STUDY MATERIALS

CLASS- VII

SCIENCE

CHAPTER 4 – HEAT

INTRODUCTION

We wear woolen clothes in winter season to keep us warm. We prefer to wear light coloured clothes in summer when it is hot. In winter we feel cold inside our house. If we come out in the sun, we feel warm. In summer, we feel hot even inside the house. How do we know whether an object is hot or cold?

HOT OR COLD

In our day-to-day life, we come across a number of objects. Some of them are hot and some of them are cold. Tea is hot and ice is cold. Usually we identify them by touching. But we cannot always rely on our sense of touch to decide whether an object is hot or cold. Sometimes it may deceive us. Then how do we find out how hot an object really is? A reliable measure of the hotness of an object is its temperature. Temperature is measured by a device called thermometer.

MEASURING TEMPERATURE

There are different types of thermometers.

1. Clinical thermometer

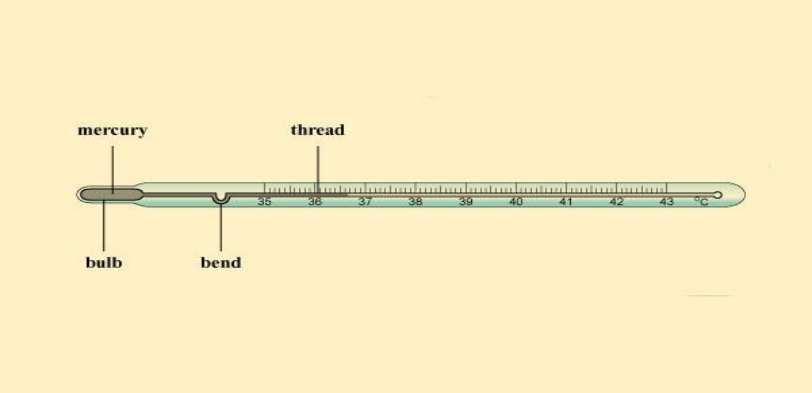
2. Laboratory thermometer

3. Maximum- minimum thermometer and

4. Digital thermometer

1. CLINICAL THERMOMETER

The thermometer that measures our body temperature is called a clinical thermometer. A clinical thermometer consists of a long, narrow, uniform glass tube. It has a bulb in one end which contains mercury. Outside the bulb, a shining thread of mercury can be seen.



We can also see a scale on the thermometer. The scale we use is Celsius scale indicated by ^{o}C. Kink prevents mercury level from falling on its own. The clinical thermometer is designed to measure the temperature of the human body only. The temperature of the human body does not go below 35^{o}C or above 42^{o}C.That is the reason that this thermometer has the range from 35^{o}C to 42^{o}C.

HOW TO USE A CLINICAL THERMOMETER?

Wash the thermometer, preferably with an antiseptic solution. Hold it firmly and give it with a few jerks. The jerk will bring the level of mercury down. Ensure that it falls below 35^{o}C.Now place the bulb of the thermometer under your tongue. After one minute, take the thermometer out and note the reading. This is your body temperature. The temperature should always be stated with its unit. The normal temperature of the human body is 37^{o}C.

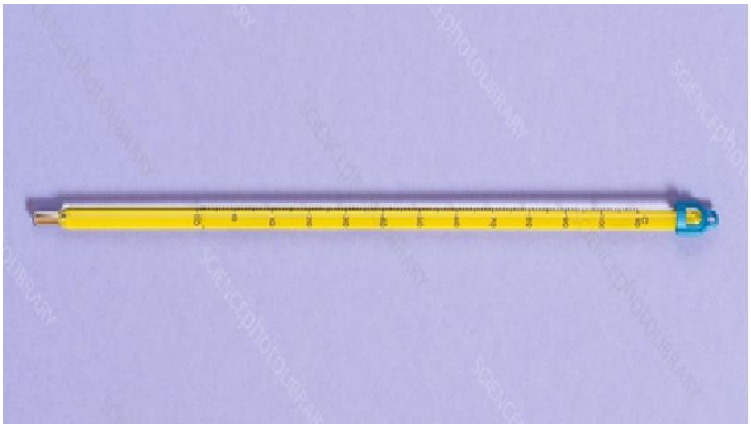
PRECAUTIONS TO BE OBSERVED WHILE READING A CLINICAL THERMOMETER

- Thermometer should be washed before and after use, preferably with an antiseptic solution.
- Ensure that before use the mercury level is below 35^{o}C.
- Read the thermometer keeping the level of mercury along the line of sight.
- Handle the thermometer with care. If it hits against some hard objects, it can break.
- Don’t hold the thermometer by the bulb while reading it.

- Do not use a clinical thermometer for measuring the temperature of any other objects other than the human body. Also avoid keeping the thermometer in the sun or near flame.

2. LABORATORY THERMOMETER

The range of laboratory thermometer is -10^{o}C to 110^{o}C.It is used in laboratories to measure temperature with high accuracy. The bulb of this thermometer is also filled with mercury. Kink is absent in the laboratory thermometer and it is not convenient to measure the human body temperature.



PRECAUTIONS TO BE OBSERVED WHILE READING A LABORATORY THERMOMETER

In addition to the precautions needed while reading a clinical thermometer, the laboratory thermometer: Page-3

- Should be kept upright, not tilted.
- The bulb should be surrounded from all sides by the substance of which the temperature should be measured.
- The bulb should not touch the surface of the container.

3.MAXIMUM – MINIMUM THERMOMETER

The maximum and minimum temperatures of the previous day, reported in weather reports, are measured by this thermometer.

4. DIGITAL THERMOMETER

There is a lot of concern over the use of mercury in thermometers. Mercury is a toxic substance and is very difficult to dispose of, if a thermometer breaks. Digital thermometers do not use mercury.

TRANSFER OF HEAT

We have observed that a frying pan becomes hot when kept on a flame. It is because the heat passes from the flame to the utensil. When the pan is removed from the fire, it slowly cools down. Why does it cool down? The heat is transferred from the pan to the surroundings. So, we can understand that in both cases, the heat flows from a hotter object to a colder object. In fact in all cases heat flows from a hotter object to a colder object.

Transfer of heat takes place through the following methods:

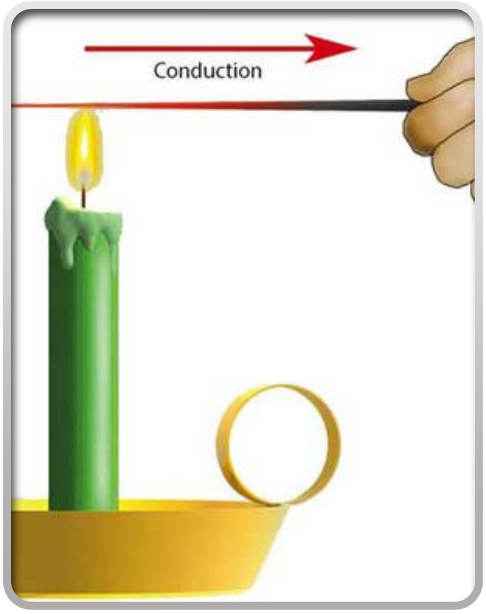
i) Conduction

ii) Convection and

iii) Radiation

CONDUCTION

The process by which heat is transferred from the hotter end to the colder end of an object is known as conduction. In solids, generally, the heat is transferred by the process of conduction.



CONDUCTORS AND INSULATORS

Conductors- The materials which allow heat to pass through them easily are conductors of heat.

Eg:-Aluminium, iron, copper

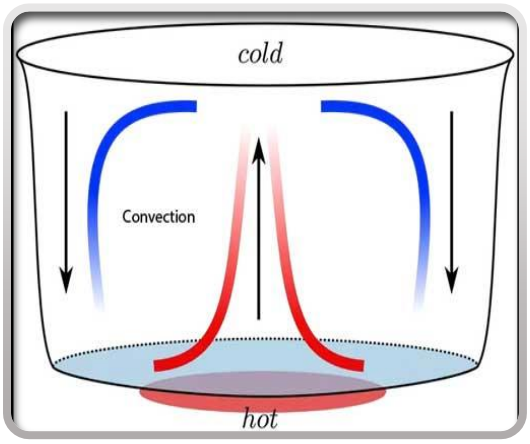
Insulators- The materials which do not allow heat to pass through them easily are poor conductors or insulators of heat.

Eg:- Plastic, wood, rubber

CONVECTION

When water is heated in a vessel, the water near the flame gets hot. Hot water rises up. The cold water from the sides moves down towards the source of heat. This water also gets hot and rises and water from the sides moves down. This process continues till the whole water gets heated. This mode of heat transfer is called convection.

Convection is the transfer of heat by the movement of a fluid (liquid or gas) between the areas of different temperature.

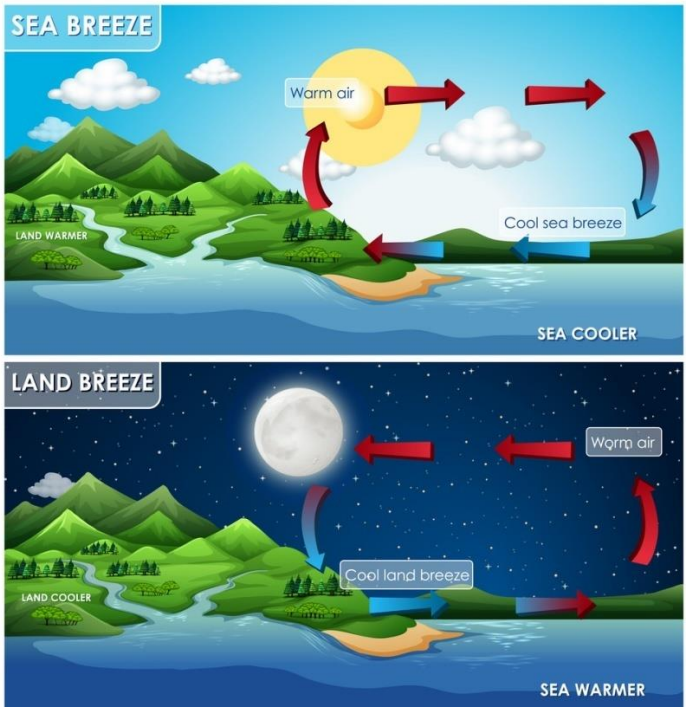


SEA BREEZE AND LAND BREEZE

How does the heat travel in air? The air near the heat source gets hot and rises. The air from the sides comes in to take its place. In this way the air gets heated.

Sea breeze

During the day, the land gets heated faster than water. The air over the land becomes hotter and rises up. The cooler air from the sea rushes in towards the land to take its place. The warm air from the land moves towards the sea to complete the cycle. The air from the sea is called the sea breeze.



Land Breeze

At night, it is exactly the reverse. The water cools down more slowly than the land. So the cool air from the land moves towards the sea. This is called the land breeze.

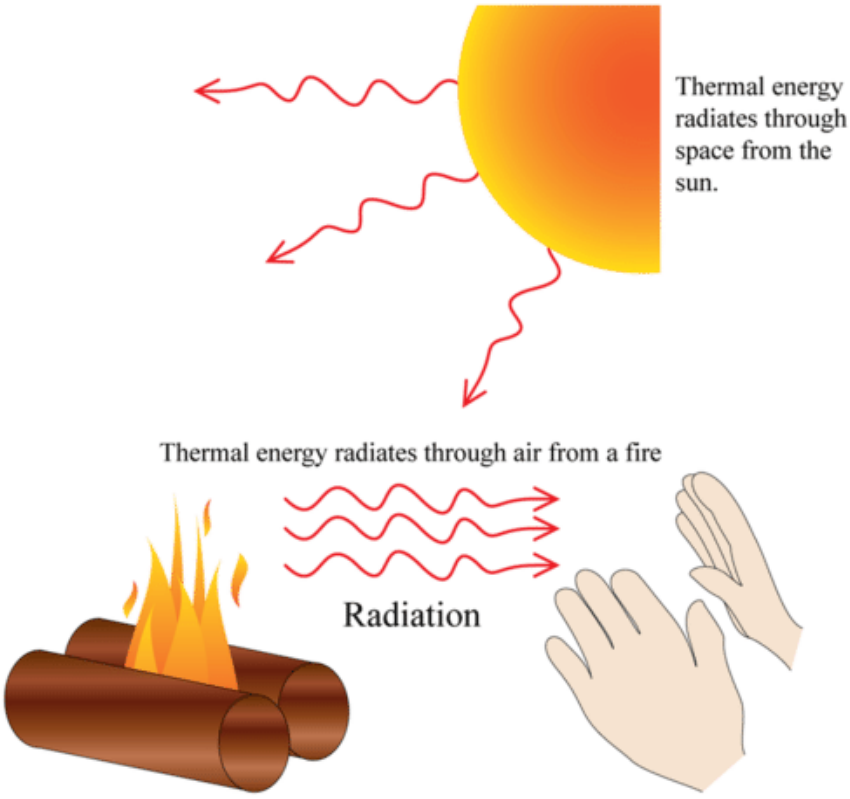
RADIATION

It is the transfer of heat which does not require any medium.

Example:-

- From the sun heat comes to us by radiation.
- A hot utensil kept away from the flame cools down.
- We get heat from the room heater.
- Our body also, gives heat to the surroundings and receives heat from it by radiation.

All hot bodies radiate heat. When this heat falls on some object, a part of it is reflected, a part is absorbed and a part may be transmitted. The temperature of the object increases due to the absorbed part of the heat.



KINDS OF CLOTH WE WEAR IN SUMMER AND WINTER

In summer we prefer light coloured clothes and in winter usually wear dark coloured clothes. Light coloured clothes reflect most of the heat falls on them, and therefore, we feel more comfortable wearing them in the summer. Dark surfaces absorb more heat and we feel more comfortable with dark coloured clothes in the winter.

WOOLLEN CLOTHES KEEP US WARM IN WINTER

Wool is a poor conductor of heat. Air is trapped in between the wool fibers. This air prevents the flow of heat from our body to the cold surroundings. So, we feel warm.

In winter season, using two thin blankets joined together is better than one thick blanket because air is trapped in between the layers of the blankets. Air is a poor conductor of heat and we feel more comfortable.

Reference- Science: A Text Book for Class- VII- NCERT

Wikipedia