

# **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  $^{12}\text{C}$ .

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

## **Pressure**

When a force  $\vec{F}$  with the perpendicular 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.

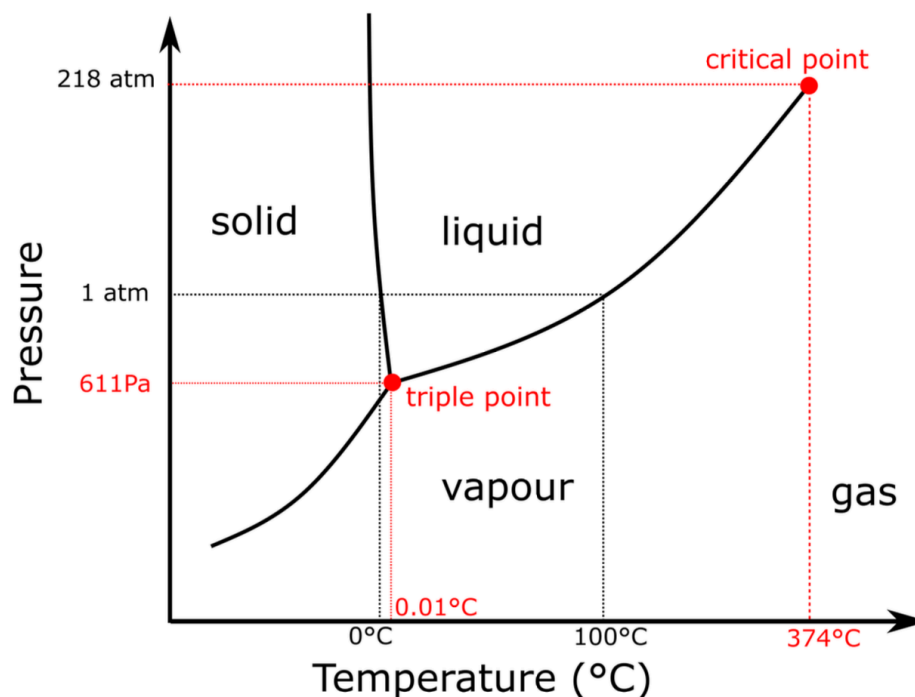
## Critical Temperature

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  $T = 0.01^\circ\text{C}$  and  $P = 611\text{Pa}$



## 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 than the volume of the container
- the particles can only interact through elastic collisions
- the particles occupy uniformly 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**