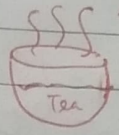
**Thermodynamics :-** [Therm - o - dynamics] (Therm = Heat, dynamics = motion)

**Types of System :-**

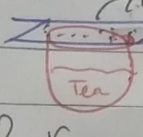
1) **Open System :-**




↕ exchange of heat with surroundings

Here, $\Delta E \neq 0$, $\Delta m \neq 0$ } Both Energy & mass (matter) changes

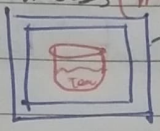
2) **Closed System :-**




→ mass condenses & drops back onto the tea
→ Cover the top
↕ exchange of heat between plate & tea takes place

Here, $\Delta E \neq 0$, $\Delta m = 0$ } Energy changes, mass (matter) remains same

3) **Isolated System :-**

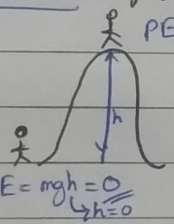



→ Thermas glass (ideal case)
This glass doesn't allow heat exchange

Here, $\Delta E = 0$, $\Delta m = 0$ } No change in Energy & mass (matter)

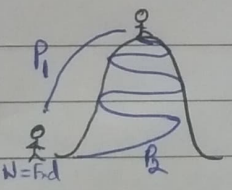
**State variables :-** Variable upon changing changes the state of system

**State function :-** Eg :-




Here, PE depends on initial & final state ($h_{final} - h_{initial}$)
Hence, PE = mgh is a State function
(∵ it depends on initial & final state of the body)

**Path function :-** Eg :-

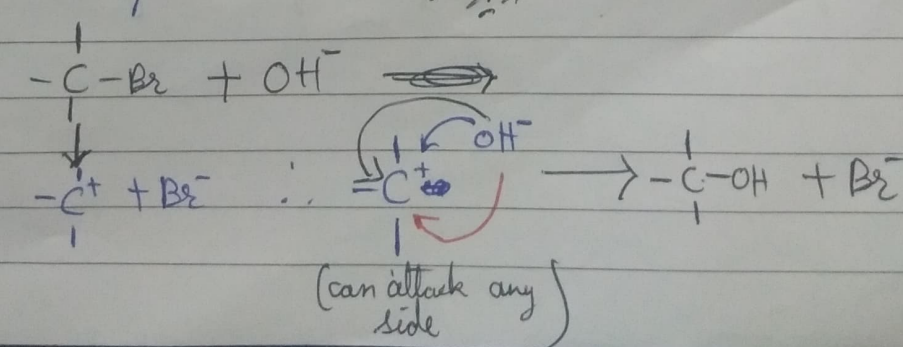



Here, W depends on the path taken ($P_1 < P_2$)
Hence, W = Fd is a Path function
(∵ it depends on which path was taken to reach final destination)

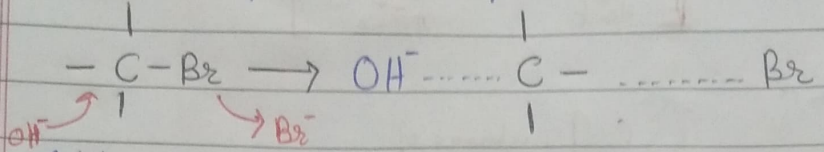
In terms of **Organic Chemistry :-**

1) **$SN^1$ :-** Takes place in two steps

Eg :-

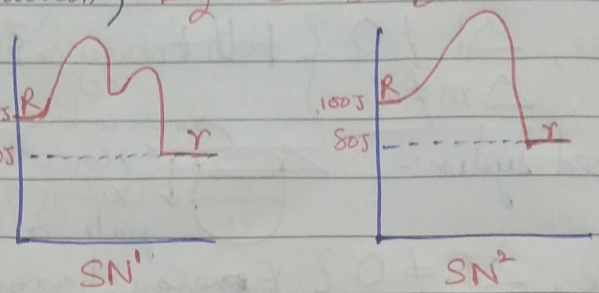


→ $SN^2$ :- Takes place in 1 step




Let's say :- Before reaction, $E_1 = 100\ J$
After reaction, $E_2 = 80\ J$
$\Delta E = 100 - 80 = 20\ J$

For Both reactions :-




∴ $\Delta E$ in both cases is same ∴ State function = $\Delta E$
∴ Path taken in both cases is different ∴ Path function = Path taken to reach $\Delta E$

In thermodynamics :-

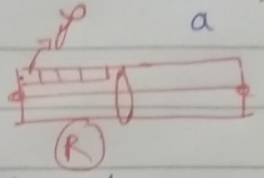
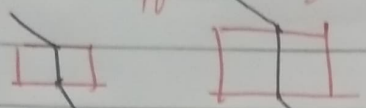
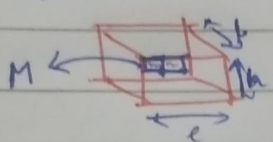
State functions :-
- Temperature
- Pressure
- Volume
- Internal energy
- Enthalpy
- Entropy
- Gibbs free energy

Path functions :-
- Heat
- Mechanical Work

State function describes the current state of a system

Path function describes the process of reaching that state

## Intensive Vs Extensive

| Intensive | Extensive |
|---|---|
| • Doesn't depend on mass of substance | • Depends on mass of substance |
| Eg: Color, Taste | Eg: ~~Resistance~~ |
| • If we have two glass of same refractive index but different size | • Resistance → $R \propto \frac{l}{a}$ → $R = \rho \frac{l}{a}$   |
|  <br> $\mu$ → is independent on mass of glass | Length, volume, mass/weight |
| • Density ($\rho$) → Mass per unit unit volume   Per unit volume, mass is fixed (M) | |
| • Resistivity ($\rho$) = $\frac{Ra}{l}$ | |

In ~~thermodynamics~~ :-

Intensive properties :-
- Temperature
- Concentration
- Density
- ~~Boiling Point~~
- Boiling Point
- Freezing Point
- Viscosity

Ex

Extensive properties :-
- Mass
- Volume
- Internal Energy
- Enthalpy
- Gibbs's Free Energy