Thermodynamic Laws

Zeroth Law:

Two systems in thermal equilibrium with a third system will be in thermal equilibrium with each other

1st Law of Thermodynamic

$$W = JH$$

J = Joule mechanical equivalent of heat.

- But whenever a certain energy is given to a system
- a part of this energy is utilized in increasing the INTERNAL ENERGY of system.

$$dQ = dU + dW.$$

↳ 1st law of thermodynamics

This law does not put any constraint on direction of process

Second Law of Thermodynamics:

* First Law a qualitative statement
* It does not exclude the possibility of 100% efficiency of heat engine or self acting refrigerator.

* BUT in practice both are impossible. or we can say they are not attainable.

* Different scientists observed and hence state these facts in their own way;

(1) KELVIN – PLANK STATEMENT:

It is impossible to get a continuous supply of work from a body (or engine) which can transfer heat with a single reservoir

It means that there should be minimum two heat reservoirs i) source ii) sink.

As per this state ZERO Kelvin temperature is unattainable.
Because no heat can be taken or rejected to a reservoir at zero temperature.

(2) KELVIN'S Statement.
It is impossible to get A continous supply of work from a body or system by cooling it to a temperature lower than that of its surrounding.

(3) Clausius's Statement:
It is impossible to make heat flow from a body at a lower temperature to a body at a higher temperature without doing external work on the working substance.

Assignment: Show that now these statements are equivalent.