

by eq (1) $\boxed{\Delta Q = \Delta W}$ — (4)

So, in case of isothermal process, the whole of the heat taken by the system is used by it to do work.

(d) Adiabatic Process: $\Delta Q = 0$.

by eq (1) $0 = \Delta U + \Delta W$

$$\Rightarrow \boxed{\Delta U = -\Delta W} \text{ — (5)}$$

$$U_f - U_i = -\Delta W \text{ — (6)}$$

If $\Delta W = +ve$ i.e. work is done by the system

$$\Rightarrow U_f - U_i = -ve \Rightarrow U_f < U_i$$
$$T_f < T_i$$

So, when work is done by a system in adiabatic process, it does work by spending its own internal energy.