Ideal Gas Equation Worksheet Questions and Answers PDF

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Part 1: Building a Foundation

What is the ideal gas law equation?

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

- ◯ **A) PV = nRT ✓**
- ◯ B) P = nRT/V
- ◯ C) PV = nR/T
- ◯ D) P = VnRT

> The ideal gas law equation is PV = nRT.

Which of the following are units for the universal gas constant (R)?

Hint: Consider the different forms of energy and pressure.

- ☐ **A) J/(mol·K) ✓**
- ☐ **B) L·atm/(mol·K) ✓**
- ☐ C) Pa
- ☐ D) mmHg

> The units for the universal gas constant include J/(mol·K) and L·atm/(mol·K).

Explain why it is important to convert temperature to Kelvin when using the ideal gas law.

Hint: Consider the absolute temperature scale.

Temperature must be in Kelvin because the ideal gas law is based on absolute temperature, where 0 K represents absolute zero.

List the variables in the ideal gas law and their corresponding units.

Hint: Think about pressure, volume, temperature, and moles.

1. P

Pressure (atm)

2. V

Volume (liters)

3. n

Number of moles

4. R

Universal gas constant (L·atm/(mol·K))

5. T

> Temperature (Kelvin)

> The variables are P (pressure in atm), V (volume in liters), n (moles), R (gas constant), and T (temperature in Kelvin).

Part 2: Comprehension and Interpretation

If the temperature of a gas is given in Celsius, what is the first step you should take before using the ideal gas law?

Hint: Consider the correct temperature scale for calculations.

- ◯ A) Convert to Fahrenheit
- ◯ **B) Convert to Kelvin ✓**
- ◯ C) Convert to Rankine
- ◯ D) Convert to liters

> You should convert the temperature to Kelvin.

Which of the following statements about the ideal gas law are true?

Hint: Think about the assumptions made by the ideal gas law.

- ☐ **A) It assumes gas particles have no volume. ✓**
- ☐ B) It is accurate for all gases under all conditions.
- ☐ **C) It assumes no interactions between gas particles. ✓**
- ☐ D) It is more accurate at high pressures.

> True statements include that it assumes gas particles have no volume and no interactions between them.

Describe a scenario where the ideal gas law might not accurately predict the behavior of a gas.

Hint: Consider extreme conditions or specific gas types.

The ideal gas law may not accurately predict behavior at high pressures or low temperatures, where gas particles are close together and interactions become significant.

Part 3: Application and Analysis

A gas occupies 10 liters at a pressure of 2 atm and a temperature of 300 K. How many moles of gas are present? (R = 0.0821 L·atm/(mol·K))

Hint: Use the ideal gas law to solve for n.

- ◯ A) 0.82 moles
- ◯ **B) 0.81 moles ✓**
- ◯ C) 0.80 moles
- ◯ D) 0.79 moles

Using the ideal gas law, the number of moles of gas is approximately 0.81 moles.

When using the ideal gas law, which of the following conditions would require you to adjust your calculations?

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

- ☐ **A) High pressure ✓**
- ☐ **B) Low temperature ✓**
- ☐ C) Large volume
- ☐ D) High temperature

Conditions such as high pressure and low temperature would require adjustments in calculations.

Calculate the pressure of a gas if 2 moles occupy a volume of 5 liters at a temperature of 350 K. Use R = 0.0821 L·atm/(mol·K).

Hint: Use the ideal gas law to find pressure.

The pressure of the gas can be calculated using the ideal gas law, resulting in approximately 9.42 atm.

Which variable in the ideal gas law is directly proportional to both pressure and volume?

Hint: Think about the relationships in the ideal gas law.

- ◯ **A) Temperature ✓**
- ◯ B) Number of moles
- ◯ C) Universal gas constant
- ◯ D) None of the above

The variable directly proportional to both pressure and volume is temperature.

Analyze the following scenarios and select those where the ideal gas law would likely be inaccurate:

Hint: Consider extreme conditions for gases.

- ☐ **A) Gas at very high pressure ✓**
- ☐ **B) Gas at very low temperature ✓**
- ☐ C) Gas at room temperature and atmospheric pressure
- ☐ D) Gas in a small container

The ideal gas law would likely be inaccurate at very high pressures and very low temperatures.

Compare and contrast the assumptions of the ideal gas law with the behavior of real gases.

Hint: Think about the ideal conditions versus real-world conditions.

The ideal gas law assumes no volume and no interactions between particles, while real gases have volume and experience intermolecular forces.

Part 4: Evaluation and Creation

If a gas behaves ideally at low pressure, what might you infer about its behavior at high pressure?

Hint: Consider the relationship between pressure and ideal behavior.

- ◯ A) It will behave more ideally.
- ◯ **B) It will deviate from ideal behavior. ✓**
- ◯ C) It will have no change in behavior.
- ◯ D) It will behave less ideally at low temperature.

At high pressure, the gas will likely deviate from ideal behavior.

Evaluate the following modifications to the ideal gas law for real gases and select those that could improve accuracy:

Hint: Consider factors that affect gas behavior.

- ☐ **A) Consideration of intermolecular forces ✓**
- ☐ **B) Inclusion of gas particle volume ✓**
- ☐ C) Use of a higher universal gas constant
- ☐ D) Adjustment for temperature fluctuations

Modifications that could improve accuracy include consideration of intermolecular forces and inclusion of gas particle volume.

Propose a real-world experiment to test the accuracy of the ideal gas law under different conditions, detailing the variables you would control and measure.

Hint: Think about how you would set up an experiment to gather data.

An experiment could involve measuring the pressure, volume, and temperature of a gas under varying conditions to compare with ideal predictions.