# Heat and work

#### Heat

- A spontaneous flow of energy caused by a temperature difference
- Example: frying pan on a hotplate
- Q > 0 heat enters the system.

### Work

- Any other transfer of energy in to or out of the system.
- We can identify an agent who is putting energy into the system.
- Example: push a piston, send current through a resistor.
- W > 0 energy flows into the system.

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#### Transit

Heat and work designate energy in transit.

- We can speak about the amount of energy in a system,
- ... but we never talk about the amount of heat in a system,
- ... we never talk about the amount of work in a system.

## Units for heat

- SI units for heat = Joule
- Traditionally calories, 1 cal = the energy needed to raise the temperature of 1g of water by 1°C.
- 1 cal = 4.186 J

The usual "calorie" is 1 kcal=4186 J.

#### Different processes of heat transfer

- conduction molecular contact
- convection bulk motion of gas or liquid
- radiation emission of electromagnetic waves, infrared or visible