

Chem Unit 10 Gases

Charles' Law

Charles' Law: Temperature and Volume relationships in gases

Review:

- As you know Boyle's Law deals with the P & V relationship in gases when everything else is held constant.
- You also know that the relationship between P & V is inverse.

Notes / Demonstrations:

- Today we look at another relationship ... between T & V. Jacques Charles, 1746-1823 first studied this aspect of gases. What he found was that T & V are directly related when everything else is kept constant.
- His experiment began with a volume of gas at a certain temperature. He then cooled the gas and measured the new volume!
- He also extrapolated the data ... absolute zero. (Real vs. Ideal gases issues!)

Charles' Law:

- T & V are directly related.
- $V_1 / T_1 = V_2 / T_2$ (always use temperatures in Kelvin [$K = ^\circ C + 273$])

Practical Applications:

- Tire pressure after driving.
- Hot Air Balloon
- Food storage containers
- Incinerating an aerosol can or lightbulb

Examples:

(1) 5.0 L of a gas at 293 K will have what volume at 323 K?

(2) 325 mL of a gas at 298 K will have what volume at 12.0 °C?

Cautions:

1. Always watch your units ... use the same volume units on both sides.
2. All temperatures in Kelvin (no negative values)
3. Use common sense ... think about your answer!

Assignment:

1. Read 13.3 (pp. 407 - 412)
2. Work problems on p. 436: 13-16

Additional Problems:

- (1) A child blows a 250 cm^3 bubble that contains air at 28°C . As the bubble rises it cools. If there is no change in pressure, what volume will the bubble have at 18°C ?

- (2) A 24 L sample of nitrogen gas is cooled from 25°C to a final temperature of $-100.^\circ\text{C}$. What is the new volume of the gas?

- (3) The label on an aerosol spray can contains a warning that the can should not be heated to over 54°C because of the danger of explosion. Although the pressure in an aerosol can also increase if it is heated, calculate the potential volume of the gas in a 500. mL aerosol can when it is heated from 25°C to 54°C if the pressure remains constant?