

Note:

It generally varies with temperature (an average value is usually used for a given temperature range) but can also vary with pressure and volume (particularly when dealing with gases).

29. REVERSIBILITY

When a substance is made to pass through a process in such a manner that after the process the substance can be returned to its original form, through all the stages in the reversed order, then the process is said to be reversible.

- After carrying out a reversible process, there is no evidence that the process ever occurred.
- No process can be reversible in practice.

Think and give examples!

30. THERMODYNAMIC SYSTEM

All physical things in nature have some form of boundary whose shape identifies it as the object. Inside the **BOUNDARY**, there are certain items with specific functions. This inside arrangement is called the **SYSTEM**. The outside (external part) of the boundary is called the **SURROUNDING**. The reactions between the system and the surroundings control the behavior of the object e.g. human beings, trees, machines etc.

An important step in engineering is to define precisely what is being studied. In mechanics, if the motion of a body is being studied, the first step is to draw or define a free body diagram and identify all the forces acting on the body. Newton's second law of motion is applied thereafter.

In thermodynamics, the term system is used to identify the subject of analysis. The system is identified and the relevant interactions with other systems are identified. One or more physical laws or relations are then applied.

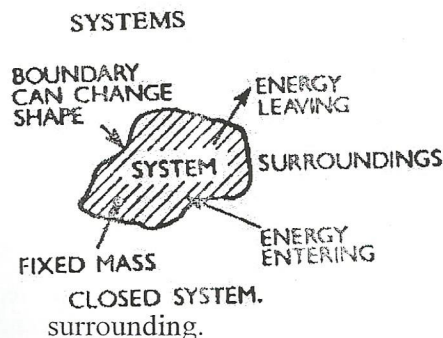
Therefore, a system is anything that needs to be studied. It can be very simple or complex e.g. the quantity of matter contained in a closed vessel or gas pipeline through which matter flows.

Types of Systems

The following basic types of systems can be distinguished:

- (i) Closed Systems
- (ii) Open Systems
- (iii) Control Volumes

- (i) **Closed System:** This is a system in which the internal mass remains constant. It refers to a fixed quantity of matter and is also called "control mass". Only transfer of work and heat is possible in such a system.



Examples: Mixture of water and steam in a closed vessel, Expansion of gas in a cylinder by displacing the piston.

type of closed system that does not interact with the

Think of more examples!

- (ii) **Open System:** This is a system in which the mass changes or is continuously changing e.g. an air compressor, (since air continuously streams in and out i.e. air crosses the