

Name: _____

Homework was checked against the key with wrong answers corrected.

Parent Signature: _____

Chapter 12: The Behavior of Gases

Each numbered question is worth 1 point except as noted. Total possible = 35 points

Section 12.1: The Properties of Gases

1. State the main assumptions of kinetic theory regarding gas particles.

4. What variables and units are used to describe a gas?

Section 12.2: Factors Affecting Gas Pressure

6. What is the effect of temperature change on the pressure of a contained gas? (0.5)

7. What would you have to do to the volume of a gas to reduce its pressure to one-quarter of the original value, assuming that the gas is at a constant temperature? (0.5)

8. Keeping temperature constant, how could you increase the pressure in a container by one hundredfold? (0.5)

9. The manufacturer of an aerosol deodorant packaged in a 150-mL container wishes to produce a container of the same size that will hold twice as much gas. How will the pressure of the gas in the new product compare with that of the gas in the original container? (0.5)

Section 12.3: The Gas Laws

10. The pressure on 2.50 L of anesthetic gas changes from 105 kPa to 40.5 kPa. What will be the new volume if the temperature remains constant?

11. A gas with a volume of 4.00 L at a pressure of 205 kPa is allowed to expand to a volume of 12.0 L. What is the pressure in the container if the temperature remains constant?

12. If a sample of gas occupies 6.80 L at 325 °C, what will be its volume at 25 °C if the pressure does not change?

13. Exactly 5.00 L of air at -50.0 °C is warmed to 100.0 °C. What is the new volume if the pressure remains constant?

14. A gas has a pressure of 6.58 kPa at 539 K. What will be the pressure at 211 K if the volume does not change?

15. The pressure in an automobile tire is 198 kPa at 27 °C. At the end of a trip on a hot sunny day, the pressure has risen to 225 kPa. What is the temperature of the air in the tire? (Assume that the volume has not changed.)

16. A gas at 155 kPa and 25 °C occupies a container with an initial volume of 1.00 L. By changing the volume, the pressure of the gas increases to 605 kPa as the temperature is raised to 125 °C. What is the new volume?

17. A 5.00-L air sample at a temperature of -50 °C has a pressure of 107 kPa. What will be the new pressure if the temperature is raised to 102 °C and the volume expands to 7.00 L?

Section 12.4: Ideal Gases

22. When the temperature of a rigid hollow sphere containing 685 L of helium gas is held at 621 K, the pressure of the gas is 1.89×10^3 kPa. How many moles of helium does the sphere contain?

23. What pressure will be exerted by 0.450 mol of a gas at 25 °C if it is contained in a 0.650-L vessel?

24. A child has a lung capacity of 2.20 L. How many grams of air do her lungs hold at a pressure of 102 kPa and a normal body temperature of 37 °C? Air is a mixture, but you may assume an average molar mass of 29 g/mol for air because air is about 20% O₂ (molar mass 32) and 80% N₂ (molar mass 28).

25. What volume will 12.0 g of oxygen gas (O₂)(g) occupy at 25°C and a pressure of 52.7 kPa?

29. Determine the volume occupied by 0.582 mol of a gas at 15 °C if the pressure is 81.8 kPa.

30. If 28.0 g of methane gas (CH₄) are introduced into an evacuated 2.00-L gas cylinder at a temperature of 35 °C, what is the pressure inside the cylinder? Note that the volume of the gas cylinder is constant.

Section 12.5: Gas Molecules: Mixtures and Movements

32. What volume does 0.742 mol of argon gas occupy at STP?

33. How many nitrogen molecules are in 5.12 L of the gas at STP?
34. What volume is occupied by 4.02×10^{22} molecules of helium gas at STP?
35. What is the volume of a container that holds 8.80 g of carbon dioxide at STP?
37. Determine the total pressure of a gas mixture that contains oxygen, nitrogen, and helium if the partial pressures of the gases are as follows: $P_{O_2} = 20.0$ kPa, $P_{N_2} = 46.7$ kPa, and $P_{He} = 26.7$ kPa.
38. A gas mixture containing oxygen, nitrogen, and carbon dioxide has a total pressure of 32.9 kPa. If $P_{O_2} = 6.6$ kPa and $P_{N_2} = 23.0$ kPa, what is P_{CO_2} ?
39. Briefly state Avogadro's hypothesis, Dalton's law, and Graham's law.
44. At the same temperature, the rates of diffusion of carbon monoxide and nitrogen gas are virtually identical. Explain.

Chapter Review

49. Why is Kelvin temperature specified in calculations that involve gases? *12.2*
50. Describe what happens to the volume of a balloon when it is taken outside on a cold winter day. Explain why this happens. *12.2*
59. Explain why it is impossible for an ideal gas to exist. *12.4*
62. If 4.50 g of methane gas (CH_4) is introduced into an evacuated 2.00-L container at 35 °C, what is the pressure in the container? *12.4*
64. How would the number of particles of two gases compare if their partial pressures in a container were identical? *12.5*
65. Which gas effuses faster: hydrogen or chlorine? How much faster? *12.5*
66. Which gas effuses faster at the same temperature: molecular oxygen or atomic argon? *12.5*

67. Calculate the ratio of the velocity of helium atoms to the velocity of neon atoms at the same temperature. *12.5*

71. A 3.50-L gas sample at 20 °C and a pressure of 86.7 kPa expands to a volume of 8.00 L. The final pressure of the gas is 56.7 kPa. What is the final temperature of the gas, in degrees Celsius?