What is the Ideal Gas Law?

Worksheet

The ideal gas law is PV = nRT, where pressure times volume equals moles times the gas constant times absolute temperature. It predicts how gases behave when pressure, volume or temperature changes.

PV = nRT

Questions

1. Using PV = nRT, if you double the temperature of a gas at constant volume and moles, pressure will

A) stay the same
B) double
C) halve
D) quadruple

2. The units of R are typically

A) Pam/(molK)
B) Latm/(molK)
C) J/(molK)
D) all of above

3. At STP (1 atm, 273 K), one mole of ideal gas occupies roughly

A) 5.6 L
B) 11.2 L
C) 22.4 L
D) 44.8 L

4. An ideal gas assumes molecules

A) have significant volume
B) attract each other
C) have no volume and no forces between them
D) always move in straight lines

5. A 5 L flask contains 2 mol of N gas at 300 K. What is the pressure? (R = 8.314 J/(molK); 1 Pam = 1 J)

6. At STP (273 K, 1 atm), how many moles are in 22.4 L of gas?

7. If a sealed 10 L container of gas at 300 K is heated to 600 K, and pressure doubles, how many moles were inside?

8. Define: What is the ideal gas law equation?

9. Define: What is the gas constant R?

10. Define: Why must temperature be in Kelvin?

Answer Key

1. B) double - P T at constant V and n. Doubling T doubles P.
2. D) all of above - R = 8.314 J/(molK) = 0.08206 Latm/(molK) = 0.0821 LPa/(molK), etc.
3. C) 22.4 L - Using PV = nRT: V = nRT/P = 1 0.08206 273 / 1 22.4 L.
4. C) have no volume and no forces between them - Ideal gas = point particles, elastic collisions, no intermolecular forces.
5. PV = nRT P 5 = 2 8.314 300 P = 4988.4 / 5 = 997.68 Pa 0.0098 atm (or ~1 kPa)
6. PV = nRT 1 22.4 = n 0.08206 273 n 1 mol
7. At 300K: PV = n R 300 At 600K: 2PV = n R 600 Dividing: 2 = 600/300 (confirms the relationship) Using first: n = P 10 / (8.314 300)
8. PV = nRT - pressure volume = moles gas constant temperature.
9. 8.314 J/(molK) or 0.08206 Latm/(molK), depending on units.
10. The law assumes absolute temperature; negative Kelvin values are unphysical.