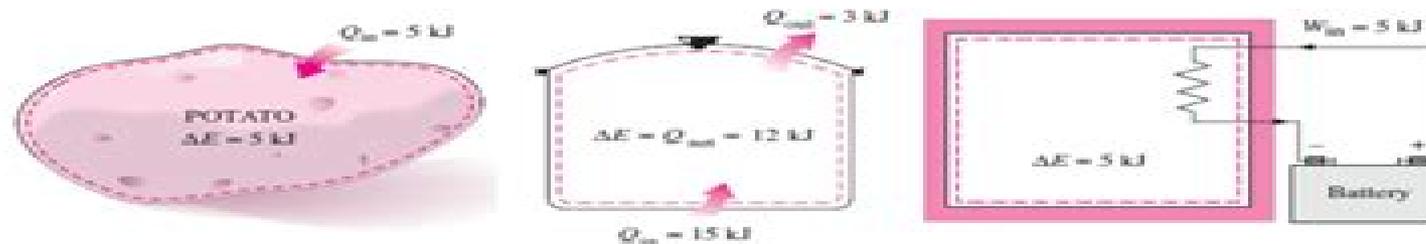


## FIRST LAW OF THERMODYNAMICS

1. Energy can neither be created nor be destroyed; it can only change its form.
2. It is also called "The conservation of energy principle".



## ENERGY BALANCE

The net change (increase or decrease) in the total energy of the system during a process is equal to the difference between the total energy entering and the total energy leaving the system during that process.

$$\left( \begin{array}{c} \text{Total energy} \\ \text{entering the system} \end{array} \right) - \left( \begin{array}{c} \text{Total energy} \\ \text{leaving the system} \end{array} \right) = \left( \begin{array}{c} \text{Change in the total} \\ \text{energy of the system} \end{array} \right)$$

$$E_{in} - E_{out} = \Delta E_{system}$$

The above relation is called "Energy balance".

### Energy change ( $\Delta E_{system}$ )

For a simple compressible system,

$$E = U + KE + PE$$

$$\Delta E = \Delta U + \Delta KE + \Delta PE$$

$$\Delta E = m(u_2 - u_1) + \frac{1}{2} m (V_2^2 - V_1^2) + mg(z_2 - z_1)$$

For a simple compressible stationary system:

$$\Delta KE = \Delta PE = 0$$

$$\Delta E = \Delta U = m(u_2 - u_1)$$

For steady flow process,

$$\Delta E = 0$$

# Fundamentals Of Thermodynamics Solution Chapter 4

**S Ashworth**



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