# THERMODYNAMICS

## Mole

The mole $N$ is a measurement for the amount of substance of a system.

***Unit***

$$[N] = mol$$

## Avogadro number

The Avogadro number $N_A$ is the number of particles in 1 mole of $12g$ of $^{12}\mathrm{C}$.

$$N_A = 6.022 \cdot 10^{23}$$

## Pressure

When a force $\overrightarrow{F}$ with the perpendicuar component $F_\perp$ is applied on a surface $A$, we can define the pressure $P$ exerted on the surface $A$ as:

***Formula***

$$P = \frac{F_\perp}{A}$$

***Unit***

$$[P] = \frac{N}{m^2} = Pa$$

$$Pa,\ Pascal$$

***Remark***

Pressure is a scalar quantity.

## Pressure units

Pressure has a lot of weird units that have historical or practical significance. See: Exotische Umwandlungen.

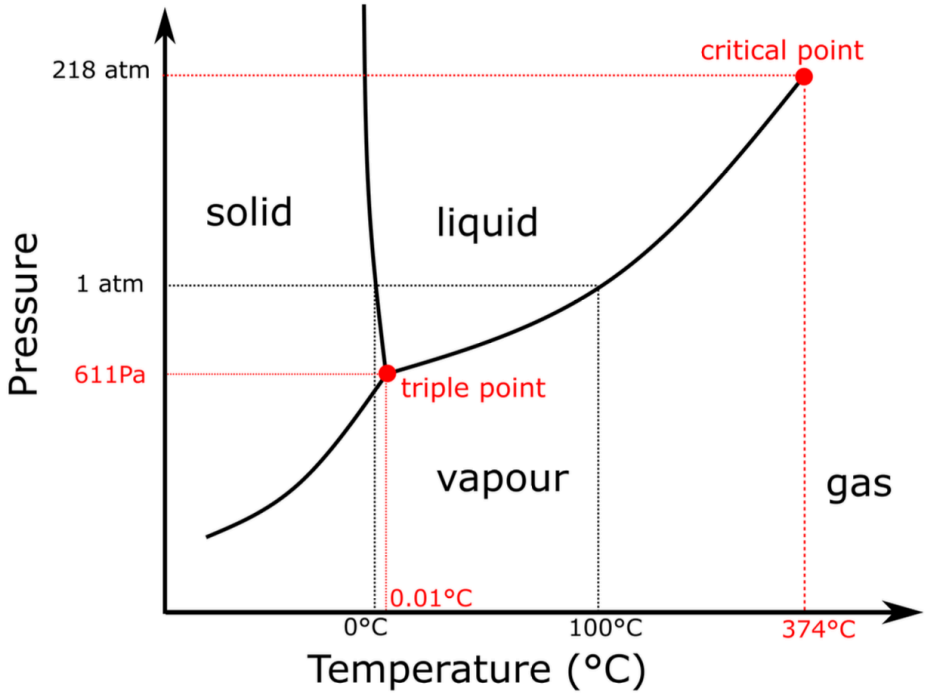
# Critical Temperature

The critical temperature $T_c$ is the temperature where above the critical temperature the system cannot liquify anymore, no matter how much the pressure is increased.

# Triple point of Water

The triple point for water is the temperature and pressure where the 3 phases of water, vapour, liquid, gas, coexists at the same time.

This occurs for $T = 0.01°C$ and $P = 611Pa$




# Gas and vapour

The terms gas and vapour cannot be used interchangeably:

- Vapour:

We use the term vapour to describe a thermodynamic situation in which a system can be condensed just by decreasing pressure, keeping the temperature fixed.

- Gas:

  A gas is what we obtain by heating a vapour or a liquid above the critical temperature.

# Gas universal constant

$$R = 8.314 \frac{J}{mol \cdot K}$$

# Perfect gas

Perfect gas has the following properties:

- the dimension of each particle is much smaller that the volume of the container
- the particles can only interact through elastic collisions
- the particles occupy uniformously the volume of the container
- there are no favoured directions in which motion can occur. The particles can move in every direction

***Formula***

$$PV = nRT$$

# Kinetic Theory of Gases