Temperature

Temperature is a comparative objective measure of hot and cold.

Temperature is also the degree of hotness of a piece of matter.

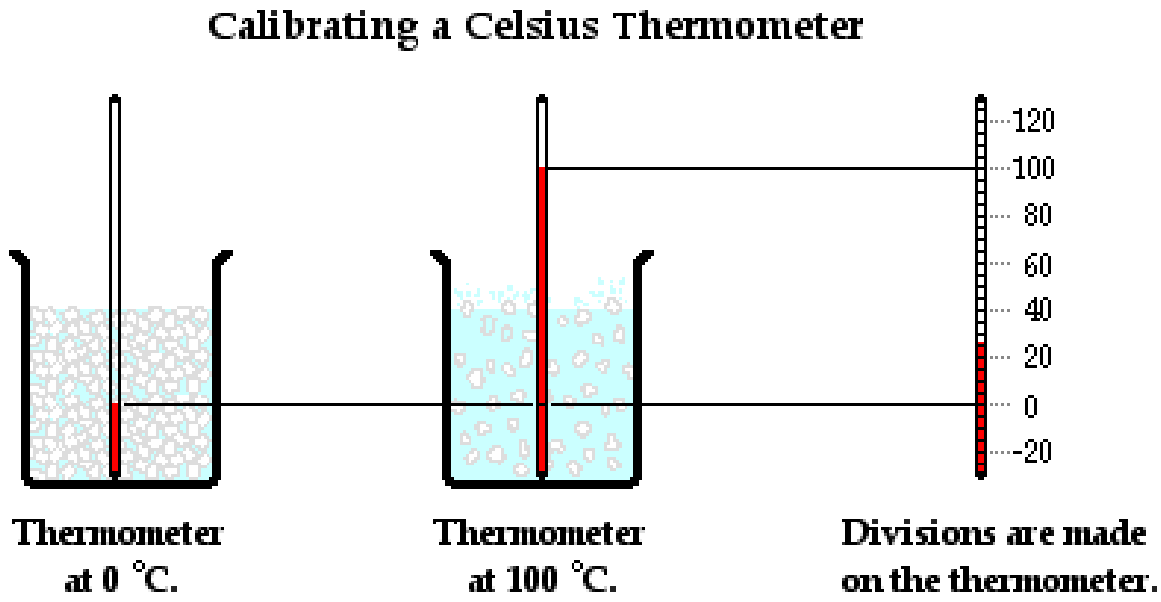
Heat is the total amount of energy possessed by the molecules in a piece of matter.

What is the difference between heat and temperature?

Temperature	Heat
• T	• Q
• Celsius, Fahrenheit or Kelvin	• Joule
• Kelvin	• Joule
• Can be only used to measure the degree of heat	• Has the ability to do work

Measuring temperature

To measure **temperature**, it is necessary to use a thermometer.
Thermometers may be calibrated to a variety of temperature scales.

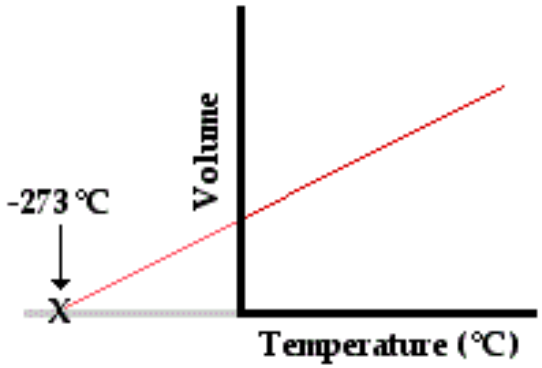


Temperature scales:

- Celsius 0˚ - 100˚
- Fahrenheit 32˚ - 212˚
- Réaumur 0˚ - 80˚
- Kelvin -273˚-373˚

Gay-Lussac's laws

1st law

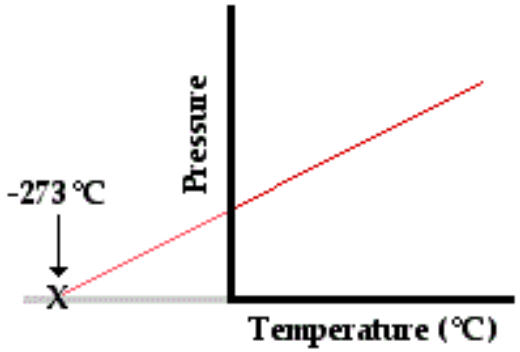


$V=k$

$P=P_o(1+\beta\Delta t)$

The pressure of a gas of fixed mass and fixed volume is directly proportional to the gas's temperature

2nd law



$P=k$

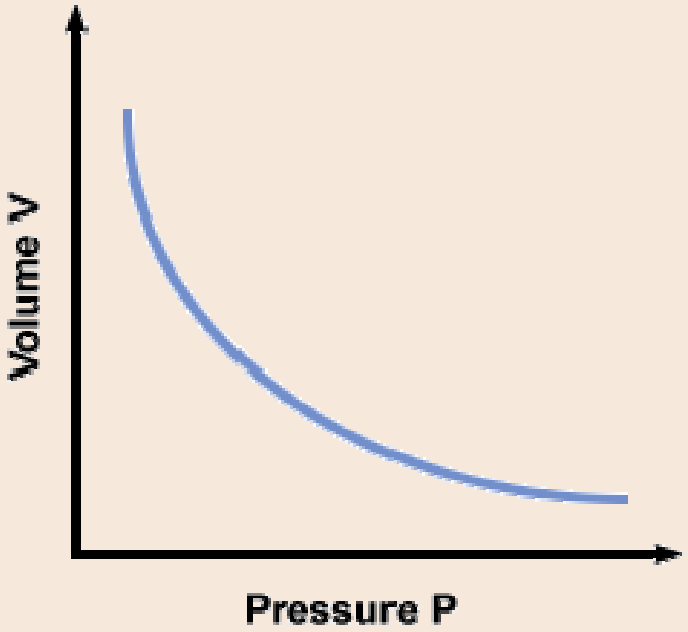
$V=V_o(1+\beta\Delta t)$

The volume of a gas of fixed mass and fixed pressure is directly proportional to the gas's temperature

Boyle's law

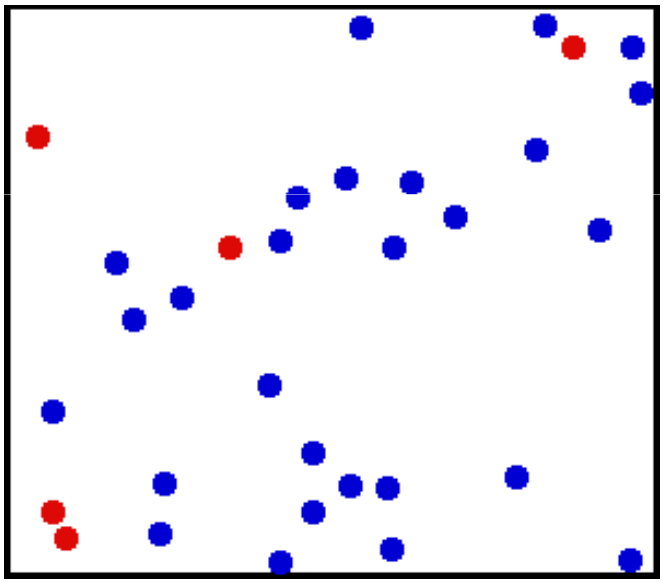
$$P_1V_1 = P_2V_2$$

$$PV = k$$



If the temperature remains unchanged, the absolute pressure exerted by a given mass of a gas is inversely proportional to the volume it occupies

Thermal agitation



Thermal agitation is the ceaseless random motion of molecules or other small component particles of a substance that is associated with heat.

Thermal expansion

Thermal expansion is the tendency of matter to change in volume in response to a change in temperature, though heat transfer.

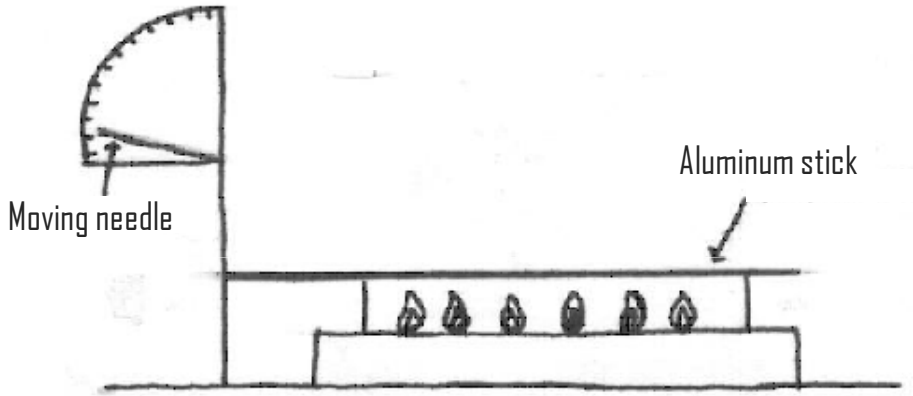
Volumetric expansion
Increase in volume caused by increase in temperature

Linear expansion
Increase in length caused by increased in temperature

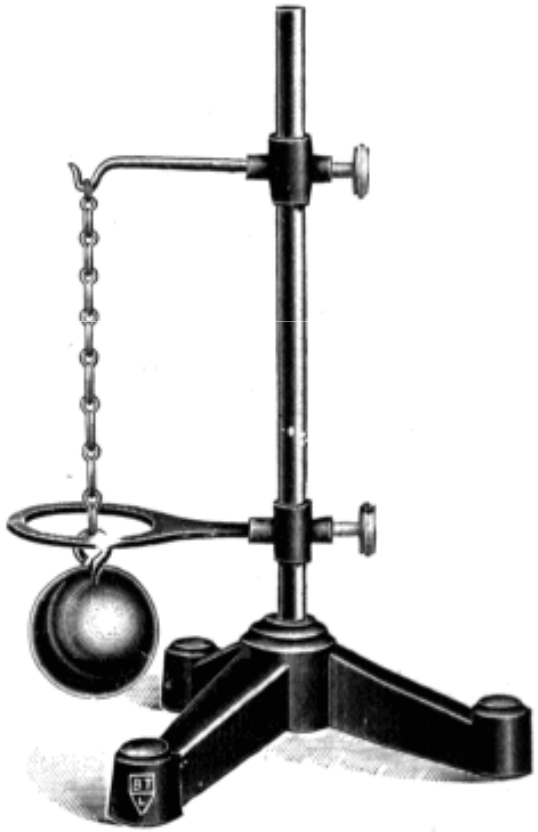
Aluminum stick experiment

This experiment demonstrates linear expansion

$$L=L_o(1+\lambda\Delta t)$$



Gravesande's ring



Gravesande's ring is a simple experiment used to demonstrate thermal expansion.

$V=V_0(1+\beta\Delta t)$

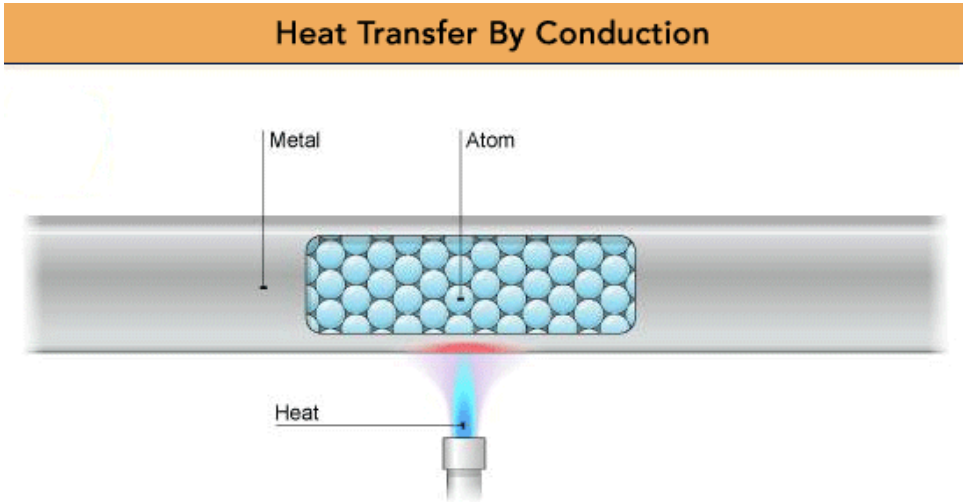
$\beta=3\,\lambda$

Heat transfer

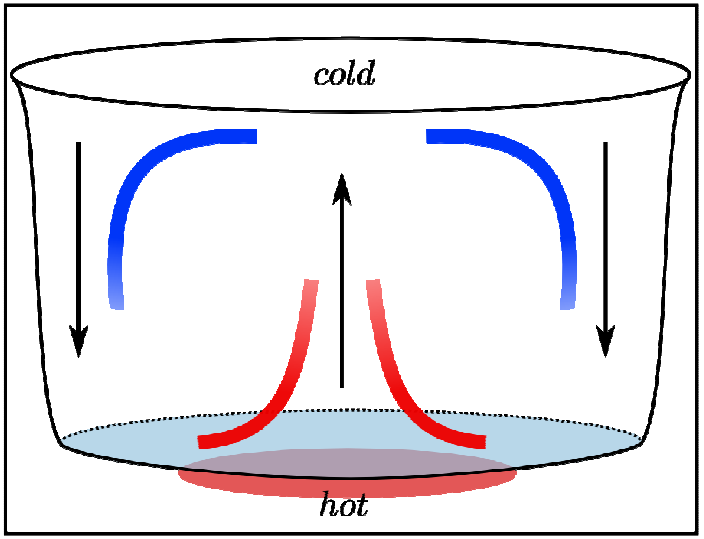
Heat transfer describes the exchange of thermal energy between physical system depending on temperature and pressure.

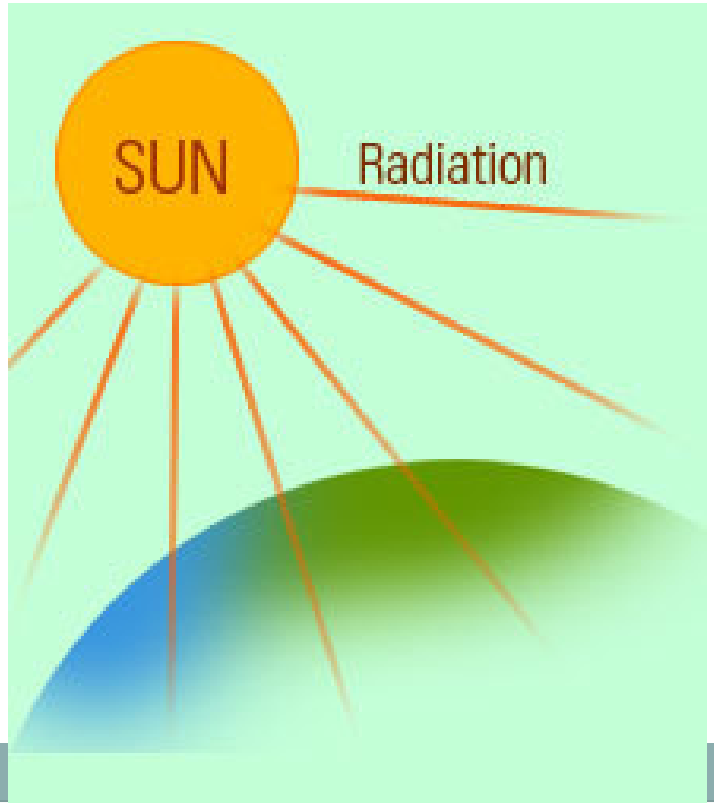
The fundamentals modes of heat transfer are:

-**conduction**: the transfer of energy between object that are in physical contact.



-**convection**: the transfer of energy between an object and its environment, due to fluid.





-**radiation**: the transfer of energy that occurs in a vacuum or any transparent medium