# Unit IX: Gas Laws (Chapter 12)

1. Describe the motion of particles of a gas according to the kinetic theory.

2. Explain gas pressure in terms of kinetic theory.

3. Describe the design and function of a thermometer.

4. Describe the design and function of a barometer.

5. Read an open-ended and closed-ended manometer to determine the pressure of a gas sample.

6. Define the temperature of a substance as a measure of the kinetic energy of the particles in the substance.
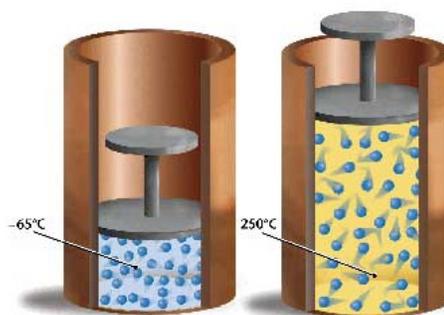
7. **Boyle's Law:**

   A) Calculate the pressure or volume from the pressure-volume relationship of a contained gas at constant temperature.
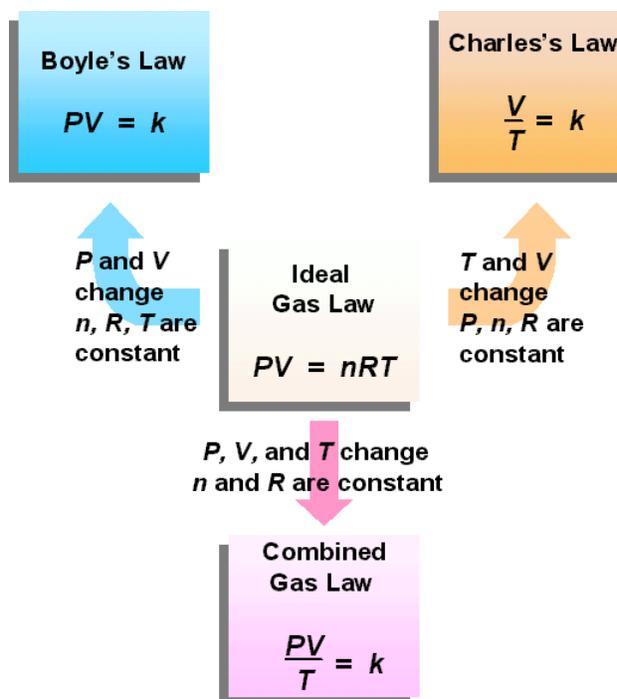
10. **Charle's Law:**

    A) Calculate the temperature or volume from the temperature-volume relationship of a contained gas at constant pressure.
    B) Discuss the significance of absolute-zero temperature. Use the Kelvin scale in calculations.

11. **The Gay-Lussac Law:**

    A) Calculate the temperature or pressure from the temperature-pressure relationship of a contained gas at constant volume

12. **The Combined Gas Law:**
    A) Calculate pressure, volume or temperature from the pressure-volume-temperature relationship of a contained gas
    B) Calculate the amount of gas at any specified conditions of pressure, volume and temperature.

Boyle's Law

$$PV = k$$

Charles's Law

$$\frac{V}{T} = k$$

P and V change
n, R, T are constant

Ideal Gas Law

$$PV = nRT$$

T and V change
P, n, R are constant

P, V, and T change
n and R are constant

Combined Gas Law

$$\frac{PV}{T} = k$$

−65°C   250°C

13. Describe the **Ideal Gas Law: PV = nRT**. Calculate pressure, temperature, volume, moles, grams, or molecules using the Ideal Gas Law.

14. Using the Ideal Gas Law:

   A. Calculate the molar mass or density of a gas.

   B. Calculate the amount of gas at any specified conditions of pressure, volume and temperature.

15. Calculate the total pressure of a mixture of gases or the partial pressure of a gas in a mixture of gases.

16. Explain Avogadro's hypothesis using the kinetic theory.

17. Explain, using kinetic theory, why molecular of small mass diffuse more rapidly than molecules of large mass.

18. Use a chemical equation to specify volume ratios for gaseous reactants and/or products.

19. Use volume ratios, standard molar volume, and the gas laws where appropriate to calculate volumes, masses or molar amounts of reactants involving gases.

20. Distinguish between real and ideal gases.

21. Explain why no gas behaves as an ideal gas at all temperatures and pressures.

22. Describe and analyze the set-up for the preparation of different gases as well as test for H_2, O_2 and CO_2.