

20. A sample of air has a volume of 140.0 mL at 67°C. At what temperature would its volume be 50.0 mL at constant pressure?
21. The pressure exerted on a 240.0 mL sample of hydrogen gas at constant temperature is increased from 0.428 atm to 0.724 atm. What will the final volume of the sample be?
22. A sample of hydrogen at 47°C exerts a pressure of 0.329 atm. The gas is heated to 77°C at constant volume. What will its new pressure be?
23. A sample of gas at 47°C and 1.03 atm occupies a volume of 2.20 L. What volume would this gas occupy at 107°C and 0.789 atm?
24. The pressure on a gas at -73°C is doubled, but its volume is held constant. What will the final temperature be in degrees Celsius?
25. A flask containing 155 cm³ of hydrogen was collected under a pressure of 22.5 kPa. What pressure would have been required for the volume of the gas to have been 90.0 cm³, assuming the same temperature?
26. A gas has a volume of 450.0 mL. If the temperature is held constant, what volume would the gas occupy if the pressure were
 - a. doubled? (Hint: Express P_2 in terms of P_1 .)
 - b. reduced to one-fourth of its original value?
27. A sample of oxygen that occupies 1.00×10^6 mL at 575 mm Hg is subjected to a pressure of 1.25 atm. What will the final volume of the sample be if the temperature is held constant?
28. To what temperature must a sample of nitrogen at 27°C and 0.625 atm be taken so that its pressure becomes 1.125 atm at constant volume?
29. A gas has a volume of 1.75 L at -23°C and 150.0 kPa. At what temperature would the gas occupy 1.30 L at 210.0 kPa?
30. A gas at 7.75×10^4 Pa and 17°C occupies a volume of 850.0 cm³. At what temperature, in degrees Celsius, would the gas occupy 720.0 cm³ at 8.10×10^4 Pa?
31. A meteorological balloon contains 250.0 L He at 22°C and 740.0 mm Hg. If the volume of the balloon can vary according to external conditions, what volume would it occupy at an altitude at which the temperature is -52°C and the pressure is 0.750 atm?
32. The balloon in the previous problem will burst if its volume reaches 400.0 L. Given the initial conditions specified in that problem, determine at what temperature, in degrees Celsius, the balloon will burst if its pressure at that bursting point is 0.475 atm.
33. The normal respiratory rate for a human being is 15.0 breaths per minute. The average volume of air for each breath is 505 cm³ at 20.0°C and 9.95×10^4 Pa. What is the volume of air at STP that an individual breathes in one day? Give your answer in cubic meters.

Gas Volumes and the Ideal Gas Law

SECTION 3 REVIEW

34.
 - a. What are the restrictions on the use of Gay-Lussac's law of combining volumes?
 - b. At the same temperature and pressure, what is the relationship between the volume of a gas and the number of molecules present?
35.
 - a. In a balanced chemical equation, what is the relationship between the molar ratios and the volume ratios of gaseous reactants and products?
 - b. What restriction applies to the use of the volume ratios in solving stoichiometry problems?
36. According to Avogadro,
 - a. what is the relationship between gas volume and number of moles at constant temperature and pressure?
 - b. what is the mathematical expression denoting this relationship?
37. What is the relationship between the number of molecules and the mass of 22.4 L of different gases at STP?
38.
 - a. In what situations is the ideal gas law most suitable for calculations?
 - b. When using this law, why do you have to pay particular attention to units?
39.
 - a. Write the equation for the ideal gas law.
 - b. What relationship is expressed in the ideal gas law?