

Chapter Test B

Chapter: Gases

PART I In the space provided, write the letter of the term or phrase that best completes each statement or best answers each question.

- _____ 1. If the temperature of a gas remains constant, then the pressure of the gas will increase if the
- mass of the gas molecules decreases.
 - diffusion of the gas molecules increases.
 - size of the container is decreased.
 - number of gas molecules in the container is decreased.
- _____ 2. When Gay-Lussac's law of combining volumes holds, which of the following can be expressed in ratios of small whole numbers?
- pressures before and after reaction
 - volumes of gaseous reactants and products
 - kelvin temperatures
 - molar masses of products and molar masses of reactants
- _____ 3. Equal volumes of ideal gases at the same temperature and pressure contain equal numbers of
- protons.
 - ions.
 - particles.
 - electrons.
- _____ 4. At constant temperature and pressure, the volume of a gas is directly proportional to its
- molar mass.
 - number of moles.
 - density at STP.
 - rate of diffusion.
- _____ 5. To use the ideal gas law to determine the molar mass of a gas, you
- must determine the mass of a molar volume of that gas.
 - may use the mass of any known volume of the gas.
 - may not use a volume of less than 22.4 L.
 - must make the volume measurement at STP.
- _____ 6. Suppose that two unlike gases are injected into opposite ends of a long tube at the same time and allowed to diffuse toward the center. They should begin to mix
- at the end that held the heavier gas.
 - between the end where the heavier gas entered and the middle.
 - between the end where the lighter gas entered and the middle.
 - exactly in the middle.

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_____ 7. The value of the gas constant is

- a. $0.0821 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}$.
- b. $0.0281 \text{ L} \cdot \text{atm}$.
- c. $0.0281 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}$.
- d. $0.0821 \text{ mol} \cdot \text{K}$.

PART II Write the correct term (or terms) in the space provided.

8. The ideal gas law combines Boyle's law, Charles's law, Gay-Lussac's law, and _____.
9. The pressure of a gas is directly proportional to the number of moles of the gas if both volume and _____ are constant.
10. If a fixed quantity and volume of a gas undergoes a change in temperature, it will also experience a change in _____.
11. To study the relationship between the pressure and volume of a fixed amount of gas, hold the _____ constant.
12. Standard pressure is the atmospheric pressure balanced by a column of mercury with a height of exactly _____.
13. When the temperature of a gas remains constant, the mathematical expression of Boyle's law is _____, where V and P represent the original volume and pressure, and V' and P' represent the new volume and pressure.
14. The process by which gas particles under pressure flow through a tiny opening is called _____.
15. The force per unit area on a surface is called _____.
16. The SI unit of force is the _____.
17. A device used to measure atmospheric pressure is a(n) _____.

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18. The pressure exerted by each gas in a mixture is called the _____ of that gas.
19. If the temperature and number of moles of a gas remain constant but the volume increases, the pressure of the gas will _____.
20. The lowest possible temperature, corresponding to zero on the kelvin scale, is referred to as _____.

PART III 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.

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| _____ 21. The pressure of a fixed mass of gas varies directly with the kelvin temperature at constant volume. | a. Dalton's law |
| _____ 22. The volume of a fixed mass of gas varies inversely with the pressure at constant temperature. | b. Charles's law |
| _____ 23. At constant temperature and pressure, the volumes of gaseous reactants and products can be expressed as ratios of small whole numbers. | c. Gay-Lussac's law |
| _____ 24. Equal volumes of gases at the same temperature and pressure contain equal numbers of molecules. | d. Boyle's law |
| _____ 25. The total pressure of a mixture of gases is equal to the sum of the partial pressures of the component gases. | e. combined gas law |
| _____ 26. The relationship between pressure, volume, and temperature is expressed by this law. | f. Pascal's law |
| _____ 27. Pressure times volume equals molar amount times 0.0821 L·atm/(mol·K) times temperature in kelvins. | g. gas pressure law |
| _____ 28. The rates of effusion of gases at the same temperature and pressure are inversely proportional to their molar masses. | h. ideal gas law |
| _____ 29. The volume of a fixed mass of gas varies directly with the kelvin temperature at constant pressure. | i. Gay-Lussac's law of combining volumes |
| | j. Avogadro's law |
| | k. Graham's law |

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PART IV Write the answers to the following questions on the line to the left, and show your work in the space provided.

_____ **30.** Convert 0.75 atm to mm Hg.

_____ **31.** 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?

_____ **32.** The volume of a gas at 7.00°C is 49.0 mL. If the volume increases to 74.0 mL and the pressure is constant, what will the temperature of the gas be?

_____ **33.** 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?

_____ **34.** 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?

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- _____ **35.** The mass of a 1.0 L sample of a gas is 0.716 g at STP. What is the molar mass of the gas?
- _____ **36.** What is the density at STP of NO₂ gas (molar mass = 46.01 g/mol) in grams per liter?
- _____ **37.** What is the volume of 2.0 g of CS₂ vapor (molar mass = 76.15 g/mol) at 70.°C and 726 mm Hg?
- _____ **38.** When calcium carbonate is heated, it produces calcium oxide and carbon dioxide. The equation for the reaction is $\text{CaCO}_3(s) \rightarrow \text{CaO}(s) + \text{CO}_2(g)$. How many grams of calcium carbonate (molar mass = 100.09 g/mol) must be decomposed to produce 5.00 L of carbon dioxide at STP?
- _____ **39.** How many times greater is the rate of effusion of fluorine gas, F₂ (molar mass = 38.00 g/mol), than that of bromine gas, Br₂ (molar mass = 159.80 g/mol), at the same temperature and pressure?