Class :3rd stage
Subject: Thermodynamics
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(Thermodynamic Lab3)

Experiment No.5

(Latent heat)

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Number of Experiment: Five

Name of Experiment: Latent heat

Purpose of Experiment:

1. Calculate the total heat amount needed to convert the material from one case to another.
2. Know the difference between heat quality and latent heat.

Equipment: Equipment and tools used to calculate the latent heat of vaporization are:

1. Glass cup with water.
2. Thermometer.
3. Flame.

Theory:

heat**,** energy that is transferred from one body to another as the result of a difference in temperature. If two bodies at different temperatures are brought together, energy is transferred—i.e., heat flows—from the hotter body to the colder. The effect of this transfer of energy usually, but not always, is an increase in the temperature of the colder body and a decrease in the temperature of the hotter body. A substance may absorb heat without an increase in temperature by changing from one physical state (or phase) to another, as from a solid to a liquid (melting), from a solid to a vapor (sublimation), from a liquid to a vapor (boiling), or from one solid form to another (usually called a crystalline transition). The important distinction between heat and temperature (heat being a form of energy and temperature a measure of the amount of that energy present in a body) was clarified during the 18th and 19th centuries.

latent heat is the energy absorbed or released by a substance during a change in its physical state (phase) that occurs without changing its temperature. The latent

heat associated with melting a solid or freezing a liquid is called the heat of fusion; that associated with vaporizing a liquid or a solid or condensing a vapor is called the heat of vaporization. The latent heat is normally expressed as the amount of heat (in units of joules or calories) per mole or unit mass of the substance undergoing a change of state.

The specific latent heat (L) of a material is a measure of the heat energy (Q) per mass (m) released or absorbed during a phase change and it is defined through the formula Q = mL in unit of joule per kilogram [J/kg].
There are three basic types of latent heat each associated with a different pair of phases.

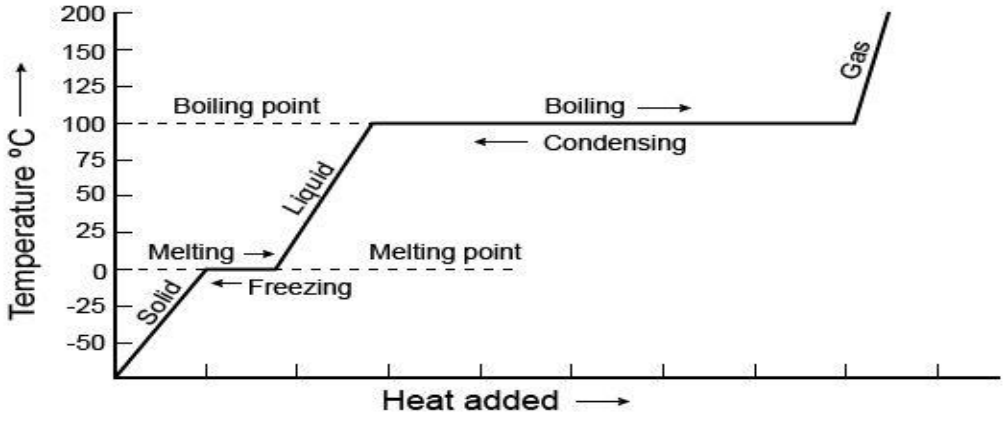
In evaporation:

The temperature of the liquid does not rise during boiling, the heat obtained is consumed by breaking the bonds between the molecules of the liquid substance (water) to convert it into a gas substance (water vapor).

In condensation:

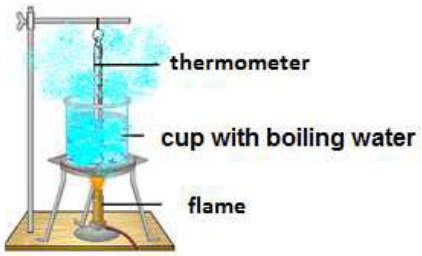
The temperature of the snow does not rise as it melts: the heat obtained is used to increase the distances between the molecules of the solids (ice) to convert them into liquid (water).

The figure below shows the state of evaporation and condensation of water.



Procedure to calculate heat of evaporation:

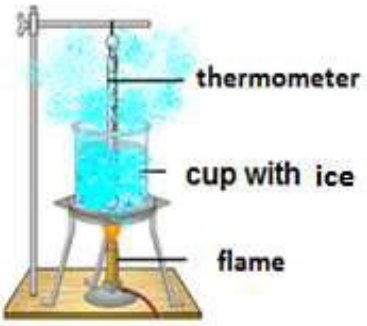
1. Place a thermometer in a cup with water over the flame and heat until boiling.
2. Note The thermometer is read when it reaches (100 C^o).
3. The water begins to boil.
4. Record the thermometer readings during boiling and after boiling.
5. Draw a graphic relationship between time and temperature.



Note: The thermometer temperature remains constant at (100 C^o) until all water becomes vapor.

Procedure to calculate heat of condensation:

1. Place a thermometer in a glass cup with snow on top of flame
2. The thermometer reading (0 C^o)
3. Ice begins to melt
4. record thermometer readings during the fusion process and after fusion
5. Draw a graphic relationship between time and temperature.



Note: The thermometer temperature remains constant at 0 C^o until all the ice turns into water.