Ideal Gas Law Problems Worksheet

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Part 1: Building a Foundation

What is the formula for the Ideal Gas Law?

Hint: Think about the relationship between pressure, volume, and temperature.

- ◯ PV = nRT
- ◯ P = nRT/V
- ◯ PV = nR/T
- ◯ P = V/nRT

Which of the following are units for pressure in the Ideal Gas Law?

Hint: Consider the common units used in gas law calculations.

- ☐ atm
- ☐ kPa
- ☐ mmHg
- ☐ Kelvin

Explain the significance of the universal gas constant (R) in the Ideal Gas Law.

Hint: Consider why R is a constant and its role in the equation.

List the variables in the Ideal Gas Law and provide their standard units.

Hint: Think about the variables represented in the equation PV = nRT.

1. P

2. V

3. n

4. R

5. T

If the temperature of a gas is increased, what happens to the volume if pressure and moles remain constant?

Hint: Consider the relationship between temperature and volume in gas laws.

- ◯ Volume decreases
- ◯ Volume remains constant
- ◯ Volume increases
- ◯ Volume becomes zero

Part 2: Comprehension and Application

Why is it necessary to convert Celsius to Kelvin when using the Ideal Gas Law?

Hint: Think about the requirements for temperature in scientific equations.

- ☐ Kelvin is a larger unit than Celsius.
- ☐ The Ideal Gas Law requires absolute temperature.
- ☐ Celsius is not a standard unit in physics.
- ☐ Kelvin is more precise than Celsius.

Describe how the Ideal Gas Law can be used to determine the number of moles of a gas when given pressure, volume, and temperature.

Hint: Think about how to rearrange the Ideal Gas Law to solve for n.

Which condition is most likely to cause a gas to deviate from ideal behavior?

Hint: Consider the effects of pressure and temperature on gas molecules.

- ◯ Low pressure and high temperature
- ◯ High pressure and low temperature
- ◯ High pressure and high temperature
- ◯ Low pressure and low temperature

A 2.5 L container holds a gas at 1 atm and 300 K. Calculate the number of moles of gas present. Use R = 0.0821 L atm/(mol K).

Hint: Use the Ideal Gas Law to solve for n.

A gas occupies 10 L at 2 atm and 273 K. If the pressure is increased to 4 atm and the temperature remains constant, what is the new volume?

Hint: Consider Boyle's Law for constant temperature conditions.

- ◯ 5 L
- ◯ 20 L
- ◯ 10 L
- ◯ 2.5 L

Part 3: Analysis, Evaluation, and Creation

Analyze the relationship between pressure and volume in the Ideal Gas Law. How does this relationship change when temperature is held constant?

Hint: Consider Boyle's Law and the inverse relationship.

Consider a gas sample with an initial state of 1 atm, 22.4 L, and 273 K. If the volume is halved and the temperature is doubled, what is the final pressure?

Hint: Use the Ideal Gas Law to find the final pressure after changes.

1. Initial Pressure
2. Initial Volume
3. Initial Temperature
4. Final Volume
5. Final Temperature
6. Final Pressure

In an experiment, a gas is compressed at constant temperature. What happens to the kinetic energy of the gas molecules?

Hint: Consider the relationship between temperature and kinetic energy.

- ◯ It increases

- ◯ It decreases
- ◯ It remains the same
- ◯ It becomes zero

Evaluate the limitations of the Ideal Gas Law when applied to real gases. Provide examples of conditions where the law fails.

Hint: Consider the assumptions made by the Ideal Gas Law.

Which modifications to the Ideal Gas Law would improve its accuracy for real gases?

Hint: Think about equations that account for real gas behavior.

- ☐ Using the Van der Waals equation
- ☐ Increasing the value of R
- ☐ Decreasing the volume of gas molecules
- ☐ Ignoring intermolecular forces

Design an experiment to test the validity of the Ideal Gas Law under varying temperature conditions. Describe the setup, procedure, and expected outcomes.

Hint: Consider how to measure pressure, volume, and temperature accurately.