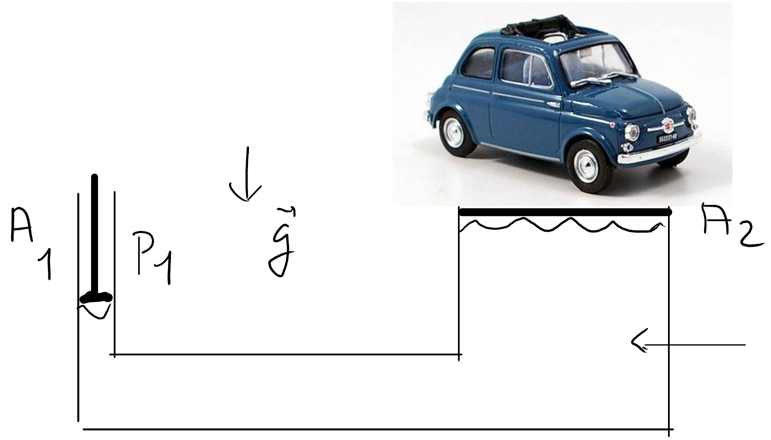
Es.: pistone idraulico



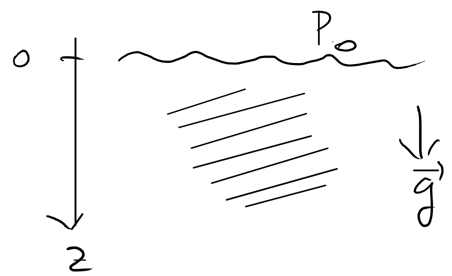
peso auto
13300 N

$P_1 = ?$ $F_1 = ?$

fluido ρ = cost

$r_1 = 5\,cm$ $r_2 = 15\,cm$

Legge di Stevino



fluido ρ = cost
a riposo

$$P = P_0 + \rho g z$$

$$P_1 = P_2$$

$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

TEMPERATURA

Calore — temperatura

↓ ↓

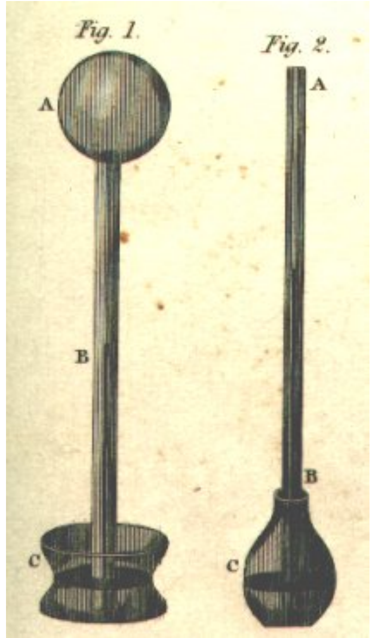
trasferimento di energia — energia cinetica microscopica

[teor. energia cinetica

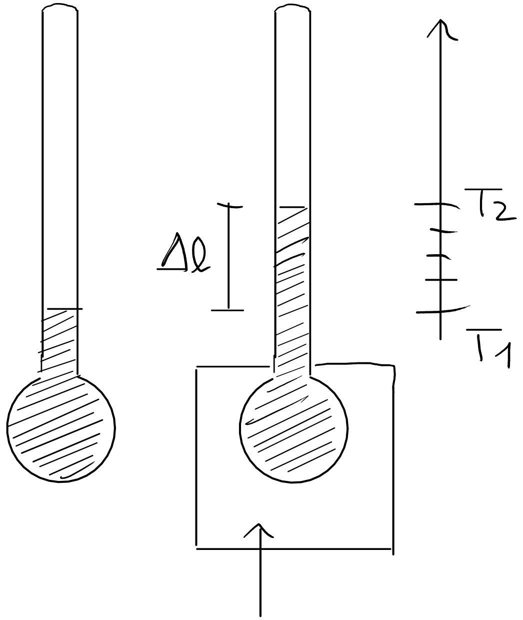
$W = \Delta E_c$]

$Q \to \Delta T$

Definizione operativa



Termoscopio
∼1600



contatto termico

Fahrenheit 1724

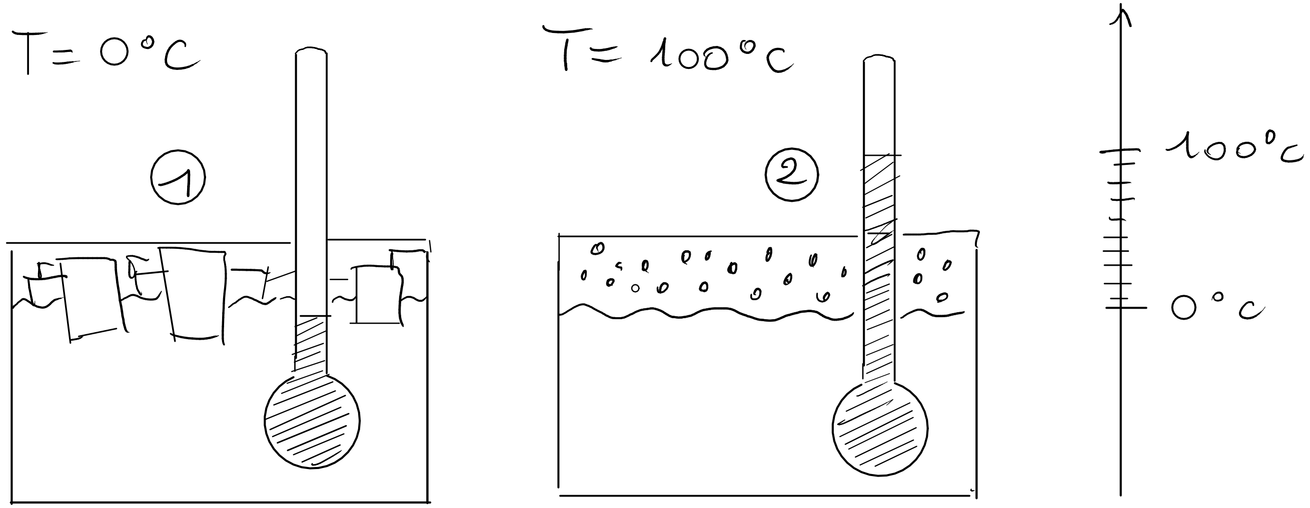
- dilatazione termica liquidi / gas
- fenomeni elettrici

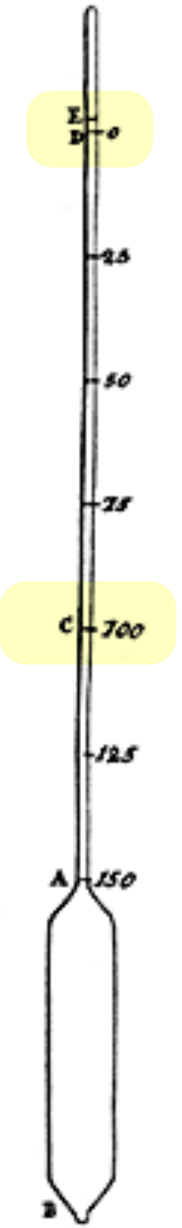
Scale di temperatura

Scala Celsius

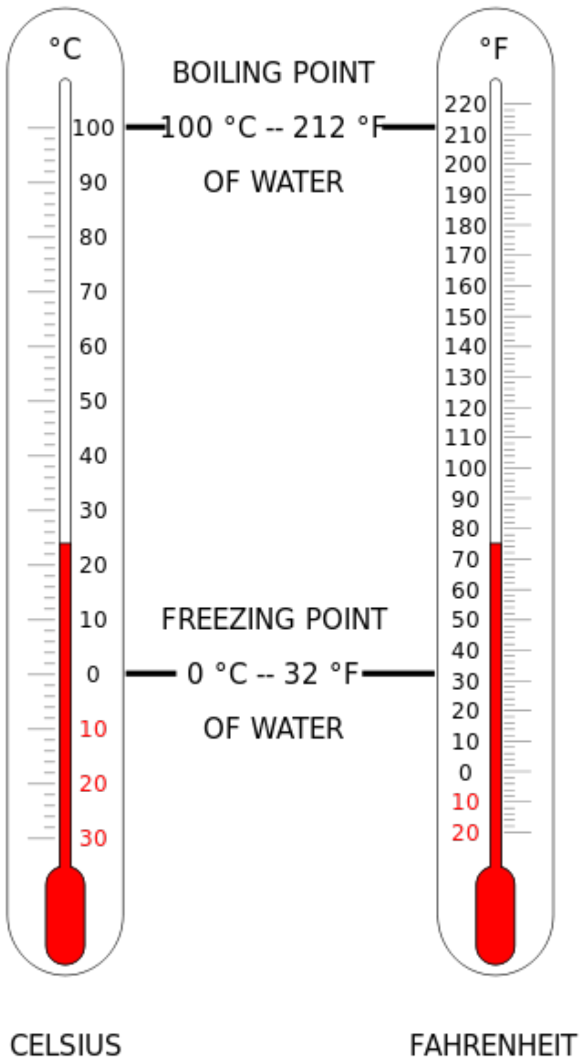
① miscela acqua liquida e ghiaccio a P_{atm}

② miscela acqua liquida e vapor d'acqua a P_{atm}

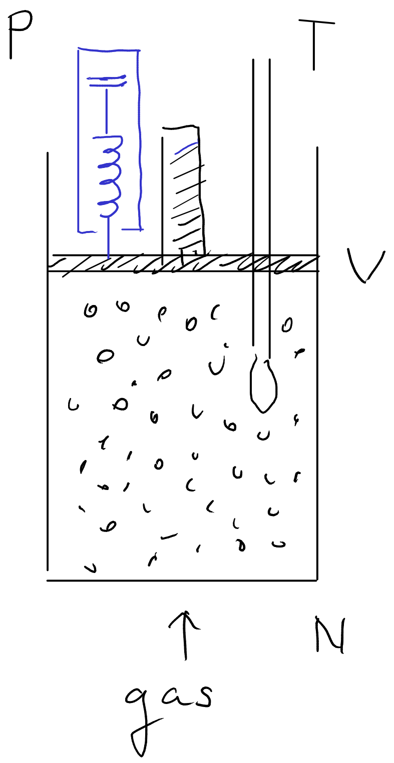




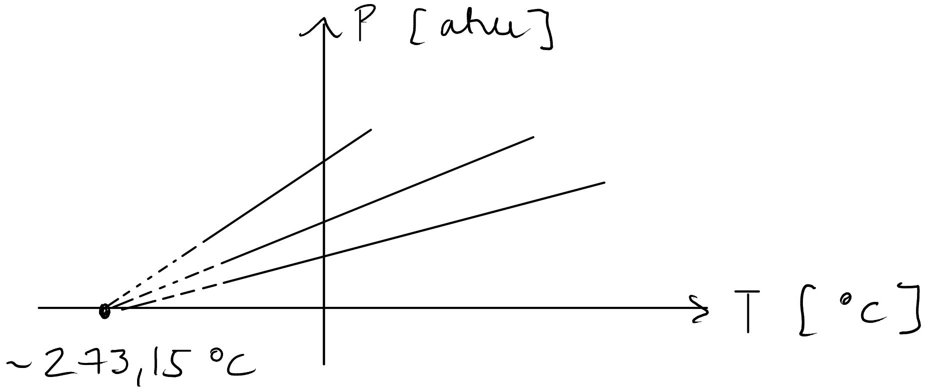
Celsius
1742



Scala di temperatura assoluta



$P = P(T)$ N fissato



$P = aT + b$

$T_0 = -\frac{b}{a}$

$T_0 = -273{,}15\,°C$

1848 Kelvin → scala Kelvin o assoluta

$-273{,}15\,°C \rightarrow 0\,K$

$T = T_c + 273{,}15\,°C$

SI : K $[T] = \theta$ dimensione fisica della temp.

$\Delta T = 1\,°C = 1\,K$

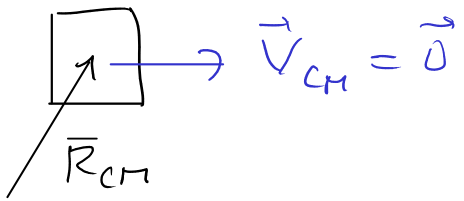
EQUAZIONI DI STATO

Variabili di stato

M, N, V

$\rho = \frac{M}{V}, \quad \rho_N = \frac{N}{V}$

P, T



Equilibrio termodinamico:

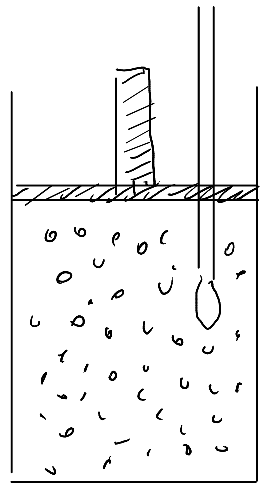
un sistema è in EQUILIBRIO TERMODINAMICO se ciascuna delle sue variabili di stato ha un valore ben definito e indipendente dal tempo

$$\Delta P = \rho g h \approx 10^3 \frac{kg}{m^3} \times 10 \frac{m}{s^2} \times 10^{-1} m = 10^3 Pa = 0.01 \text{ bar}$$

Legge fisica che mette in relazione le variabili di stato $\equiv$ equazione di stato

$$f(N, V, P, T, \dots) = 0 \qquad f(\rho_N, P, T, \dots) = 0$$

1. Leggi empiriche dei gas diluiti



T in gradi Kelvin

$V = \text{cost}$: $P \sim T$ legge di GAY-LOUSSAC

$P = \text{cost}$: $V \sim T$ legge di CHARLES

$T = \text{cost}$: $PV \sim \text{cost}$ legge di BOYLE-MARIOTTE

$$PV = \alpha T$$

$$\alpha \sim N$$

Eq. di stato dei gas perfetti

$$n = \frac{N}{N_A} \qquad n = \frac{M}{M_A}$$

$$PV = k_B N T$$

$$PV = N k_B T \longrightarrow PV = \underbrace{k_B N_A}_{R} nT = RnT = nRT$$

$k_B = 1{,}38 \times 10^{-23}$ J/K

costante di Boltzmann

$R = 8{,}314$ J/K/mol

costante universale dei gas