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kinetic energy (K): work that an object can perform, which results from motion. $K = \frac{1}{2}mv^2$

Potential energy (V): work that a system can perform by virtue of its position.

e.g. $V = mgz$ ← vertical position

other mathmatical forms are possible.

$E = K + V \Rightarrow$ constant

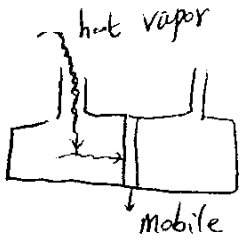
↓ total energy

principle of conservation of energy

Heat 9.

Historically:

in late 1700's: Heat is a form of matter



~~After~~ At the end of the mechanical motion, steam came out: it was colder but the amount of matter was the same.

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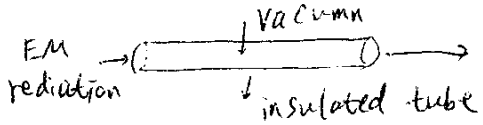
Link between heat and temperature (T)?
→ Yes, in general, but not always.

E.g. boiling water: heat is given, but no T change.
→ there is latent heat of boiling.

More experiments:

① Heat propagates through vacumn by electromagnetic rediation.
vacumn: volume that does not contain matter.



② Heat can be converted to work and vice versa.

A. Heat and work can be interconverted.

B. Heat is not conserved.

1st. Principle of Thermodynamics:

$U = q + W$

↓ internal energy

Heat is a form of energy.

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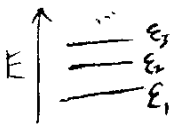
Kinetic theory of gas:

$$3kT = \frac{1}{2} m\langle v^2 \rangle$$

k: Boltzmann constant.

$T \propto \langle v^2 \rangle$ $T \propto \langle$kinetical energy$\rangle$

In the early 20th. century. QM.
energy is quantized. discret energy levels.



For a specific system.

$$U = \Sigma_i N_i \varepsilon_i$$

Why does heat flow?

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