

What Is the Ideal Gas Law?

Worksheet

The ideal gas law is $PV = nRT$, where P is pressure (Pa), V is volume (m), n is moles (mol), R is the gas constant (8.314 J/molK), and T is absolute temperature (K).

$$PV = nRT$$

Questions

1. The ideal gas law is

- A) $PV = mRT$
- B) $PV = nRT$
- C) $PV = nR/T$
- D) $P = V/nRT$

2. If volume doubles at constant T and n , pressure

- A) doubles
- B) halves
- C) stays same
- D) quadruples

3. Unit of R is

- A) Pa·m/molK
- B) J/(molK)
- C) Pa/molK
- D) mK

4. Temperature must be in

- A) C
- B) F
- C) K
- D) any unit

5. 1 mole of ideal gas at 298 K occupies 0.0244 m. Find its pressure.

6. A 2 L tank contains 0.5 mol of gas at 25 C. Find pressure in Pa.

7. If 3 moles expand from 0.5 m to 1.5 m at 300 K, find final pressure.

8. Define: What is the ideal gas law?

9. Define: What is R ?

10. Define: When is the ideal gas law most accurate?

Answer Key

1. B) $PV = nRT$ - $PV = nRT$ is the correct form.
2. B) halves - $PV = nRT$; if V doubles, P must halve to keep product constant.
3. B) $J/(molK)$ - $8.314 J/(molK)$; $J = Pam$.
4. C) K - Kelvins (absolute scale) for $PV = nRT$.
5. $PV = nRT$ $P = nRT/V$ $P = (1 \cdot 8.314 \cdot 298) / 0.0244$ $P = 2481.572 / 0.0244$ $P = 101,690$ Pa 1 atm
6. $2 L = 0.002 m^3$; $T = 25 + 273 = 298 K$ $P = nRT/V = (0.5 \cdot 8.314 \cdot 298) / 0.002$ $P = 1238.786 / 0.002 = 619,393$ Pa
7. $PV = PV$ (same T , n) $P = nRT/V = (3 \cdot 8.314 \cdot 300) / 0.5 = 14,965.2$ Pa $P = nRT/V = (3 \cdot 8.314 \cdot 300) / 1.5 = 4,988.4$ Pa
8. $PV = nRT$, relating pressure, volume, moles, and temperature.
9. The universal gas constant, $8.314 J/(molK)$.
10. For most gases at moderate pressures and temperatures.

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