

THE BEHAVIOR OF GASES

Practice 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 14.2-14.4 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?
3. 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?
4. 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?
5. 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?
6. A sample of argon gas is at a pressure of 1.24×10^4 kPa and a temperature of $24^\circ C$ in a rigid 25-L tank. How many moles of argon does this tank contain?
7. 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?
8. How many grams of helium does a 25.0-L balloon contain at 102.0 kPa and $24^\circ C$?
9. Calculate the volume that 2.25 mol of O_2 (g) will occupy at STP.
10. 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?
11. What is the volume occupied by 0.355 mole of nitrogen gas at STP?
12. What is the volume of a container that holds 25.0 g of carbon dioxide gas at STP?
13. 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.
14. Compare the effusion rates of O_{oxygen} (molar mass, 32.0 g/mol) and N_{nitrogen} (molar mass, 28.0 g/mol).



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Vocabulary Review

Match the correct vocabulary term to each numbered statement. Write the letter of the correct term on the line.

Column A

- _____ 1. At constant volume and temperature, the total pressure exerted by a mixture of gases is equal to the sum of the partial pressures of the component gases.
- _____ 2. The volume of a fixed mass of gas is directly proportional to its Kelvin temperature if the pressure is kept constant.
- _____ 3. The rate of effusion of a gas is inversely proportional to the square root of its molar mass.
- _____ 4. the contribution each gas in a mixture makes to the total pressure of that mixture
- _____ 5. a measure of how much the volume of matter decreases under pressure
- _____ 6. For a given mass of gas at constant temperature, the volume of the gas varies inversely with pressure.
- _____ 7. the tendency of molecules to move toward areas of lower concentration until the concentration is uniform throughout
- _____ 8. $\frac{P_1 \times V_1}{T_1} = \frac{P_2 \times V_2}{T_2}$
- _____ 9. the escape of a gas through a tiny hole in a container of gas
- _____ 10. 8.31 (L·kPa)/(K·mol)

Column B

- a. combined gas law
- b. ideal gas constant (R)
- c. diffusion
- d. compressibility
- e. Boyle's law
- f. partial pressure
- g. Dalton's law of partial pressures
- h. effusion
- i. Charles's law
- j. Graham's law of effusion