Tendency indicates the absence of any driving force.

A system at equilibrium is one at which all forces are at exact balance.

\[
\frac{\text{Rate of Driving Force}}{\text{Resistance}}
\]

The point at which the driving force is zero is the point of equilibrium.

Reversible Process:

A process is reversible when its direction can be reversed at any time by an infinitesimal change in external conditions, e.g., expansion of a gas in a piston-cylinder arrangement.

If there is no friction inside the cylinders, then there is no energy expanded or liberated.

\[\text{dW} = -\text{pdV}\] (Reversible process)

Heat capacity of the substance is defined as the ability of the substance to store heat.

Specific Heat Capacity:

It is defined as the ability of the substance to store heat per unit change in temperature per unit mass. Heat capacity in general, represented by the symbol \( c = \frac{dQ}{dT} \). Heat capacity is a path function, it depends on the path.

Constant Volume & Constant Pressure for 1st Law of Thermodynamics:

Energy of thermodynamics for a closed system.
A SECOND LAW OF THERMODYNAMICS

1. STATEMENTS:
   * No apparatus can operate in such a way that its only effect (in system & surrounding) is to convert heat absorbed by a system completely into work.
   * No process is possible which consists solely in the transfer of heat from one temperature level to a higher one.
   * It is impossible by a cyclic process to convert the heat absorbed by a system completely into work.

HEAT ENGINE:

A heat engine is a device or a machine that produces work from heat in a cyclic process. A steam power plant:

1. Liquid water is pumped into the boiler.
2. Heat from a fuel (or heat from a nuclear reactor) is transferred to water converting it into steam at higher temperature and pressure.
3. Energy is transferred to a shaft from a steam to the surrounding by a device such as a turbine.
4. Exhaust steam from a turbine is condensed by the transfer of heat to cooling water thus...
CARNOT'S ENGINE.

A heat engine operating in a completely reverse manner is called a Carnot's engine. Discovered by N.L.S. Carnot in 1824. A Carnot engine operates between two heat reservoirs in such a way that all heat absorbed is absorbed at the constant temperature of the hot reservoir and all heat rejected is at the constant temperature of the cold reservoir. Any reversible engine operating between two reservoirs is a Carnot's engine.

CARNOT THEOREM.

Carnot Theorem states that, for two given heat reservoirs, no engine can have a higher thermal efficiency than a Carnot engine.

\[
\eta_c = \frac{T_H - T_c}{T_H}
\]

\[
\eta_c = \frac{Q_H}{Q_H - W}
\]

Source Hot reservoir \( T_H \)

\( Q_H, W \)

\( T_H \) - Temperature in hot reservoir

\( T_c \) - Temperature in cold reservoir

Cold reservoir sink \( T_c \)

Efficiency:

\[
\eta_c = \frac{100}{\frac{Q_H}{W}}
\]

\[
\eta_c = \frac{100}{1 + \frac{W}{Q_H}}
\]