

Ideal Gas Law Problems Worksheet Answer Key PDF

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Part 1: Building a Foundation

What is the formula for the Ideal Gas Law?

undefined. **PV = nRT** ✓

undefined. $P = nRT/V$

undefined. $PV = nR/T$

undefined. $P = V/nRT$

The correct formula for the Ideal Gas Law is $PV = nRT$.

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

undefined. **atm** ✓

undefined. **kPa** ✓

undefined. **mmHg** ✓

undefined. Kelvin

The units for pressure include atm, kPa, and mmHg.

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

The universal gas constant (R) relates the energy scale to the temperature scale in the Ideal Gas Law.

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

1. P

Pressure (atm)

2. V

Volume (L)

3. n

Number of moles (mol)

4. R

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

5. T

Temperature (K)

The variables are P (pressure in atm), V (volume in L), n (moles), R (L atm/(mol K)), and T (temperature in K).

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

undefined. Volume decreases

undefined. Volume remains constant

undefined. Volume increases ✓

undefined. Volume becomes zero

If temperature increases, volume increases when pressure and moles are constant.

Part 2: Comprehension and Application

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

undefined. Kelvin is a larger unit than Celsius.

undefined. The Ideal Gas Law requires absolute temperature. ✓

undefined. Celsius is not a standard unit in physics.

undefined. Kelvin is more precise than Celsius.

Kelvin is required because the Ideal Gas Law uses absolute temperature.

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

The Ideal Gas Law can be rearranged to $n = PV/(RT)$ to find the number of moles.

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

undefined. Low pressure and high temperature

undefined. High pressure and low temperature ✓

undefined. High pressure and high temperature

undefined. Low pressure and low temperature

High pressure and low temperature are conditions that cause deviation from ideal behavior.

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

Using the Ideal Gas Law, $n = PV/(RT)$ gives the number of moles.

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?

undefined. 5 L ✓

undefined. 20 L

undefined. 10 L

undefined. 2.5 L

The new volume is 5 L when pressure is doubled at constant temperature.

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?

Pressure and volume have an inverse relationship; as one increases, the other decreases when temperature is constant.

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?

1. Initial Pressure

1 atm

2. Initial Volume

22.4 L

3. Initial Temperature

273 K

4. Final Volume

11.2 L

5. Final Temperature

546 K

6. Final Pressure

2 atm

The final pressure can be calculated using the Ideal Gas Law after adjusting the volume and temperature.

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

undefined. It increases

undefined. It decreases

undefined. It remains the same ✓

undefined. It becomes zero

The kinetic energy remains the same because temperature is constant.

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

The Ideal Gas Law fails under high pressure and low temperature where real gases exhibit non-ideal behavior.

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

undefined. Using the Van der Waals equation ✓

undefined. Increasing the value of R

undefined. Decreasing the volume of gas molecules

undefined. Ignoring intermolecular forces

Using the Van der Waals equation can improve accuracy for real gases.

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

An experiment can be designed to measure gas behavior under different temperatures to validate the Ideal Gas Law.