

$$q = (E_2 - E_1) + w$$

$$= \Delta E + w$$

Let work performed is due to work of expansion
So $w = P\Delta V$

$$\therefore q = \Delta E + P\Delta V$$

When, $\Delta E = 0$

$$q = 0 + P\Delta V$$

$$q = P\Delta V$$

This says that when supplied heat q does not change the energy of system in that case supplied heat is completely change to work, which is not possible.

But one thing arises here that supplied heat can be spent only for the change of internal energy without performing work.

$$\text{i.e., } w = 0 = P\Delta V$$

$$q = \Delta E + w(P\Delta V)$$

$$w = 0$$

$$\underline{q = \Delta E}$$