeats from the previous quiz):

pressure (definition, units, measuring tool, what causes it)
temperature (conversion, relation to kinetic energy)
volume (conversions)
Boyle's Law
Charles's Law
Combined Gas Law
Avogadro's Law
molar volume of a gas
molar mass from vapor density
gas stoichiometry
ideal gas law
Dalton's Law of Partial Pressures
collecting gas over water
kinetic molecular theory (explain statements, relate them to the gas laws)
- be able to predict and draw what occurs to the gas particles when P, V, n, or T are changed
ideal gas vs. real gases (deviation from ideal behavior)