Gas Laws — Answer Key

Instructor reference • Worked solutions in red

Explanations use introductory chemistry conventions. Equivalent valid structures or correctly rounded numeric answers may also receive credit.

1. **Ideal gas law: n = 0.5 mol; P = 1.0 atm; T = 298.15 K. Find volume (L).**

   Use PV = nRT with R = 0.082057 L·atm·mol^{-1}·K^{-1}. Temperature must be in kelvin. Answer ≈ 12.2 L.

2. **Ideal gas law: n = 1.25 mol; V = 10.0 L; T = 300.15 K. Find pressure (atm).**

   Use PV = nRT with R = 0.082057 L·atm·mol^{-1}·K^{-1}. Temperature must be in kelvin. Answer ≈ 3.08 atm.

3. **Ideal gas law: P = 0.95 atm; V = 5.0 L; T = 310.15 K. Find moles (mol).**

   Use PV = nRT with R = 0.082057 L·atm·mol^{-1}·K^{-1}. Temperature must be in kelvin. Answer ≈ 0.187 mol.

4. **Ideal gas law: n = 2.0 mol; P = 2.5 atm; T = 273.15 K. Find volume (L).**

   Use PV = nRT with R = 0.082057 L·atm·mol^{-1}·K^{-1}. Temperature must be in kelvin. Answer ≈ 17.9 L.

5. **Ideal gas law: n = 0.75 mol; V = 12.0 L; T = 350.0 K. Find pressure (atm).**

   Use PV = nRT with R = 0.082057 L·atm·mol^{-1}·K^{-1}. Temperature must be in kelvin. Answer ≈ 1.79 atm.

6. **Ideal gas law: P = 1.25 atm; V = 2.5 L; T = 298.15 K. Find moles (mol).**

   Use PV = nRT with R = 0.082057 L·atm·mol^{-1}·K^{-1}. Temperature must be in kelvin. Answer ≈ 0.128 mol.

7. **Boyle law: P1 = 1.2 atm; V1 = 3.5 L; P2 = 0.8 atm. Find V_2 (L).**

   At constant temperature and amount, $P_1V_1 = P_2V_2$. Answer ≈ 5.25 L.

8. **Boyle law: P1 = 0.95 atm; V1 = 8.0 L; P2 = 1.9 atm. Find V_2 (L).**

   At constant temperature and amount, $P_1V_1 = P_2V_2$. Answer ≈ 4 L.

9. **Charles law: V1 = 2.4 L; T1 = 300.0 K; T2 = 360.0 K. Find V_2 (L).**

   At constant pressure and amount, $V_1/T_1 = V_2/T_2$. Temperatures are in kelvin. Answer ≈ 2.88 L.

10. **Charles law: V1 = 5.0 L; T1 = 250.0 K; T2 = 300.0 K. Find V_2 (L).**

    At constant pressure and amount, $V_1/T_1 = V_2/T_2$. Temperatures are in kelvin. Answer ≈ 6 L.

11. **Gay Lussac law: P1 = 1.1 atm; T1 = 280.0 K; T2 = 350.0 K. Find P_2 (atm).**

    At constant volume and amount, $P_1/T_1 = P_2/T_2$. Answer ≈ 1.38 atm.

12. **Gay Lussac law: P1 = 2.0 atm; T1 = 320.0 K; T2 = 256.0 K. Find P_2 (atm).**

    At constant volume and amount, $P_1/T_1 = P_2/T_2$. Answer ≈ 1.6 atm.

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