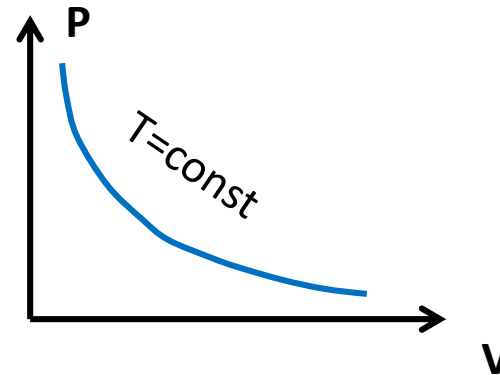


Ideal Gas Laws

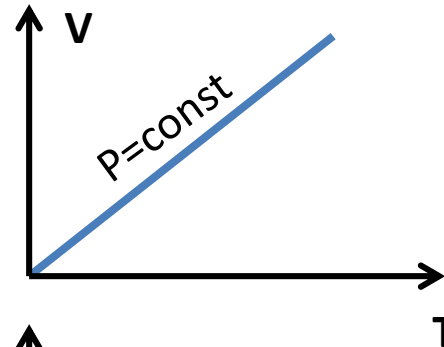
Boyle's Law :

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



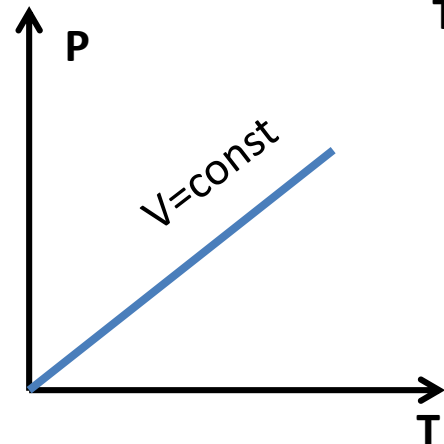
Charles's Law :

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



Gay - Lussac's Law :

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



$$T[K] \approx T^{\circ}C + 273.15$$

Homework

Problem 1

An air bubble in water had volume $V = 10 \text{ ml}$ at depth $h = 20 \text{ m}$. 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 ρ_0 at temperature T_0 (in Kelvin). Find the density at temperature T , and the same pressure.
- b) Use result of part (a) to find the density of air inside the hot air balloon. Temperature of air inside and outside is 87°C and 27°C , respectively. Density of the outside air is $\rho_0 = 1.2 \text{ kg/m}^3$. Note that hot air balloon is not sealed, but pressure inside and outside should be the same.

Take the absolute zero temperature to be -273°C .