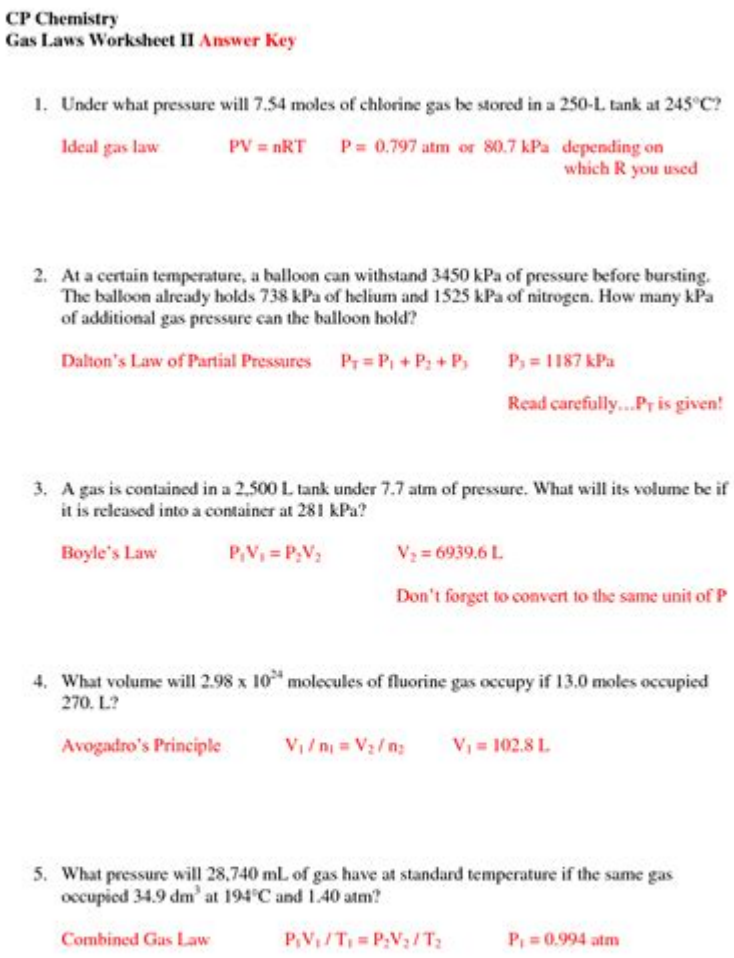
Ideal Gas Law Worksheet Answer Key



CP Chemistry
Gas Laws Worksheet II Answer Key

1. Under what pressure will 7.54 moles of chlorine gas be stored in a 250-L tank at 245°C?

   Ideal gas law PV = nRT P = 0.797 atm or 80.7 kPa depending on which R you used

2. At a certain temperature, a balloon can withstand 3450 kPa of pressure before bursting. The balloon already holds 738 kPa of helium and 1525 kPa of nitrogen. How many kPa of additional gas pressure can the balloon hold?

   Dalton's Law of Partial Pressures $P_T = P_1 + P_2 + P_3$ P_3 = 1187 kPa

   Read carefully…P_T is given!

3. A gas is contained in a 2,500 L tank under 7.7 atm of pressure. What will its volume be if it is released into a container at 281 kPa?

   Boyle's Law $P_1V_1 = P_2V_2$ V_2 = 6939.6 L

   Don't forget to convert to the same unit of P

4. What volume will 2.98 x 10^{24} molecules of fluorine gas occupy if 13.0 moles occupied 270. L?

   Avogadro's Principle $V_1 / n_1 = V_2 / n_2$ V_1 = 102.8 L

5. What pressure will 28,740 mL of gas have at standard temperature if the same gas occupied 34.9 dm^3 at 194°C and 1.40 atm?

   Combined Gas Law $P_1V_1 / T_1 = P_2V_2 / T_2$ P_1 = 0.994 atm

Ideal Gas Law Worksheet Answer Key: Mastering Gas Calculations

Are you struggling with Ideal Gas Law problems? Feeling overwhelmed by those pesky calculations involving pressure, volume, temperature, and moles? You're not alone! Many students find the Ideal Gas Law challenging, but with the right resources and understanding, it can become much more manageable. This comprehensive guide provides a detailed look at common Ideal Gas Law worksheet problems, offering not just the answers but also a thorough explanation of the solution process. We'll walk you through various scenarios, equipping you with the skills to tackle any Ideal Gas Law problem with confidence. Prepare to conquer your chemistry homework!

Understanding the Ideal Gas Law Equation

Before we dive into specific worksheet problems, let's refresh our understanding of the Ideal Gas Law itself. The equation is:

PV = nRT

Where:

P represents pressure (usually in atmospheres, atm)
V represents volume (usually in liters, L)
n represents the number of moles of gas (mol)
R is the ideal gas constant (0.0821 L·atm/mol·K)
T represents temperature (always in Kelvin, K)

Remember, converting units is crucial for accurate calculations. Failing to convert to the correct units is a common source of error.

Ideal Gas Law Worksheet Problem #1: Finding Pressure

Problem: A sample of helium gas occupies 5.0 L at 25°C and 1.5 mol. Calculate the pressure of the gas.

Solution:

1. Convert Celsius to Kelvin: 25°C + 273.15 = 298.15 K
2. Substitute values into the Ideal Gas Law: P(5.0 L) = (1.5 mol)(0.0821 L·atm/mol·K)(298.15 K)
3. Solve for P: P = [(1.5 mol)(0.0821 L·atm/mol·K)(298.15 K)] / (5.0 L) ≈ 7.3 atm

Answer: The pressure of the helium gas is approximately 7.3 atm.

Ideal Gas Law Worksheet Problem #2: Finding Volume

Problem: 2.0 moles of nitrogen gas are at a pressure of 1.0 atm and a temperature of 273 K. What volume does the gas occupy?

Solution:

1. Directly substitute values into the Ideal Gas Law: (1.0 atm)V = (2.0 mol)(0.0821 L·atm/mol·K)(273 K)
2. Solve for V: V = [(2.0 mol)(0.0821 L·atm/mol·K)(273 K)] / (1.0 atm) ≈ 44.8 L

Answer: The nitrogen gas occupies approximately 44.8 L.

Ideal Gas Law Worksheet Problem #3: Finding Moles

Problem: A gas sample has a volume of 10.0 L, a pressure of 2.5 atm, and a temperature of 300 K. How many moles of gas are present?

Solution:

1. Substitute values into the Ideal Gas Law: (2.5 atm)(10.0 L) = n(0.0821 L·atm/mol·K)(300 K)
2. Solve for n: n = [(2.5 atm)(10.0 L)] / [(0.0821 L·atm/mol·K)(300 K)] ≈ 1.01 mol

Answer: Approximately 1.01 moles of gas are present.

Ideal Gas Law Worksheet Problem #4: Finding Temperature

Problem: 0.5 moles of oxygen gas are contained in a 2.0 L container at a pressure of 3.0 atm. What is the temperature of the gas in Celsius?

Solution:

1. Substitute values into the Ideal Gas Law: (3.0 atm)(2.0 L) = (0.5 mol)(0.0821 L·atm/mol·K)T
2. Solve for T (in Kelvin): T = [(3.0 atm)(2.0 L)] / [(0.5 mol)(0.0821 L·atm/mol·K)] ≈ 146 K
3. Convert Kelvin to Celsius: 146 K - 273.15 = -127.15°C

Answer: The temperature of the oxygen gas is approximately -127.15°C.

Tackling More Complex Ideal Gas Law Problems

Many worksheets include problems involving gas mixtures, stoichiometry, or changes in conditions. These require a deeper understanding of the concepts but follow the same fundamental principles. Remember to break down complex problems into smaller, manageable steps. Always clearly identify the knowns and unknowns before applying the Ideal Gas Law. Practice is key to mastering these more advanced scenarios.

Conclusion

The Ideal Gas Law, while initially daunting, becomes manageable with consistent practice and a clear understanding of the equation and unit conversions. By working through various problems and understanding the logic behind the solutions, you'll build the confidence to tackle any Ideal Gas Law worksheet. Remember to always double-check your units and meticulously follow each step of the calculation. With dedication and practice, you'll master this important concept in chemistry!

FAQs

1. What if the gas isn't ideal? The Ideal Gas Law assumes that gas particles have negligible volume and don't interact. Real gases deviate from this at high pressure and low temperature. More complex equations are needed for non-ideal gases.

2. How do I handle gas mixtures? For gas mixtures, the total pressure is the sum of the partial pressures of each gas (Dalton's Law of Partial Pressures). Use the total pressure and the total number of moles in the Ideal Gas Law.

3. Can I use different units for pressure, volume, and temperature? You can, but you must use a corresponding gas constant (R) that matches your units. Sticking to atm, L, mol, and K simplifies calculations.

4. Why is it important to convert Celsius to Kelvin? Kelvin is an absolute temperature scale; it starts at absolute zero. The Ideal Gas Law requires an absolute temperature scale for accurate results.

5. Where can I find more practice problems? Many chemistry textbooks and online resources offer additional Ideal Gas Law practice problems and worksheets. Look for those with detailed solutions to help you learn from your mistakes.

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Student. Regents Physics Essentials has all the information you could ever need and is much easier to understand than many other textbooks... it is an excellent review tool and is truly written for students. -- Cat, NY Regents Physics Student

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problem by presenting the first textbook on atmospheric chemistry for a one-semester course. Based on the approach he developed in his class at Harvard, Jacob introduces students in clear and concise chapters to the fundamentals as well as the latest ideas and findings in the field. Jacob's aim is to show students how to use basic principles of physics and chemistry to describe a complex system such as the atmosphere. He also seeks to give students an overview of the current state of research and the work that led to this point. Jacob begins with atmospheric structure, design of simple models, atmospheric transport, and the continuity equation, and continues with geochemical cycles, the greenhouse effect, aerosols, stratospheric ozone, the oxidizing power of the atmosphere, smog, and acid rain. Each chapter concludes with a problem set based on recent scientific literature. This is a novel approach to problem-set writing, and one that successfully introduces students to the prevailing issues. This is a major contribution to a growing area of study and will be welcomed enthusiastically by students and teachers alike.

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ATOMS FIRST APPROACH, 1e, International Edition the Zumdahls use a meaningful approach that begins with the atom and proceeds through the concept of molecules, structure, and bonding, to more complex materials and their properties. Because this approach differs from what most students have experienced in high school courses, it encourages them to focus on conceptual learning early in the course, rather than relying on memorization and a plug and chug method of problem solving that even the best students can fall back on when confronted with familiar material. The atoms first organization provides an opportunity for students to use the tools of critical thinkers: to ask questions, to apply rules and models and to

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