QUESTIONS

8.2 Why does heat flow from hot body to cold body?

Ans: Heat flows from warm to cold body because the energy state is higher.

Heat flow moves energy from a higher temperature to a lower temperature. He bigger the difference in temperature between the two objects, the faster heat flows between them. When temperature is the same there is no change in energy due to heat flow. Heat flows from a hot body to a cold body until thermal equilibrium is reached.

Radiation and conduction are the two methods of heat transfer. Convection is a special type of conduction.

8.3 Define the terms heat and temperature?

Ans: Heat:

Heat is the energy that is transferred from one body to the other in thermal contact with each other as a result of the difference of temperature between them.

Temperature:

Temperature of a body is the degree of hotness or coldness of the body.

8.4 What is meant by the internal energy of a body?

Ans: Internal energy:

The sum of kinetic energy and potential energy associated with the atoms, molecules and particles of a body is called internal energy.

Internal energy of a body depends on many factors such as the mass of the body, kinetic and potential energy of molecules etc.

$$\Delta U = Q - W$$

Where, ΔU = internal energy, Q = Heat and W = work done

8.5 How does heating affect the motion of molecules of a gas?

Ans: The larger the temperature of a gas the faster the molecules will move (temperature is proportional to the average kinetic energy of the particles) and the large the force they will exert, and the higher the pressure (pressure is the force exerted by the particles divided by the area).

$$T \propto K.E \propto P$$

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8.6 What is thermometer? Why mercury is preferred as a thermometric substance?

Ans: Thermometer:

A device that is used to measure the temperature of a body is called thermometer.

Principle of thermometer:

Mercury thermometer are based on the fact that material (in this case, the liquid mercury) expand when heated.

Basic properties of thermometric liquid:

A thermometric liquid should have the following properties:

- It should be visible.

- It should have uniform thermal expansion.
- I should have a low freeing point.
- It should have a high boiling point.
- It should no wet glass.
- I should be a good conductor of heat.
- It should have a small specific heat capacity

Preference of mercury:

Mercury has uniform thermal expansion, easily visible, has low freezing point, has high boiling point and less specific heat.

Note: Due to these properties' mercury is used in mercury thermometer. Since it is opaque, it is easy to see the capillary.

8.7 Explain the volumetric thermal expansion.

Ans: Volumetric thermal expansion:

The volume of a solid also changes with the change in temperature and is called volume thermal expansion or cubical thermal expansion.

Consider a solid of initial volume V_0 at certain temperature T_0. On heating the solid to a temperature T, let its volume becomes V, then

Change in the volume of a solid $\Delta V = V - V_0$

And change in temperature $\Delta T = T - T_0$

Like linear expansion, the change in ΔV is found to be proportional to its original volume V_0 and change in temperature ΔT. Thus

$$\Delta V \propto V_0 \Delta T$$

or $$\Delta V = \beta V_0 \Delta T \ldots\ldots\ldots \text{(i)}$$

or $$V - V_0 = \beta V_0 \Delta T$$

or $$V = V_0 + \beta V_0 \Delta T$$

or $V = V_0 (1 + \beta \Delta T)$ ..... (ii)

where β is the temperature coefficient of volume thermal expansion, using equation (i), we get

$$\beta = \frac{\Delta V}{V_0 \Delta T} \quad \text{(iii)}$$

Coefficient of volume expansion β:

Thus, we can define the temperature coefficient of volume expansion β as the fractional change in its volume per kelvin change in temperature. The coefficient of linear expansion and volume expansion are related by the equation:

$\beta = 3\alpha$ ..... (iv)

8.8 Define specific heat. How would you find the specific heat of a solid?

Ans: Specific heat:

Specific heat of a substance is the amount of heat required to raise the temperature if 1kg mass of that substance through 1K.

It has been observed that the quantity of heat Δ Q required to raise the temperature Δ T of a body is proportional to the mass of the body. Thus,

$\Delta Q \propto m \Delta T$

$\Delta Q = c\, m \Delta T$ ..... (i)

Here Δ Q is the amount of heat absorbed by the body and c is the constant of proportionality called the specific heat capacity or simply specific heat.

Mathematically,

$$c = \frac{\Delta Q}{m \Delta T} \quad \text{(ii)}$$

Unit of specific heat:

SI unit of specific heat is $Jkg^{-1}K^{-1}$.

8.9: Define and explain latent heat of fusion.

Ans: Latent heat of fusion:

Heat energy required to change unit mass of a substance from solid to liquid state at its melting point without change in its temperature is called its latent heat of fusion.

It is denoted by H_f.

$$H_f = \frac{\Delta Q_f}{\mathrm{m}}$$

Or $\Delta Q_f = \mathrm{m}\, H_f$ ..... (i)

Ice changes at 0°C into water. Latent heat of fusion of ice is: $3.36 \times 10^5\ Jkg^{-1}$. *That* is, 3.36×10^5 joule heat is required to melt 1kg of ice into water at 0°C.

8.10 Define latent heat of vaporization.

Ans: Latent heat of vaporization:

The quantity of heat that changes unit mass of a liquid completely into as at its boiling point without any change in its temperature is called its latent heat of vaporization.

It is denoted by H_v.

$$H_v = \frac{\Delta Q_v}{\mathrm{m}}$$

Or $\Delta Q_v = \mathrm{m}\, H_v$ ..... (i)

When water is heated, it boils at 100°C under standard pressure. Its temperature remains 100°C until it is changed completely into steam. Its latent

heat of vaporization is $2.26 \times 10^6\ Jkg^{-1}$. That is; one kilograms of water requires 2.26×10^6 joule heat to change it completely into gas (steam) at its boiling point.

8.11 What is meant by evaporation? On what factors the evaporation of liquid depends? Explain how cooling is produced by evaporation.

Ans: The evaporation:

Evaporation is the changing of a liquid into vapors (gaseous state) from the surface of the liquid without heating it.

Evaporation causes cooling:

Evaporation plays an important role in or daily life. We clothe dry up rapidly when spread. During evaporation; fast moving molecules escape out from the surface of the liquid. Molecules that have lower kinetic energies-l are left behind. This lowers the average kinetic energy of the liquid molecules and the temperature of the liquid. Since temperature of a substance depends on the average kinetic energy of its molecules. Evaporation of perspiration helps to cool our bodies.

$$T \propto K.E$$

Evaporation takes place at all temperature from the surface of a liquid. The rate

of evaporation is affected by various factors.

Factors affecting the rate of evaporation:

i. Temperature:

Why wet clothes dry up more quickly in summer than in winter? A higher temperature, more molecules of a liquid are moving with high velocities. Thus, evaporation is faster at high temperature than at low temperature.

ii. Surface area:

Why water evaporates faster when spread over large area? Larger is the surface area of a liquid, greater number of molecules has the chance to escape from its surface.

iii. **Wind:**

Wind blowing over the surface of a liquid sweeps away the liquid molecules that have just escaped out, this increase the chance for more liquid molecules to escaped out.

iv. **Nature of the liquid:**

Does spirit and water evaporate at the same rate? Liquids differ in the rate at which they evaporate spread a few drops of ether or spirit on your palm. You feel cold, why?

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