IDEAL GAS LAW

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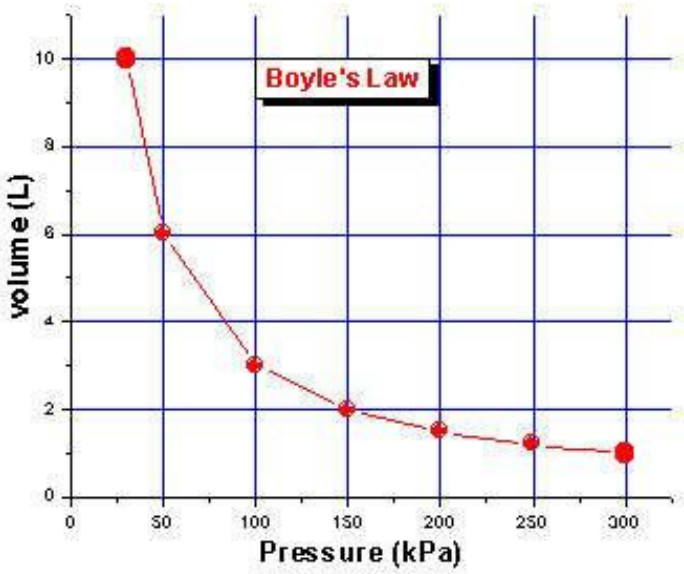
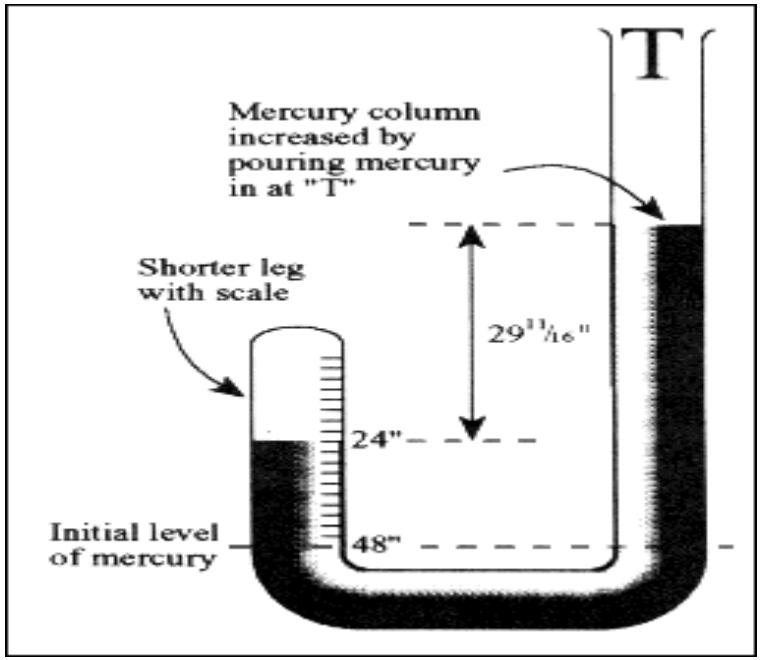
GAS LAWS

BOYLE'S LAW (Pressure – Volume Relationship)

According to Robert Boyle's Law, at constant temperature, the pressure of a fixed amount of gas varies inversely with its volume.

$$pv = \text{constant}$$
$$pv = k$$

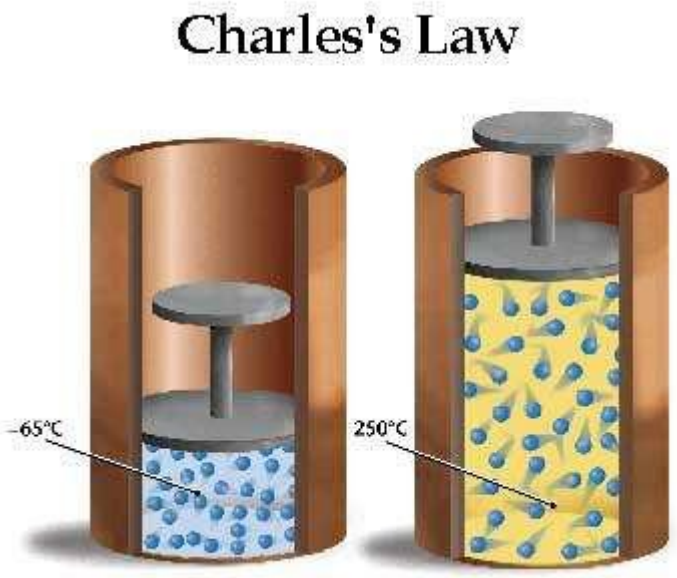


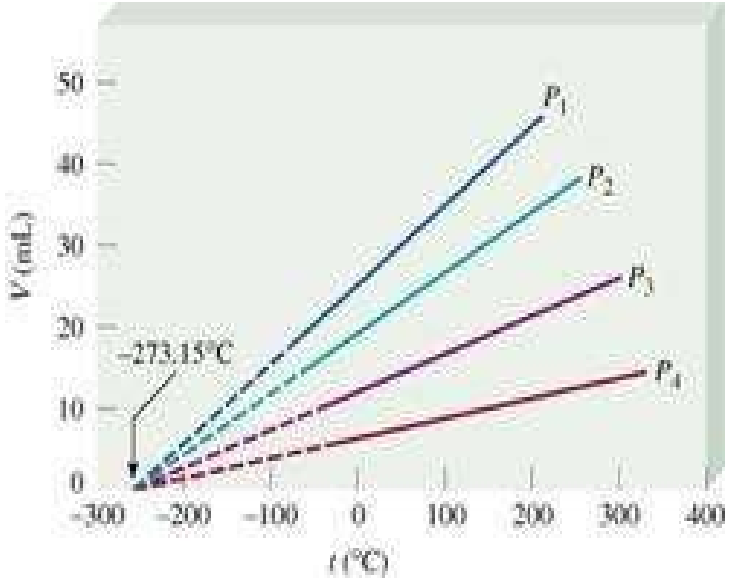


CHARLE'S LAW (Temperature – Volume Relationship)

Charle's Law states that pressure remaining constant, the volume of a fixed mass of a gas is directly proportional to it's absolute temperature.

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

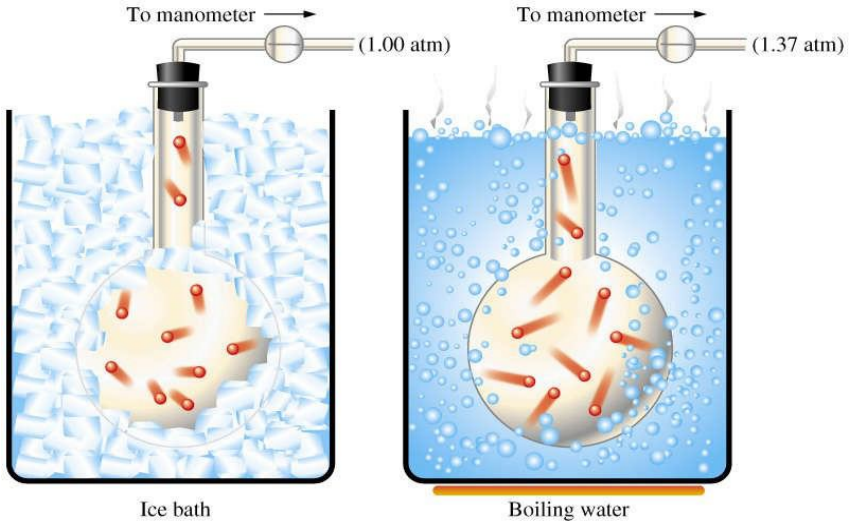


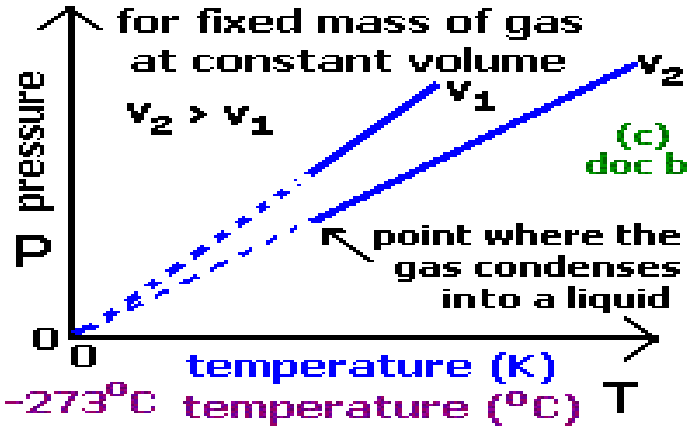


GAY LUSSAC'S LAW (Pressure – Temperature Relationship)

Gay Lussac's law states that at constant volume, pressure of a fixed amount of a gas varies directly with the temperature.

$$\frac{P}{T} = \text{constant}$$





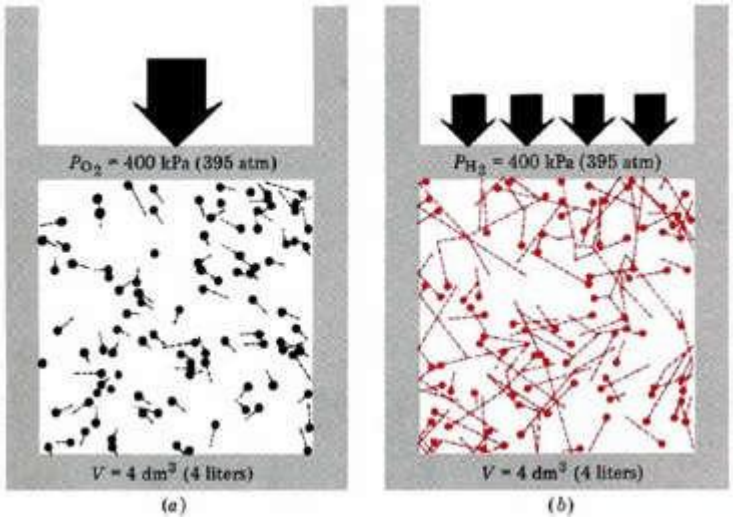
AVAGADRO LAW (Volume – Amount Relationship)

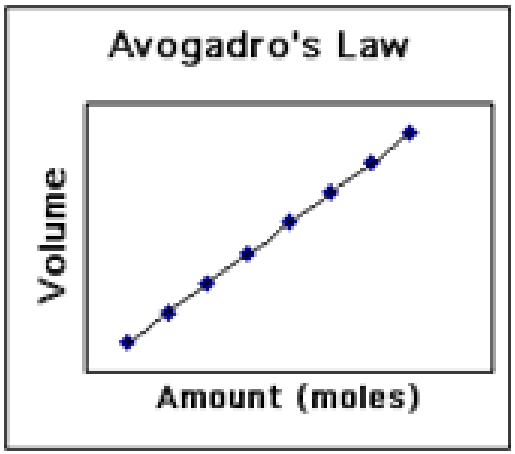
It states that equal volumes of all gases under the same conditions of temperature and pressure contain equal number of molecules.

$$V \propto n$$

(constant T and P)

$$\frac{V_1}{n_1} = \frac{V_2}{n_2}$$





IDEAL GAS EQUATION

Ideal gas equation is a relation between four variables and it describes the state of any gas, therefore, it is also called equation of state.

Starting with the three gas laws…

$P \propto 1/V$ $V \propto T$ $V \propto n$

Therefore, using the Laws of Proportionality

$PV=C_B$ $V/T=C_C$ $V/n=C_A$ (C is some constant)

Using Algebraic Substitution

$PV/nT=R$ (R is combination of 3 constants)

$\therefore PV=nRT$

$$\frac{p_1V_1}{T_1} = \frac{p_2V_2}{T_2}$$