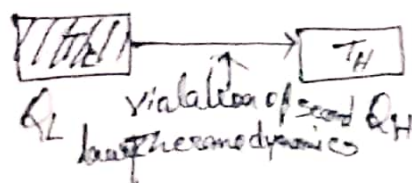


Clausius Statement

It is impossible to construct a device operating in a cycle that can transfer heat from a colder body to a hotter one without consuming any work.

$$T_L < T_H$$



Unless the compressor is driven by an external source the refrigerator and heat pump won't be able to operate. As for these two, the heat is transferred from the lower temperature to the higher temperature by doing extra work. With the help of electrical work, the refrigerator extracts heat from the cold body and transfers it to room. Hence refrigerator is nothing just a reverse heat engine.

Here $T_{\text{source}} > T_{\text{sink}}$
it can be said

$$q_H = W_{\text{in}} + q_C$$

$$\frac{q_H}{q_C} = \frac{T_{\text{source}}}{T_{\text{sink}}}$$

The electrical work is W_{in} used by refrigerator

What is the amount of the heat rejected to the room which is at a constant temperature T_{source} .

q_C is the amount of heat rejected by the refrigerator which is at a constant temperature T_{sink} .