Partial Pressure and Density
Chemistry

KEY

Name

$d = \frac{MP}{RT}$

1 Calculate the density of each of the following gases at STP. *Hint: Calculate molar mass first.*

(a) He

M = 4
T = 273k
P = 1 atm
d = 0.18 g/L

(b) C_3H_6

M = 42
d = 1.9 g/L

(c) HF

M = 20
d = 0.89 g/L

(d) N_2O

M = 44
d = 1.96 g/L

(e) SO_3

M = 80
d = 3.57 g/L

(f) CCl_2F_2

M = 120.9
d = 5.4 g/L

2 Calculate the density of each of the following gases. *Hint: Calculate molar mass first.*

(a) NH_3 at 25°C and 1.2 atm

M = 17
T = 298k
P = 1.2 atm
d = 0.834 g/L

(b) CO_2 at 175°C and 1045 torr

M = 44
T = 448
$= 1045 \text{ torr} \times \frac{1 \text{ atm}}{760 \text{ torr}} = 1.375 \text{ atm}$
d = 1.65 g/L

3 A container holds three gases: oxygen, carbon dioxide, and helium. The partial pressures of the three gases are 2.00 atm, 3.00 atm, and 4.00 atm, respectively. What is the total pressure inside the container?

9 atm

4 A container with two gases, helium and argon, is composed of 30.0% helium atoms. Calculate the partial pressures of both helium and argon if the total pressure inside the container is 4.00 atm.

He = .3 × 4 atm = 1.2 atm

Ar = .7 × 4 = 2.8 atm

5 A tank contains 480.0 grams of oxygen and 80.00 grams of helium at a total pressure of 7.00 atmospheres at a temperature of 27°C. Calculate the following.

a) How many moles of O_2 are in the tank? b) How many moles of He are in the tank?

c) Total moles of gas in tank. d) Total volume of the tank.

$O_2: n = 480\,g \times \frac{1\,mol\,O_2}{32\,g} = 15\,mol\,O_2$

$He: n = 80\,g \times \frac{1\,mol\,He}{4\,g} = 20\,mol\,He$

35 mol

$PV = nRT$

$V = \frac{nRT}{P}$

$= \frac{35 \times .08206 \times 300\,K}{7\,atm}$

$V = 123\,L$

Gas Laws Review

6 You have a container filled with 1 mol of gas at "room temperature" and some pressure. Answer each of the following, and provide brief explanations for each.

(a) What will happen to the pressure if the container size is doubled while keeping the temperature and number of moles constant?

lower P (by half)

(b) What will happen to the pressure when the temperature is doubled while keeping the size of the container and the number of moles constant?

higher P

(c) What will happen to the pressure when the amount of gas is cut in half while keeping the size of the container and the temperature constant?

lower P (by half)

(d) What will happen to the pressure if 1 mole of a different gas is added to the container while keeping the temperature and size of the container the same?

higher P

7 What volume does 1 mol of an ideal gas occupy at standard conditions?

$V = 22.4\,L$

8 Explain why it is necessary to add air to a car's tires during the winter.

Colder → lower P