

## THE BEHAVIOR OF GASES

## Practice Problems

In your notebook, solve the following problems.

## SECTION 14.1 THE PROPERTIES OF GASES

- Using kinetic theory, explain why a tire is more likely to blow out during a trip in the summer than during one in the winter.
- Use kinetic theory to explain why on a cold autumn morning a camper's air mattress may appear to be somewhat flatter than when it was blown up the afternoon before. Assume no leaks.

## SECTION 14.2 THE GAS LAWS

- The volume of a gas at 155.0 kPa changes from 22.0 L to 10.0 L. What is the new pressure if the temperature remains constant?
- Is it possible for a balloon with an initial pressure of 200.0 kPa to naturally expand to four times its initial volume when the temperature remains constant and atmospheric pressure is 101.3 kPa?
- Exactly 10.0 L of  $O_2$  at  $-25^\circ C$  is heated to  $100.0^\circ C$ . What is the new volume if the pressure is kept constant?
- A gas at a pressure of 501 kPa and a temperature of  $25^\circ C$  occupies a volume of 5.2 L. When the gas is heated to  $100.0^\circ C$  the volume increases to 7.00 L. What is the new pressure?
- A sample of  $O_2$  with an initial temperature of  $50.0^\circ C$  and a volume of 105 L is cooled to  $-25^\circ C$ . The new pressure is 105.4 kPa and the new volume is 55.0 L. What was the initial pressure of the sample?

## SECTION 14.3 IDEAL GASES

- A sample of argon gas is at a pressure of  $1.24 \times 10^4$  kPa and a temperature of  $24^\circ C$  in a rigid 25-L tank. How many moles of argon does this tank contain?
- A 35.0-L tank contains 7.00 mol of compressed air. If the pressure inside the tank is 500.0 kPa, what is the temperature of the compressed gas?
- How many grams of helium does a 25.0-L balloon contain at 102.0 kPa and  $24^\circ C$ ?
- Calculate the volume that 2.25 mol of  $O_2(g)$  will occupy at STP.
- A sample of water vapor occupies a volume of 10.5 L at  $200^\circ C$  and 100.0 kPa. What volume will the water vapor occupy when it is cooled to  $27^\circ C$  if the pressure remains constant?
- What is the volume occupied by 0.355 mole of nitrogen gas at STP?
- What is the volume of a container that holds 25.0 g of carbon dioxide gas at STP?

## SECTION 14.4 GASES: MIXTURES AND MOVEMENTS

- A gaseous mixture consisting of nitrogen, argon, and oxygen is in a 3.5-L vessel at  $25^\circ C$ . Determine the number of moles of oxygen if the total pressure is 98.5 kPa and the partial pressures of nitrogen and argon are 22.0 kPa and 50.0 kPa, respectively.
- Compare the effusion rates of  $O_2$  (molar mass, 32.0 g/mol) and  $N_2$  (molar mass, 28.0 g/mol).