8. 0^{th} LAW OF THERMODYNAMICS

THERMAL EQUILIBRIUM: When two bodies are in contact, heat flows from a body at higher temperature to a body at lower temperature until the both bodies attain same final temperature.

ADIABATIC WALL: Doesn't permit heat transfer. E.g. Thermocol, Glass Wool.	**DIATHERMIC WALL:** Permit heat transfer. E.g. All metals.

STATEMENT OF ZEROTH LAW:
When two bodies are in thermal equilibrium with third body, then there are in thermal equilibrium with each other.

0^{th} Law: Concept of Temp.	1^{st} Law: Energy Conservation.	2^{nd} Law: Direction of heat transfer & Process Possibility.

TEMPERATURE MEASUREMENT:
THERMOMETRIC PROPERTY: Any property of body which is function of temperature only is called thermometric property. E.g. Pressure, Volume, Length, etc…
THERMOMETRIC SUBSTANCE: Substance which is used in temperature measurement is called thermometric substance. E.g. Mercury/ Alcohol in thermometer, etc…

TYPES OF THERMOMETERS:
1. **RESISTANCE THERMOMETER:** It works on bridge principle. Here, resistance is thermometric property.
$$P/Q = S/R\,, Where\ R = Resistance$$
2. **THERMOCOUPLE:** It works based on see-back effect. When Two dissimilar metals joints together and maintained at different temperature, EMF or voltage is generated. So, EMF (Thermometric property) is measured.
3. **CONSTANT VOLUME GAS THERMOMETER:** It works based on ideal gas law. Here, gas is used as thermometric substance. It uses Gay-Lussac's law. Here, pressure (Thermometric property) is measured.
$$T = aP + b, Where\ a, b\ are\ constant.$$
4. **CONSTANT PRESSURE GAS THERMOMETER:** It works based on ideal gas law. Here, gas is used as thermometric substance. It uses Charles law. Here, Volume (Thermometric property) is measured.
$$T = aV + b, Where\ a, b\ are\ constant.$$

REFERENCE POINT: These are points with respect to which all temperatures are measured. These point remains constant everywhere. E.g. Freezing Point of water ⇒ Ice Point $(0\ ^\circ C)$, Boiling Point of Water ⇒ Steam Point $(100\ ^\circ C)$, Triple point of Water $(0.01\ ^\circ C\ or\ 273.16\ K)$.

TEMPERATURE MEASUREMENT METHODS:
BEFORE 1954: Two reference points (Steam point & Ice Point) are used in below equation.

$$T_i(in\ ^\circ C) = al_i + b = \left[\frac{100}{l_{steam} - l_{ice}}\right](l_i - l_{ice}), Where\ l_i = Lenght\ of\ mercury\ at\ T_i\ Temp.$$

AFTER 1954: Single reference points (Triple Point of Water) is used in below equation.

$$SI\ (Kelvin)\ Scale: \frac{T_i}{T_{TP}} = \frac{l_i}{l_{TP}}, Where\ l_i = Lenght\ of\ mercury\ at\ T_i\ (in\ K)\ Temp$$

TEMPERATURE SCALE:

CENTIGRADE SCALE AND FAHRENHEIT:
It's arbitrary temperature scale. (Body Temp. $98.6\ ^\circ C = 37\ ^\circ F$)
$$T_F = (9/5)T_C + 32$$

100	**S. P.**	**212**
0	**I. P.**	**32**
$^\circ C$		$^\circ F$

IMP POINTS IN ZEROTH LAW:

- S.I. unit of temp is Kelvin. $(1K = 273.16\ ^\circ C)$
- Constant Volume Gas Thermometer is used in experiment and Tried to get 0 K as shown in figure.
- Ideal gas thermometer is independent of thermometric substance.
- Ideal gas Temperature scale is identical to Kelvin scale.