14 THE BEHAVIOR OF GASES

Practice Problems

In your notebook, solve the following problems.

SECTION 14.1 THE PROPERTIES OF GASES

1. 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.

2. 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

1. 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?

2. 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? Prove your answer.

3. Exactly 10.0 L of O_2 at –25°C is heated to 100.0°C. What is the new volume if the pressure is kept constant?

4. A gas at a pressure of 501 kPa and a temperature of 25°C occupies a volume of 5.2 L. When the gas is heated to 100.0°C the volume increases to 7.00 L. What is the new pressure?

5. A sample of O_2 with an initial temperature of 50.0°C and a volume of 105 L is cooled to –25°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

1. A sample of argon gas is at a pressure of 1.24×10^4 kPa and a temperature of 24^0C in a rigid 25-L tank. How many moles of argon does this tank contain?

2. 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?

3. How many grams of helium does a 25.0-L balloon contain at 102.0 kPa and 24^0C?

4. Calculate the volume that 2.25 mol of O_2 (g) will occupy at STP.

5. A sample of water vapor occupies a volume of 10.5 L at 200^0C and 100.0 kPa. What volume will the water vapor occupy when it is cooled to 27^0C if the pressure remains constant?

6. What is the volume occupied by 0.355 mole of nitrogen gas at STP?

7. 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

1. A gaseous mixture consisting of nitrogen, argon, and oxygen is in a 3.5-L vessel at 25^0C. Determine the number of moles of oxygen if the total pressure is 98.5kPa and the partial pressures of nitrogen and argon are 22.0 kPa and 50.0 kPa, respectively.

2. Compare the effusion rates of O_2 (molar mass, 32.0 g/mol) and N_2 (molar mass,28.0 g/mol).