5. Heat

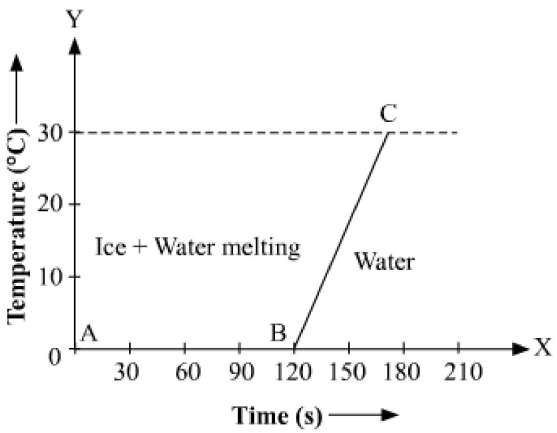
Change of state:

A change of state occurs because heat energy breaks the bonding between particles. Kinetic energy of the particle increases.

- **Melting point –** The temperature at which a solid melts into a liquid at normal atmospheric pressure.

At melting point, the temperature does not change until all solid converts into liquid.

Heating curve of ice during melting



Effect of pressure on melting and boiling point

By increasing the pressure, the melting point decreases for the substances which contract on melting . For instance ice.

By increasing the pressure, the melting point increases of the substances which expand on melting. For instance lead, wax etc.

The boiling point of liquid increases with increase in pressure and decreases with decrease in pressure.

Latent heat – The heat required to break the force of attraction between the particles at transition temperature. This heat becomes confined within the material and is called the latent heat.

- Amount of heat required to change 1 kg of material to change its state at normal atmospheric pressure is called the latent heat for that transition.
- **Specific Latent Heat**

  L=Heat absorbed or librated for the change of phaseMass=Hm

  Natural consequences of high specific latent heat of fusion of ice

- Snow on high mountains does not melt all at once
- In extremely cold conditions, water in the lakes and ponds does not freeze all at once
- Pieces of ice can cool a drink more quickly than the ice-cold water at 0 ^{o}C
- Surrounding of a frozen lake becomes extremely cold if it starts melting

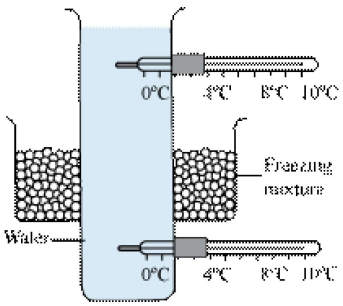
- Thermal Expansion: Solid , liquid , and gas all expand on heating.
- **Sublimation**

Solid to gas [directly]

Ammonium chloride

Expansion of liquids

- **Hope's experiment** proves anomalous expansion of water.



1. Lower thermometer reading— Stops at 4°C
2. Upper thermometer reading— Falls till 0°C
3. This happens because on cooling, water decreases in volume and sinks down whereas warmer water expands and rises up.

Water shows compression when cooled and has maximum dsensity at 4°C, below 4°C water expands and its density increase.

Expansion of Gases

- Increase in volume for different gases for the same rise in temperature is same.

Dew Point and Humidity

The moisture in the atmosphere is termed as humidity.

Absolute humidity is defined as the mass of water vapor divided by the mass of dry air in a volume of air at a given temperature.

Relative humidity is defined as the ratio of the amount of atmospheric moisture present relative to the amount that would be present if the air were saturated.

Relative
humidity= actual mass of water vapor content in the air in a given volumemass of vapor needed to make the air saturated in that volumex 100

Dew point temperature: Although air can contain a lot of water vapour at higher temperatures, if the temperature of the air is lowered, air soon becomes saturated and on further decrease in the temperature, the water vapour condenses to form dew.

Specific Heat

- The quantity of heat required to raise the temperature of unit mass of a substance by 1°C
- Unit of Specific Heat—In SI systems—Joules per kilogram per degree—J/kg °C or J/kg-K

In CGS systems—Joules per gram per degree—J/g °C or J/g-K

Heat capacity or thermal capacity

The amount of heat energy required by an object to raise its temperature by 1 ^{o}C is known as its hear capacity. Thus,

Heat Capacity, C'=Amount of heat energy suppliedRise in temperature=HΔθr

Relationship between heat capacity and specific heat capacity

Heat capacity, C'=Mass, m×Specific heat capacity, C