

LATENT HEAT

Latent Heat

- The heat energy which has to be supplied to change the state of a substance is called its latent heat.
- Latent heat does not raise (or increase) the temperature. But latent heat has always to be supplied to change the state of a substance. The word 'latent' means 'hidden'.
- The latent heat which we supply is used up in overcoming the forces of attraction between the particles of substance during the change of state. Latent heat does not increase the kinetic energy of the particles of the substance, so the temperature of a substance does not rise during the change of state.

Latent heat is of two types:

1. Latent heat of fusion
2. Latent heat of vaporization.

Latent Heat of Fusion (solid to liquid change):

- The heat which is going into ice but not increasing its temperature, is the energy required to change the state of ice from solid to liquid (water). This is known as the latent heat of fusion of ice (or latent heat of melting of ice).
- The latent heat of fusion (or melting) of a solid is the quantity of heat in joules required to convert 1 kilogram of the solid (at its melting point) to liquid, without any change in temperature.
- The latent heat of fusion of ice is 3.34×10^5 joules per kilogram (or 3.34×10^5 j/kg).

Latent Heat of Vaporization (liquid to gas change):

The latent heat of vaporisation of a liquid is the quantity of heat in joules required to convert 1 kilogram of the liquid (at its boiling point) to vapour or gas, without any change in temperature.

The latent heat of vaporization of water is 22.5×10^5 joules per kilogram (or 22.5×10^5 j/kg).

Note: It has been found that the burns caused by steam are much more severe than those caused by boiling water though both of them are at the same temperature of 100°C . This is due to the fact that steam contains more heat, in the form of latent heat, than boiling water.

Sublimation:

The changing of a solid directly into vapours on heating and of vapours into solid on cooling, is known as **sublimation**.

image

1. The changing of a solid directly into vapor (or gas) is called sublimation.
2. The changing of vapor (or gas) directly into solid is called sublimation.

- The common substances which undergo sublimation are: Ammonium chloride, Iodine, Camphor, Naphthalene and Anthracene.
- When these solids are heated, their particles move so quickly that they separate completely to form vapor (or gas). And when these vapor (or gas) is cooled, these particles slow down so quickly that they become fixed and form a solid.

Effect of Change of Pressure:

The physical state of matter can also be changed by increasing the pressure or decreasing the pressure.

- Gases can be liquefied by applying pressure and lowering temperature
- When a high pressure is applied to a gas, it gets compressed (into a small volume), and when we also lower its temperature, it gets liquefied. So, we can also say that gases can be liquefied (turned into liquids) by compression and cooling.
- Ammonia gas can be liquefied by applying high pressure and lowering the temperature.
- Decreasing the pressure and raising the temperature can change the state of matter.
- Solid carbon dioxide (dry ice) is stored under high pressure. When a slab of solid carbon dioxide is kept exposed to air, then the pressure on it is reduced to normal atmospheric pressure (1 atmosphere), its temperature rises, and it starts changing into carbon dioxide gas.

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