

PRACTICE

PROBLEM SOLVING SKILL

- 1 At 122°C the pressure of a sample of nitrogen is 1.07 atm . What will the pressure be at 205°C , assuming constant volume?
- 2 The same sample of nitrogen as in item 1 starts at 122°C and 1.07 atm . After cooling, the pressure is measured to be 0.880 atm . What is the new temperature?
- 3 A sample of helium gas is at 122 kPa and 22°C . Assuming constant volume, what will the temperature be when the pressure is 203 kPa ?
- 4 The air in a steel-belted tire is at a gauge pressure of 29.8 psi at a temperature of 20°C . After the tire is driven fast on a hot road, the temperature in the tire is 48°C . What is the tire's new gauge pressure?

Volume-Molar Relationships

In 1811, the Italian scientist Amadeo Avogadro proposed the idea that equal volumes of all gases, under the same conditions, have the same number of particles. This idea is shown in **Figure 15**, which shows equal numbers of molecules of the gases H_2 , O_2 , and CO_2 , each having the same volume. A result of this relationship is that molecular masses can be easily determined. Unfortunately, Avogadro's insight was not recognized right away, mainly because scientists at the time did not know the difference between atoms and molecules. Later, the Italian chemist Stanislao Cannizzaro used Avogadro's principle to determine the true formulas of several gaseous compounds.

Figure 15

At the same temperature and pressure, balloons of equal volume contain equal numbers of molecules, regardless of which gas they contain.

