

Gases

1. In one city, a balloon with a volume of 6.0 L is filled with air at 101 kPa pressure. The balloon is then taken to a second city at a much higher altitude. At this second city, atmospheric pressure is only 91 kPa. If the temperature is the same in both places, what will be the new volume of the balloon?
2. A certain mass of gas in a 2.25-L container has a pressure of 164 kPa. What will the new pressure be if the volume of the container is reduced to 1.50 L and the temperature stays constant?
3. If 5.80 dm³ of gas is collected at a pressure of 92.0 kPa, what volume will the same gas occupy at 101.3 kPa if the temperature stays constant?
4. If the volume of an air pump used to inflate a football decreases from 480 mL to 375 mL, and the original pressure was 93.5 kPa, what is the new air pressure in the pump if the temperature stays constant?
5. Maintaining constant pressure, the volume of a gas is increased from 18.0 dm³ to 32.0 dm³ by heating it. If the original temperature was 18.0°C, what is the new temperature in degrees Celsius?
6. A natural gas tank is constructed so that the pressure remains constant. On a hot day when the temperature was 33°C, the volume of gas in the tank was determined to be 3000.0 L. What would the volume be on a warm day when the temperature is 11°C?
7. A 50.0-mL sample of gas is cooled from 119°C to 80.0°C. If the pressure remains constant, what is the final volume of the gas?
8. A 10.0-L cylinder of gas is stored at room temperature (20.0°C) and a pressure of 1800 psi. If the gas is transferred to a 6.0-L cylinder, at what Celsius temperature would it have to be stored in order for the pressure to remain at 1800 psi?
9. If the gas pressure in an aerosol can is 148.5 kPa at 23°C, what is the pressure inside the can if it is heated to 298°C?
10. A tank for compressed gas has a maximum safe pressure limit of 850 kPa. The pressure gauge reads 425 kPa when the temperature is 28°C. What is the highest temperature in degrees Celsius the tank can withstand safely?
11. In a steel container, it was found that the pressure of the gas inside was 160 kPa when the container had been heated to 98°C. What had been the pressure of the gas when the temperature had been 50°C the previous day?
12. A steel cylinder is filled with a gas at a temperature of 25.0°C and a pressure of 225.0 kPa. What will the pressure be if the temperature is raised to 47°C?
13. A balloon is filled with gas at a pressure of 102.3 kPa and a temperature of 45.5°C. Its volume under these conditions is 12.5 L. The balloon is then taken into a decompression chamber where the volume is measured as 2.50 L. If the temperature is 36.0°C, what is the pressure in the chamber?

- 14.** A weather balloon contains 14.0 L of helium at a pressure of 95.5 kPa and a temperature of 12.0°C. If this had been stored in a 1.50-L cylinder at 21.0°C, what must the pressure in the cylinder have been?
- 15.** How many moles of a gas will occupy 2.50 L at STP?
- 16.** Calculate the volume that 3.60 g H₂ gas will occupy at STP.
- 17.** What volume is occupied by 0.580 mol of gas at 98.4 kPa and 11°C?
- 18.** When a sample of a gas was placed in a sealed container with a volume of 3.35 L and heated to 105°C, the gas vaporized and the resulting pressure inside the container was 170.0 kPa. How many moles of the gas was present?
- 19.** An engineer wishes to design a container that will hold 14.0 mol of gas at a pressure no greater than 550 kPa and a temperature of 48°C. What is the minimum volume the container can have?
- 20.** What is the molar mass of a sample of gas that has a density of 2.85g/L at 101 kPa pressure and 29°C?
- 21.** How many grams of gas are present in a sample that has a molar mass of 44 g/mol and occupies a 1.8-L container at 108 kPa and 26.7°C?
- 22.** What is the molar mass of a gas if 142 g of the gas occupies a volume of 45.1 L at 28.4°C and 94.6 kPa?
- 23.** Determine the volume of hydrogen gas needed to make 8 L of water vapor.
- 24.** Calculate the volume of chlorine gas at STP that is required to completely react with 3.50 g of silver, using the following equation:
$$2\text{Ag}(s) + \text{Cl}_2(g) \rightarrow 2\text{AgCl}(s).$$
- 25.** Use the reaction shown to calculate the mass of iron that must be used to obtain 0.500 L of hydrogen at STP.
$$3\text{Fe}(s) + 4\text{H}_2\text{O}(l) \rightarrow \text{Fe}_3\text{O}_4(s) + 4\text{H}_2(g)$$