

Board - CBSE

Class - 7

Topic - Heat

- **Thermal energy:**

The sum of total of the kinetic energy possessed by all molecules of the substance is called thermal energy. Thus, for example, the thermal energy of water in a glass is the sum of the energy possessed by all the water molecules in the glass.

- **Temperature:**

The measurement of the hotness of an object is called temperature. Unfortunately, our sense of touch is not reliable to measure the temperature.

- A thermometer is a device used for measuring temperatures.
- The normal temperature of the human body is 37°C .
- SI unit of temperature is **Kelvin (K)**.
- Commonly used units of temperature are degree Celsius ($^{\circ}\text{C}$) & degree Fahrenheit ($^{\circ}\text{F}$).
- If thermal energy increases, temperature also increases and if thermal energy decreases, temperature also decreases.

- **Heat:**

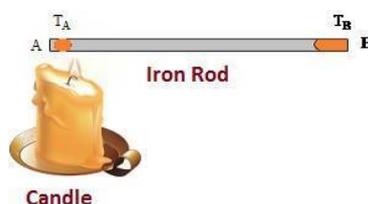
- It is a form of energy, which makes any object hot or cold.
- SI unit of heat is the **joule (J)**.

- **Difference between Heat & Temperature:**

| Heat | Temperature |
|---------------------------------------|---|
| Form of energy that flows | A measure of hotness and coldness |
| Increases the temperature of the body | It helps in the understanding flow of heat between two bodies |
| SI unit = joule | SI unit = Kelvin |

- **Types of Heat Transfer:** Heat transfer takes place in three ways which are:

1. **Conduction:** It is a process of heat transfer in which heat is transferred through a substance without the displacement of molecules from their position.



- It takes place in solids
- Molecules of solids are closely packed
- They get vibrated when they are heated and transfer the heat to their neighbouring molecules.

- **Conductors & Insulators**

| Conductors | Insulators |
|--|-------------------------------------|
| Allows heat to pass through them | It doesn't allow to pass heat |
| Example: metals (nickel, aluminium, iron etc.) | Example: wood, plastic, rubber etc. |

2. Convection: It is the process in which particles change their position by moving from warmer to cooler regions.

- It takes place in liquids and gases.
- Hot molecules go up, and cool molecules come down. Thus the movement of the liquid in a loop pattern gives transfer of heat.

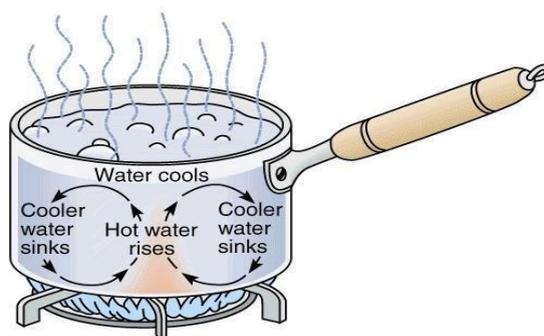


Fig. Convection

3. Radiation: it is the transfer of energy by waves that can travel through space. Heat energy from the sun to the earth is in the form of Radiation.

- Heat energy transferred through Radiation is called **radiant heat**.
- Dark & dull surfaces are good absorbers & bad reflectors of heat.
- Light & shiny colours are good reflectors & bad absorbers of heat.

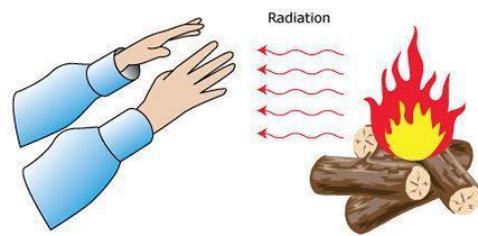


Fig. Radiation

- **Applications of Radiation:**

- We wear light coloured clothes in summers while dark coloured clothes in winter as they absorb heat and keep the body warm in winter.
- Firefighters wear highly polished and shiny suits.
- In cold regions, people paint their rooftops with dark colours.

- **Sea Breeze:**

- During the day, the land heats faster than the sea.
- Warm air above the land rises, and cold air from the sea takes its place.
- Warm air from the land moves towards the sea to complete the cycle.
- This process produces a sea breeze from the sea to the land.

- **Land Breeze:**

- At night the land cools faster than the sea.
- The warm air above the sea rises.
- This warm air is replaced by colder air from the land producing a land breeze
- This phenomenon produces a land breeze from the land to the sea

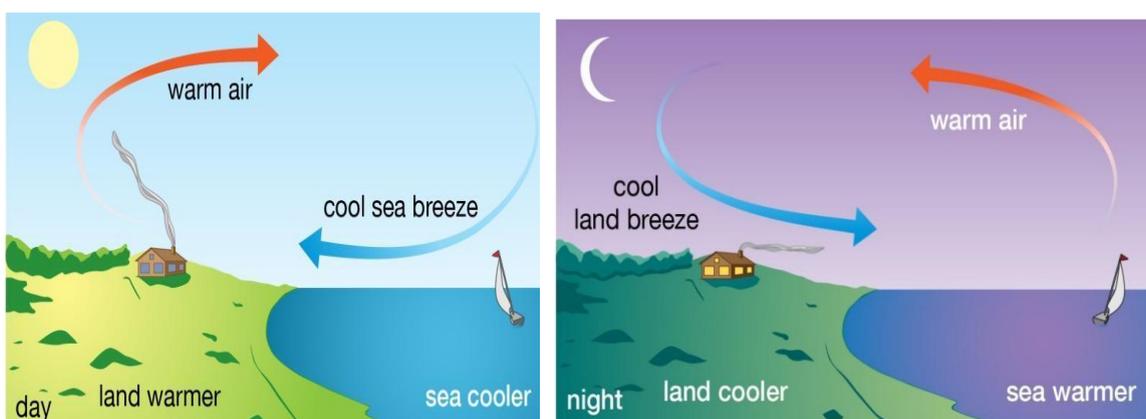
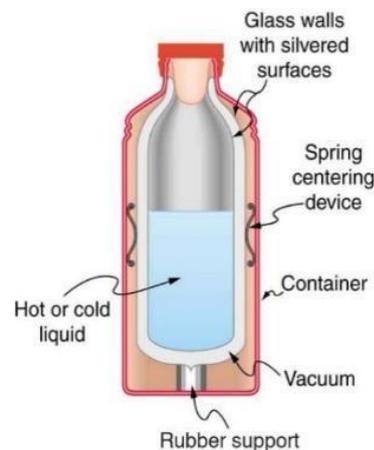


Fig. Sea Breeze

Fig. Land Breeze

- **Thermos flask:**

Thermos Flask is used to keep hot liquid hot & a cold liquid cold for a long time. It prevents loss or gain of heat due to conduction, convection & Radiation. It consists of a double-walled glass vessel resting on a cork inside a metal or plastic case. The outer surface of its inner wall and the inner surface of its outer wall are silvered. This prevents heat transfer due to Radiation. The insulating stopper or cork at the top minimizes heat loss by convection



- **Thermometer:**

The thermometer is used to measure the temperature. Temperature can be measured in degree Celsius ($^{\circ}\text{C}$), degree Fahrenheit ($^{\circ}\text{F}$), or in Kelvin (K).



- **Relation between Celsius and Fahrenheit:**

$$F = [(1.8 C) + 32]$$

- **Clinical Thermometer:**



Fig. Clinical thermometer

- It is used to measure the temperature of the human body.
- Its body is made of a thin, long & narrow uniform glass tube with a bulb at one end.
- The tube is called a capillary tube.
- Mercury is filled inside the tube.
- Scale readings are from 95°F to 110°F or 35°C to 42°C .

- **Advantages of using mercury in a thermometer:**

- Mercury is a good conductor of electricity.
- It doesn't stick to the walls of the glass tube.
- It doesn't vaporize easily.
- Its silvery shine helps to read the temperature accurately.

- **Precautions to be taken while using thermometer:**

- Wash the thermometer before and after use with an antiseptic.
- Make sure mercury is below the level of 35°C .
- Read thermometer by keeping the level of mercury along the line of sight.
- Do not hold the thermometer by its bulb.

- **Laboratory Thermometer:**

- Its capillary tube is protected by a thick tube called the stem.



Laboratory Thermometer

- When mercury comes in contact with a hot body, this mercury expands.
- Its scale is from 0°C (freezing point of water) to 100°C (boiling point of water).
- **Boiling Point:**

A fixed temperature at which a liquid gets converted to gas.

- **Melting Point:**

A fixed temperature at which a solid gets converted into liquid.

- **Six's Thermometer:**



It used to measure the temperature of weather.

It consists of U-shaped glass tube.

Top of the arm records minimum temperature contains alcohol.

The top of the arm records maximum temperature contains vacuum or low-pressure alcohol.

Fig. Six's Thermometer