

Physical Characteristics of Gases—Practice Test

MULTIPLE CHOICE: Complete the statement with the appropriate choice.

1. A real gas _____
 - a. does not completely obey the predictions of the kinetic-molecular theory
 - b. consists of particles that do not occupy space
 - c. cannot be condensed
 - d. does not diffuse
2. According to the kinetic-molecular theory, particles of a gas _____
 - a. attract each other but do not collide
 - b. repel each other and collide
 - c. collide but do not attract or repel each other
 - d. do not collide and do not attract or repel each other
3. Diffusion between two gases occurs most rapidly if the two gases are at a _____
 - a. high temperature and the molecules are small
 - b. low temperature and the molecules are large
 - c. low temperature and the molecules are small
 - d. high temperature and the molecules are large
4. The kinetic-molecular theory does not work well for _____
 - a. any real gases
 - b. gases at low pressure
 - c. gases at very low temperatures
 - d. real gases at high temperatures
5. If the temperature of a gas remains constant, then the pressure of the gas will increase if _____
 - a. the mass of the gas molecules decreases
 - b. the diffusion of the gas molecules increases
 - c. the size of the container is decreased
 - d. the number of gas molecules in the container is decreased
6. According to the equation $KE = \frac{1}{2}mv^2$ hydrogen molecules have ____ than heavier oxygen molecules at the same temperature.
 - a. less kinetic energy
 - b. more kinetic energy
 - c. higher average speeds
 - d. lower average speeds
7. The gas most likely to deviate from ideal gas behavior is _____
 - a. NH_3
 - b. H_2
 - c. He
 - d. O_2

FILL IN THE BLANK: Write the correct term (or terms) in the space provided.

8. If a fixed quantity and volume of a gas undergoes a change in temperature, it will also experience a change in _____.
9. To study the relationship between the pressure and volume of a gas, hold the _____ constant.
10. Standard pressure is the atmospheric pressure balanced by a column of mercury whose height is exactly _____.
11. If the temperature remains constant for a gas. V and P represent the original volume and pressure, and V' and P' represent the new volume and pressure. the mathematical expression for Boyle's law is _____.
12. _____ describes the properties of solids, liquids, and gases in terms of the motion of particles.
13. The process by which gas particles under pressure flow through a tiny opening is called _____.
14. An imaginary gas that conforms perfectly to all of the predictions of the kinetic-molecular theory is called a(n) _____.
15. The spontaneous mixing of the particles of two substances caused by their random motion is called _____.
16. The force per unit area on a surface is called _____.
17. The SI unit of force is the _____.
18. A device used to measure atmospheric pressure is a(n) _____.
19. The pressure exerted by each gas in a mixture is called the _____ of that gas.
20. If the temperature and number of moles of a gas remain constant, but the volume increases. the pressure of the gas will _____.
21. The lowest possible temperature, corresponding to zero on the Kelvin scale, is referred to as _____.
22. If no kinetic energy is lost, a collision is called _____.
23. Because liquids and gases flow, they are called _____.

MATCHING: On the line to the left of each expression in the first column, write the letter of the expression in the second column that is most closely related.

- | | |
|---|---------------------|
| 24. The pressure of a fixed mass of gas varies directly with the Kelvin temperature at constant volume. | a. Dalton's law |
| 25. The volume of a fixed mass of gas varies inversely with the pressure at constant temperature | b. Charles's law |
| 26. The total pressure of a mixture of gases is equal to the sum of the partial pressures of the component gases. | c. Gay-Lussac's law |
| 27. The relationship between pressure, volume, and temperature is expressed by this law. | d. Boyle's law |
| 28. The volume of a fixed mass of gas varies directly with the Kelvin temperature at constant pressure. | e. combined gas law |
| | f. Pascal's law |
| | g. gas pressure law |

PROBLEMS: Be sure to show your work for all of the following problems.

29. Convert 0.75 atm to mm Hg
30. The pressure of a sample of helium in a 200 mL container is 2.0 atm. If the helium is compressed to a volume of 10 mL without changing the temperature, what would be the pressure of the gas?
31. The volume of a gas at 7.0°C is 49 mL. If the volume increases to 74 mL and the pressure is constant, what will the temperature of the gas be?
32. A sample of gas occupies 1000. mL at standard pressure. What volume will the gas occupy at a pressure of 800. mm Hg if the temperature remains constant?
33. The pressure of a 1000. mL sample of gas is 700. mm Hg and its temperature is 10.°C. If the volume is constant, what will the temperature be at 900. mm Hg?
34. If five gases in a cylinder each exert a partial pressure of 2.50 atm, what is the total pressure exerted by the gases?
35. The pressure of a 70.0 L sample of gas is 600. mm Hg at 20.0°C. If the temperature drops to 15.0°C and the volume expands to 90.0 L, what will the pressure of the gas be?
36. The pressure of a sample of gas at constant volume is 8.0 atm at 70.°C. What will the pressure be at 20.°C?
37. The volume of a gas is 120. L at 0.500 atm and 15.0°C. What volume will it occupy at 0.250 atm and 10.0°C?
38. The volume of a gas is 400. mL at 30.0°C. What volume will it occupy at 50.0°C if the pressure remains constant?

Combined Gas Law Problems:

1. If I initially have a gas at a pressure of 12 atm, a volume of 23 liters, and a temperature of 200 K, and then I raise the pressure to 14 atm and increase the temperature to 300 K, what is the new volume of the gas?
2. A gas takes up a volume of 17 liters, has a pressure of 2.3 atm, and a temperature of 299 K. If I raise the temperature to 350 K and lower the pressure to 1.5 atm, what is the new volume of the gas?
3. A gas that has a volume of 28 liters, a temperature of 45°C, and an unknown pressure has its volume increased to 34 liters and its temperature decreased to 35°C. If I measure the pressure after the change to be 2.0 atm, what was the original pressure of the gas?
4. A gas has a temperature of 14°C, and a volume of 4.5 liters. If the temperature is raised to 29°C and the pressure is not changed, what is the new volume of the gas?
5. If I have 17 liters of gas at a temperature of 67°C and a pressure of 88.89 atm, what will be the pressure of the gas if I raise the temperature to 94°C and decrease the volume to 12 liters?
6. I have an unknown volume of gas at a pressure of 0.5 atm and a temperature of 325 K. If I raise the pressure to 1.2 atm, decrease the temperature to 320 K, and measure the final volume to be 48 liters, what was the initial volume of the gas?
7. If I have 21 liters of gas held at a pressure of 78 atm and a temperature of 900 K, what will be the volume of the gas if I decrease the pressure to 45 atm and decrease the temperature to 750 K?
8. If I have 2.9 L of gas at a pressure of 5 atm and a temperature of 50°C, what will be the temperature of the gas if I decrease the volume of the gas to 2.4 L and decrease the pressure to 3 atm?
9. I have an unknown volume of gas held at a temperature of 115 K in a container with a pressure of 60 atm. If by increasing the temperature to 225 K and decreasing the pressure to 30 atm causes the volume of the gas to be 29 liters, how many liters of gas did I start with?