

# The Gas Laws— Demonstration Summaries and Concepts



## ***The Collapsing Can—Pressure Is a Force Demonstration***

Pressure—we all feel it. But what is it? In the case of the surrounding air, the pressure it exerts is a force, a surprisingly strong force. Use this pressure-packed demonstration to convince your students that air is a force to be reckoned with!

## ***Massing Gases—Avogadro's Law Demonstration***

Make Avogadro proud by using his law to determine the molar mass of several gases. Equal volumes of a reference gas and an “unknown” gas will be trapped inside a syringe and their masses will be measured. By comparing their mass ratio, the molar mass of the unknown gas is determined.

## ***Molar Mass of Butane—Ideal Gas Law Demonstration***

The gas laws relate the four measurable gas properties—pressure, volume, temperature, and number of moles. By combining measurements of these properties with the mass of a given quantity of gas, we can use the gas laws to calculate the molar mass of an unknown gas, in this case the butane stored under pressure in a butane lighter.

## ***Diffusion of Gases—Kinetic Energy Demonstration***

Imagine two vehicles—a large truck and a compact car—traveling down the highway. In order for these vehicles to have the same kinetic energy, the compact car must travel much faster than the large truck. The same analogy is used in this demonstration to compare the rate of mixing of two gases at room temperature.

## ***Construction of Gas Volume Cubes—Assessment Activity***

Avogadro's law states that the volume of an ideal gas is directly proportional to the number of moles of gas if the temperature and pressure are constant. In this authentic assessment activity, students are asked to calculate the volume of a given number of moles of gas at STP. They must then build a cube to the specified gas volume. Assign different groups of students different numbers of moles, and the result is a classroom exhibit of Avogadro's law!

## ***Cartesian Divers—Boyle's Law Activity***

“Diver” toys that can be manipulated to sink or float in an enclosed pool of water have been around for centuries. The toys have been used to teach concepts of density and buoyancy. In this activity, students learn to make a variety of squeezable, sinkable Cartesian divers using just a few simple materials—and a lot of imagination!

## **Concepts**

- Atmospheric pressure
- Kinetic-molecular theory
- Vacuum
- Avogadro's law
- Molar mass
- Buoyancy
  
- Dalton's law
- Ideal gas law
- Molar mass
  
- Diffusion
- Kinetic-molecular theory
  
- Avogadro's law
- Molar volume
- Ideal gas
- Standard temperature and pressure (STP)
  
- Density
- Buoyancy
- Boyle's law