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CHAPTER 14 STUDY GUIDE FOR CONTENT MASTERY

Section 14.3 *continued*

In your textbook, read about applying the ideal gas law.

Rearrange the ideal gas law, $PV = nRT$, to solve for each of the following variables. Write your answers in the table.

Rearranging the Ideal Gas Law Equation	
Variable to Find	**Rearranged Ideal Gas Law Equation**
n	13. $n = \frac{PV}{RT}$
P	14. $P = \frac{nRT}{V}$
T	15. $T = \frac{PV}{nR}$
V	16. $V = \frac{nRT}{P}$

In your textbook, read about using the ideal gas law to solve for molar mass, mass, or density.

Use the following terms below to complete the statements. Each term may be used more than once.

mass	molar mass	volume

The number of moles of a gas is equal to the **(17)** mass divided by the **(18)** molar mass.

Density is defined as **(19)** mass per unit **(20)** volume.

To solve for M in the equation $M = \frac{mRT}{PV}$, the **(21)** mass and the **(22)** volume of the gas must be known.

According to the equation $D = \frac{MP}{RT}$, the **(23)** molar mass of the gas must be known when calculating density.

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Section 14.3 The Ideal Gas Law

In your textbook, read about the ideal gas law.

Answer the following questions.

1. Why is the mathematical relationship among the amount, volume, temperature, and pressure of a gas sample called the ideal gas law?
   It works best when applied to problems involving ideal gases, those that have minimal attraction between particles and occupy a negligible volume.
2. Define the ideal gas constant, R.
   R is a constant that relates pressure, volume, amount, and temperature for a gas sample.
3. In Table 14-1 in your textbook, why does R have different numerical values?
   The numerical value of R depends on what unit is used for the pressure variable in the ideal gas law equation.
4. What variable is considered in the ideal gas law that is not considered in the combined gas law?
   n, the number of moles of gas present

In your textbook, read about real versus ideal gases.

For each statement below, write *true* or *false*.

false 5. An ideal gas is one whose particles take up space.

false 6. At low temperatures, ideal gases liquefy.

false 7. In the real world, gases consisting of small molecules are the only gases that are truly ideal.

true 8. Most gases behave like ideal gases at many temperatures and pressures.

true 9. No intermolecular attractive forces exist in an ideal gas.

true 10. Nonpolar gas molecules behave more like ideal gases than do gas molecules that are polar.

true 11. Real gases deviate most from ideal gas behavior at high pressures and low temperatures.

true 12. The smaller the gas molecule, the more the gas behaves like an ideal gas.

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Gases

Section 14.1 The Gas Laws

In your textbook, read about the basic concepts of the three gas laws.

Use each of the terms below to complete the passage. Each term may be used more than once.

pressure	temperature	volume

Boyle's law relates **(1)** pressure and **(2)** volume if **(3)** temperature and amount of gas are held constant. Charles's law relates **(4)** temperature and **(5)** volume if **(6)** pressure and amount of gas are held constant. Gay-Lussac's law relates **(7)** pressure and **(8)** temperature if **(9)** volume and amount of gas are held constant.

In your textbook, read about the effects of changing conditions on a sample of gas.

For each question below, write *increases*, *decreases*, or *stays the same*.

increases **10.** The room temperature increases from 20°C to 24°C. What happens to the pressure inside a cylinder of oxygen contained in the room?

stays the same **11.** What happens to the pressure of the gas in an inflated expandable balloon if the temperature is increased?

decreases **12.** An aerosol can of air freshener is sprayed into a room. What happens to the pressure of the gas if its temperature stays constant?

increases **13.** The volume of air in human lungs increases before it is exhaled. What happens to the temperature of the air in the lungs to cause this change, assuming pressure stays constant?

decreases **14.** A leftover hamburger patty is sealed in a plastic bag and placed in the refrigerator. What happens to the volume of the air in the bag?

increases **15.** What happens to the pressure of a gas in a lightbulb a few minutes after the light is turned on?

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Section 14.4 Gas Stoichiometry

In your textbook, read about gas stoichiometry.

Balance the following chemical equation. Then use the balanced equation to answer the questions.

1. 2 $H_2(g)$ + _____ $O_2(g)$ → 2 $H_2O(g)$

2. List at least two types of information provided by the coefficients in the equation.
relative numbers of moles, molecules, volumes of gases

3. If 4.0 L of water vapor is produced, what volume of hydrogen reacted? What volume of oxygen?
4.0 L, 2.0 L

4. If it is known that 2 mol of hydrogen reacts, what additional information would you need to know to find the volume of oxygen that would react with it?
mole ratio for hydrogen and oxygen from the balanced equation, conditions of temperature and pressure, molar volume if using the combined gas law (If using the ideal gas law, molar volume is not used.)

5. List the steps you would use to find the mass of oxygen that would react with a known number of moles of hydrogen.
Use the mole ratio of hydrogen and oxygen to find the corresponding number of moles of oxygen that react. Find the molar mass of oxygen. Multiply the molar mass of oxygen by the number of moles of oxygen.

6. Find the mass of water produced from 4.00 L H_2 at STP if all of it reacts. Show your work.
4.00 $\cancel{L}$ H_2/22.4 $\cancel{L}$/mol = 0.179 mol H_2; H_2 and H_2O are in a 1:1 ratio, so 0.179 mol H_2O is produced; 0.179 $\cancel{mol}$ H_2O × 18.02 g/$\cancel{mol}$ = 3.23 g H_2O