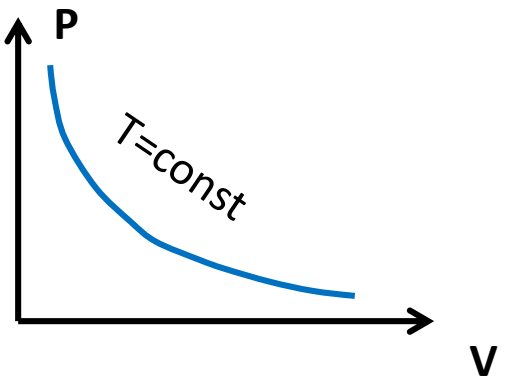
# Ideal Gas Laws

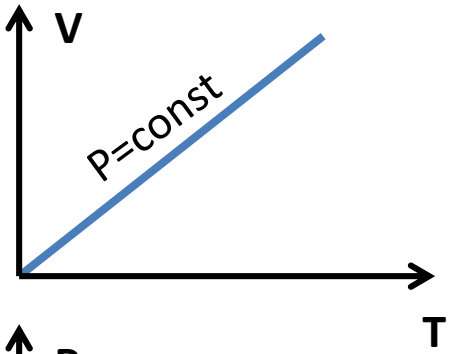
Boyle's Law :

$$PV = const \quad (\text{when} \quad T = const)$$



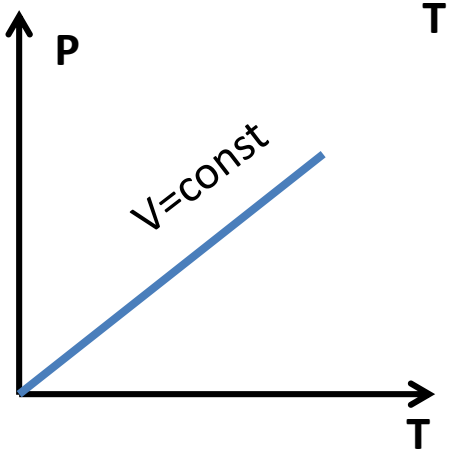

Charles's Law :

$$\frac{V}{T} = const \quad (\text{when} \quad P = const)$$




Gay - Lussac's Law :

$$\frac{P}{T} = const \quad (\text{when} \quad V = const)$$




$$T[K] \approx T^0C + 273.15$$

# Homework

**Problem 1**

An air bubble in water had volume V= 10 ml at depth h=20m. Find its volume right before the bubble reaches the surface. Assume the temperature of the air inside to be constant (typically, not true!).

**Problem 2**

a) Density of a gas is $\rho_0$ at temperature $T_0$ (in Kelvin). Find the density at temperature T, and the same pressure.

b) We have already discussed the force that lifts a Helium balloon. Hot Air balloon is different since it is not sealed. There is an exchange of air between its interior and the atmosphere. Use result of p[art (a) to find the density of air inside the balloon. Temperature of air inside and outside is $87^0$C and $27^0$C, respectively. Density of the outside air is $\rho_0 = 1.2$ kg/m $^3$.

Take the absolute zero temperature to be $-273^0$C.