c) Record the molar volume at STP in your *Active Chemistry* log.

d) The accepted value for the molar volume of *any* gas at STP is 22.4 L/mol. How close was your value?

e) Find your percent error by finding the difference between your value and 22.4 and then dividing by 22.4. Multiply by 100 to get a percent. Record this information in your *Active Chemistry* log.

f) What are some factors that may account for your percent error?

10. You now have all the information you need to compare changes in pressure, temperature, and volume for gases. The Combined Gas Law allows you to look at changes in these three variables that affect gases. The fourth variable is the number of particles—the number of moles of gas involved. How does it fit into the equation?

You know the Combined Gas Law:

$$\frac{(\text{pressure})\ (\text{volume})}{(\text{temperature})} = \text{constant}$$

or more simply: $\frac{PV}{T} = k$

Using the conditions of STP, you can add the number of particles to the equation. The unit for molar volume is liters per mole, so the number of moles will go into the denominator in the equation. Using n for the number of moles you get:

$$\frac{PV}{Tn} = k$$

Substituting the conditions for STP into the equation you get:

$$\frac{(1\ \text{atm})\ (\ 22.4\ \text{L})}{(273\ \text{K})\ (1\ \text{mole})} = R$$

By convention, "R" is called the ***Ideal Gas Law constant.***

a) What is the value and unit of "R"? Record this in your *Active Chemistry* log.

b) What would be the value and unit for "R" if the pressure were measured in 760 mm Hg? Calculate and record this in your *Active Chemistry* log.

Chem Words

ideal gas: a gas in which all collisions between atoms or molecules are perfectly elastic and in which there are no intermolecular attractive forces.

intermolecular forces: the attractive forces acting between molecules.

Chem Talk

IDEAL GAS LAW

Temperature, pressure, and the number of particles must be considered when talking about a gas. An **ideal gas** is defined as one in which all collisions between atoms or molecules are perfectly elastic and in which there are no **intermolecular** attractive **forces**. The molecules/atoms of an ideal gas have no volume. You can picture the ideal gas as a number of perfectly hard spheres that collide but that otherwise do not interact with each other. Many common gases exhibit behavior very close to that of an ideal gas at high temperature and low pressure.

In spite of their different masses, all ideal gases have similar characteristics, as shown in the table.