Isochoric Process (i.e, Volume constant)

If a system undergoes a change in which the volume remains constant, the process is called isochoric. At constant volume, no external work is done i.e $\delta W = 0$

Heat absorbed is given by $\delta Q = \delta U$

This expression may be used to define the internal energy of a system. Thus the increase in internal energy of a system is equal to the heat absorbed by the system, at constant volume. The work done in isochoric process is zero.

Isobaric Process (i.e Pressure constant)

If a system undergoes a change in which the pressure is kept constant, the process is called isobaric. Suppose Q is the heat absorbed by a system at constant pressure P and suppose its volume increases from V_1 to V_2. then

$$Q = (U_2 - U_1) + W$$

$$\text{or } Q = (U_2 - U_1) + P(V_2 - V_1)$$

$$\text{or } Q = (U_2 + PV_2) - (U_1 + PV_1)$$

$$= H_2 - H_1 \quad \text{---------- (1)}$$

From equation ① we conclude that the heat absorbed at constant pressure is equal to increase in quantity H, called as enthalpy & quantity H is also called the function at constant pressure.

Mone - Isolated system (Internal energy of the Universe)

Heat transfer between the system and surroundings is allowed. When a heat δQ is supplied to the system its internal energy increases by dU and it performs an external work δW.

$$\delta Q = dU + \delta W$$

$$dU = \delta Q - \delta W.$$

This gives the change in internal energy of the system. Here δQ is +ve, since heat enters the system. δW is +ve as work done by the system. After Apling 1st law of thermodynamics to the surroundings which loses a heat δQ and received a work δW. i.e a work δW is done on the surroundings. hence both δQ and δW are negative for the surroundings.

∴ change in internal energy of the surroundings.

$$dU' = -\delta Q - (-\delta W)$$

$$dU' = \delta W - \delta Q \quad \text{——— (2)}$$

∴ Net change in internal energy $= dU + dU'$

$$= (\delta Q - \delta W) + (\delta W - \delta Q)$$

$$= 0$$

Thus, the net in internal energy is always zero.

——— x ———