12 • The Gas Laws

1 atm = 760 mmHg = 760 torr = 14.7 psi = 101.3 kPa

Make the following conversions: (Show your work)

550 mmHg x _____ =   kPa

55 psi x _____ =   mmHg

325 kPa x _____ =   atm

2284 torr x _____ =   kPa

125.0 g of CH_4 and 15.00 g of He are placed in a rigid container. The total pressure of the gas mixture is 1.45 atm. What is the partial pressure of each gas?

12 • The Gas Laws

Three cars with speeds of 10 mph, 45 mph, and 70 mph are traveling down the highway. What is their root mean square velocity?

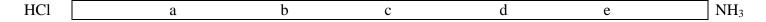Calculate the root mean square velocity of a sample of SF_6 gas at room temperature (21.0 °C).

12 • The Gas Laws

1 mole each of He gas and CO_2 gas are in a rigid container at the same temperature.

The <u>kinetic energy</u> of He is _____ (greater than, less than, the same as) the kinetic energy of CO_2?
The <u>velocity</u> of He is _____ (greater than, less than, the same as) the velocity of CO_2?

Calculate the ratio of the velocities of He/CO_2.

When HCl(g) and NH_3(g) come in contact, they form a white solid, NH_4Cl(s).
If samples of the two gases are placed at the ends of a tube, the white solid will appear closest to point ___?

HCl	a	b	c	d	e	NH_3

12 • The Gas Laws

$$(P + \frac{n^2 a}{V^2})(V - nb) = nRT$$

1.00 mol of ammonia gas, NH_3, fills a 7.00 liter bottle at 350 K. What does the van der Waals equation predict that the pressure will be? For ammonia $a = 4.17 \frac{atm\ L^2}{mol^2}$ and $b = 0.0371$ L/mol.

12 • The Gas Laws

Solve the following problems:

_____ 1. A balloon at 35.0°C and 0.980 atm has a volume of 12.5 L.
What is its volume at 75.0°C and 150. kPa?

_____ 2. A balloon has a volume of 1.00 L at 21.0°C and 750. mmHg.
What is the balloon's volume at STP?

12 • The Gas Laws

Explain the following observations in terms of the "kinetic molecular theory" (that is, what do the gas particles look like?)

A balloon of gas is placed in a car on a hot day. The balloon gets larger. Explain.

A syringe is squeezed so the gas sample changes from 10 cc to 5 cc. The pressure doubles. Explain.

12 • The Gas Laws

A 0.00195 mole sample of CO_2 has what volume (in Liters) measured at 27.0°C and 740 mmHg?

P =   V =   n =   R =   T =

How many moles of CO_2 gas will fit into a 2.00 Liter soda bottle at 35.0°C and 0.990 atm?

P =   V =   n =   R =   T =

12 • The Gas Laws

Calculate the molar mass of a gas sample if 3.00 grams of the gas in a 2.00 L container at 25.0°C has a pressure of 2.294 atm.

What mass of chlorine gas, Cl_2, is needed to fill a 10.0 L container at 100.°C and 775 torr?

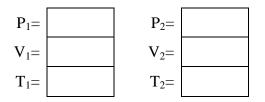# 12 • The Gas Laws

Information:

volume of gas at room conditions: 45.0 mL

length of Mg used: 4.65 cm   mass of 1.00 m of Mg: 0.958 g

room temperature: 22.0°C   room pressure: 751 mmHg

water vapor pressure at 22.0°C = 19.8 mmHg

How many moles of magnesium were used? Show work.

What is the molar volume of this hydrogen gas sample under room conditions? Show work.

What is the molar volume of this hydrogen gas sample at STP? Identify the variables and show work.

$P_1=$ [   ] $P_2=$ [   ]

$V_1=$ [   ] $V_2=$ [   ]

$T_1=$ [   ] $T_2=$ [   ]

12 • The Gas Laws