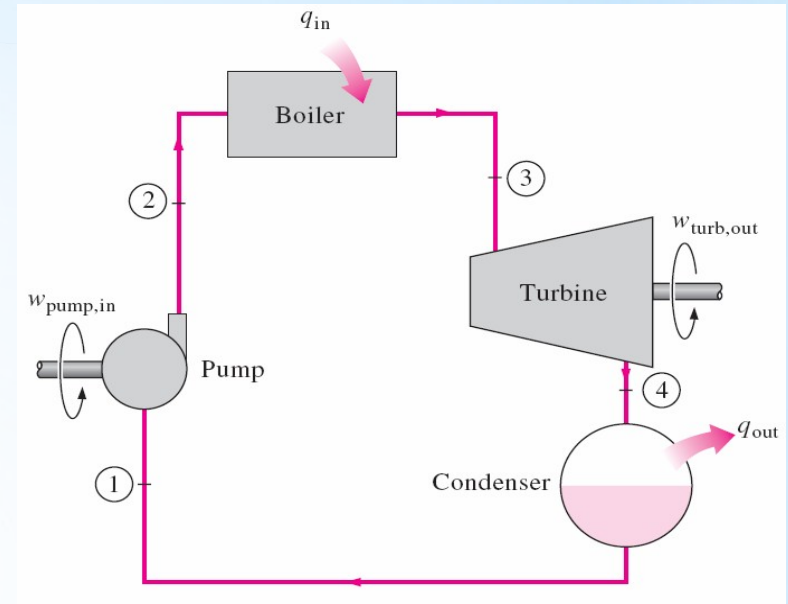


*THERMODYNAMICS



What is Thermodynamics?

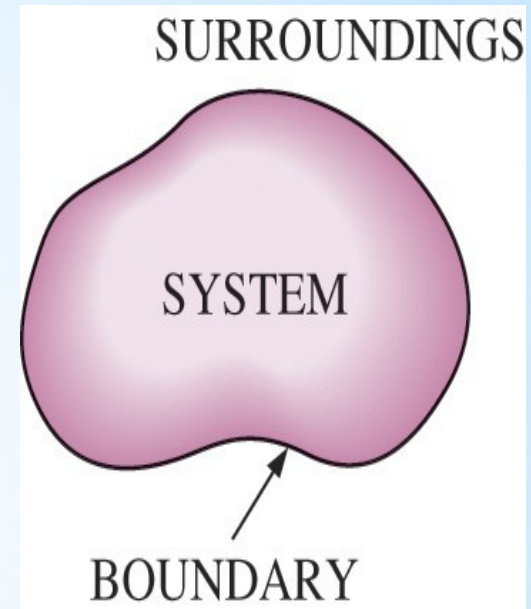
- ⌚ The science of energy, that concerned with the ways in which energy is stored within a body.
- ⌚ Energy transformations – mostly involve heat and work movements.
- ⌚ The Fundamental law is the conservation of energy principle: energy cannot be destroyed, but can only be transformed from one form to another.





System, surroundings and boundary

- ☞ **System:** A quantity of matter or a region in space chosen for study.
- ☞ **Surroundings:** The mass or region outside the system
- ☞ **Boundary:** The real or imaginary surface that separates the system from its surroundings.





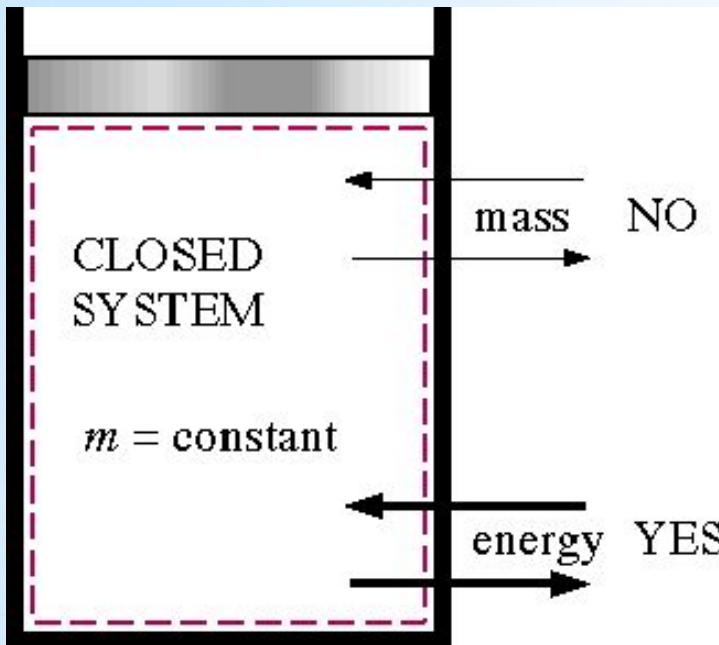
Type of system (isolated system)



- ⌚ Isolated system – neither mass nor energy can cross the selected boundary
- ⌚ Example (approximate): coffee in a closed, well-insulated thermos bottle



Type of system (Closed system)

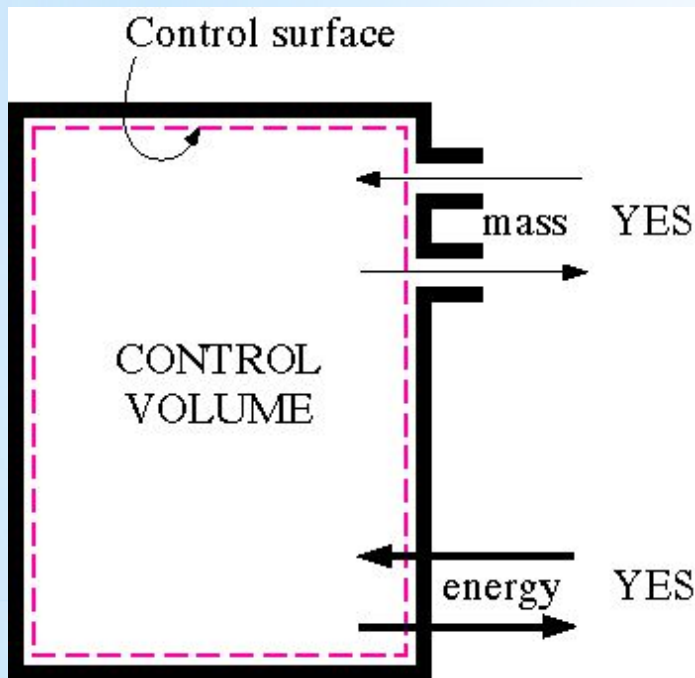


⌚ Closed system – only energy can cross the selected boundary

⌚ Examples: a tightly capped cup of coffee



Type of system (Open system)



- ⌘ Open system – both mass and energy can cross the selected boundary
- ⌘ Example: an open cup of coffee



Properties of a system

Properties of a system is a measurable characteristic of a system that is in equilibrium.

Properties may be intensive or extensive.

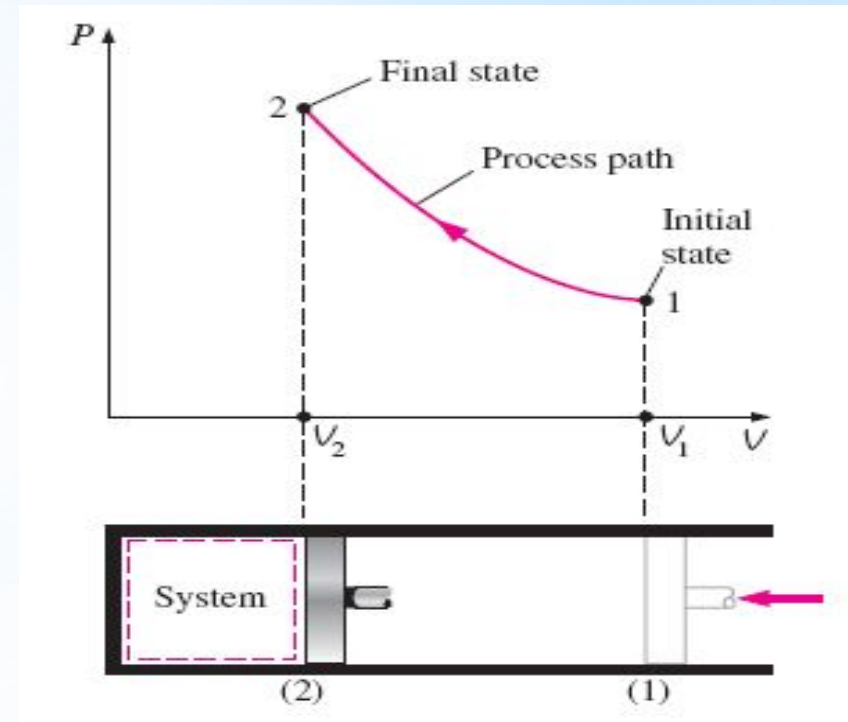
- ⊞ **Intensive – Are independent of the amount of mass:
e.g: Temperature, Pressure, and Density,**
- ⊞ **Extensive – varies directly with the mass
e.g: mass, volume, energy, enthalpy**



State, Equilibrium and Process

- ☞ Process – change from one equilibrium state to another.

Process	Property held constant
isobaric	pressure
isothermal	temperature
isochoric	volume
isentropic	entropy





State, Equilibrium and Process

The prefix iso- is often used to designate a process for which a particular property remains constant.

Isobaric process: A process during which the pressure P remains constant.

Pressure is Constant ($\Delta P = 0$)

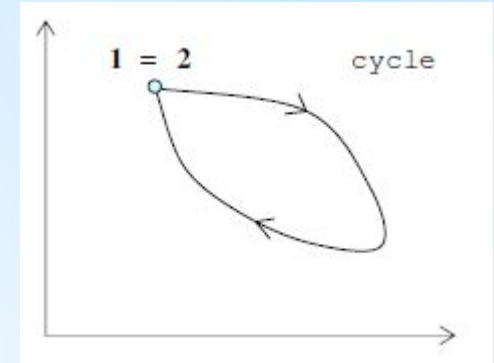
Isochoric (or isometric) process: A process during which the specific volume v remains constant

Isothermal process: A process during which the temperature T remains constant.



Types of Thermodynamics Processes

- ⌘ **Cyclic process** - when a system in a given initial state goes through various processes and finally return to its initial state, the system has undergone a cyclic process or cycle.
- ⌘ **Reversible process** - it is defined as a process that, once having take place it can be reversed. In doing so, it leaves no change in the system or boundary.
- ⌘ **Irreversible process** - a process that cannot return both the system and surrounding to their original conditions





Types of Thermodynamics Processes

- ⌚ **Adiabatic process** - a process that has no heat transfer into or out of the system. It can be considered to be perfectly insulated.
- ⌚ **Isentropic process** - a process where the entropy of the fluid remains constant.