

Flow Of Heat

5

IN THIS CHAPTER

- *Conduction*
- *Convection*
- *Radiation*
- *Application of good and bad conductor of heat*
- *Sea breeze and Land breeze*
- *Application of convection*

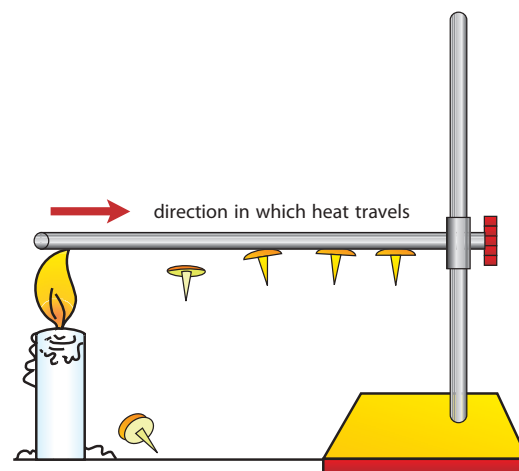
We know that heat energy flows from low temperature to high temperature. Heat is transferred from one place to other place by three different ways.

1. Conduction
2. Convection
3. Radiation

CONDUCTION

What is conduction? We can know by a practical.

Take a rod of a metal. Fix a few small wax pieces on the rod. These pieces should be at nearly equal distances. Clamp the rod to a stand. If you do not find a stand you can put one end of the rod in between bricks. Now, heat the other end of the rod and observe.



Conduction of heat

What do You Observe?

Do these pieces begin to fall ? Which falls the first ? Do you think that heat is transferred from the end nearest to the flame to the other end ? 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 heat is transferred by the process of conduction.

Different metals have different conductivity.

Copper is better conductor of heat than iron. So, the materials which allow heat to be conducted through them easily are called good conductors of heat. Aluminium and silver are also good conductor of heat.

The materials which do not allow heat to pass through them easily are poor conductors of heat. Poor conductors are known as insulators. Plastic and wood are insulators.

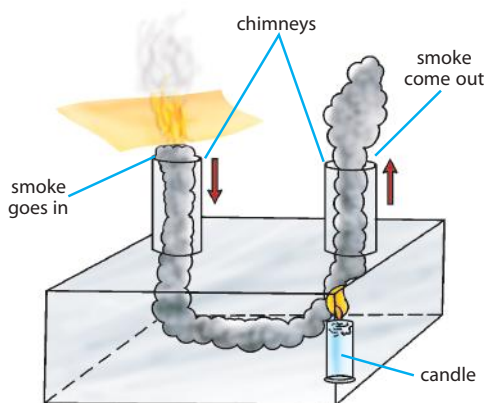
Do You Know?

Convection is thought to play a fine role in transporting energy from the centre of the sun to the surface and in movement of hot magma beneath the earth's surface.

CONVECTION

What is convection? We can know by a practical.

Take a beaker and fill it two- third with water. Place it on a tripod or make some arrangement to place the beaker in such a way that you can heat it by placing a candle below it. Wait till the water in the beaker is still. Place a crystal of potassium permanganate at the bottom of the beaker gently using a straw. Now heat the water by placing the candle just below the crystal. What do you observe? When water is heated, 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.



Convection currents in the air

This process continues till the whole water gets heated. This mode of heat transfer is known as convection.

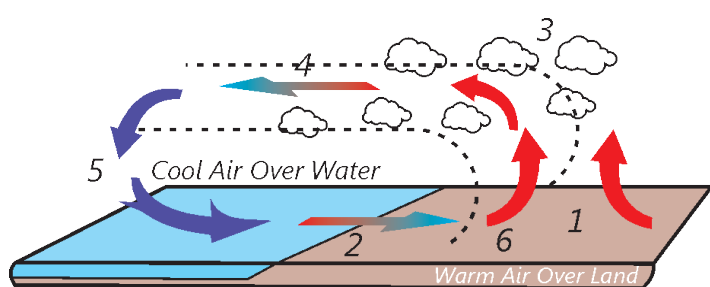
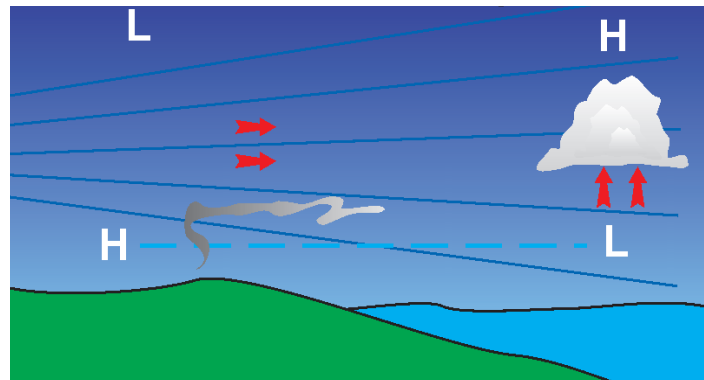
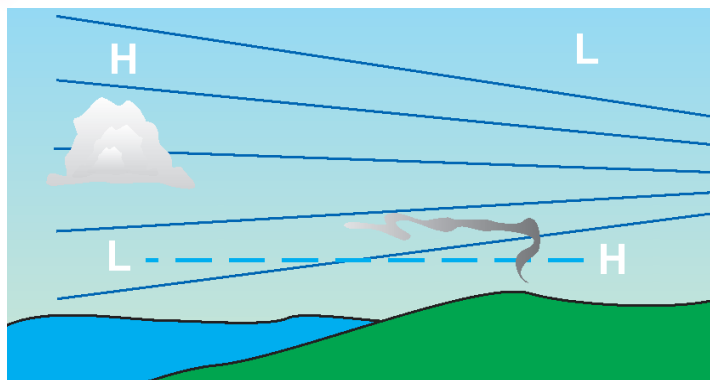
Application of Good and Bad Conductor of Heat

1. All cooking utensils like pressure cooker, fry pan etc. are made of good conductors of heat such as brass or aluminium. Silver and copper are the best conductors of heat but they are expensive so they are not used to make utensils. Some expensive cooking utensils made up of copper bases are available in the market now-a-days.
2. Handles of cooking utensils are made of bad conductors such as plastic, glass, wood etc. They do not get heated up while cooking and can be held comfortably.
3. Refrigerators are made up of double walls with the space inside filled with an insulating material. This prevents heat from the surroundings from reaching the inside of the refrigerator. Walls of microwaves and ovens have double walls to prevent heat inside from escaping out.
4. In the winter, we use woollen clothes. Air is poor conductor of heat. Wool fibre has space to trap air. This air prevents the flow of heat from our body in cold weather so we feel warm.

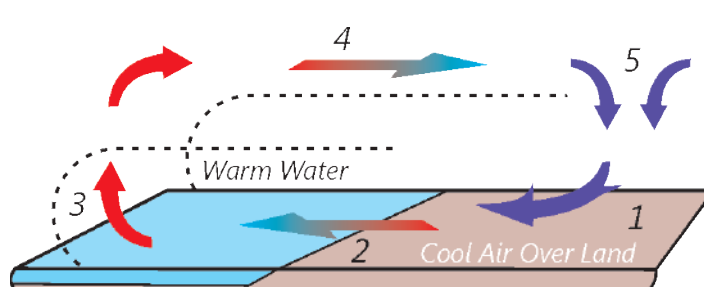
SEA BREEZES AND LAND BREEZES

In the coastal areas, during the day, the land gets heated faster than the 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 blowing from the sea is called the sea breeze.

To receive the cooler sea breeze, the windows of the houses in the coastal are made to face the sea. At night it is exactly the reverse, the water cools down more slowly than the land. This is called the land breeze.



Sea Breezes Circulation



Land Breezes Circulation

Application of Convection

1. In houses, ventilators were provided high upon the walls. This was because the air we breathe out is warmer and rises up. It escapes from the ventilators. It is replaced by fresh air coming in from doors and windows. Thus, stale air goes out and fresh air comes in due to the convection current set up in the air in the room.
2. Central heating in building is based on convection currents. Normally, water or oil is heated in a boiler. This gives rise to convection currents in the water or oil because of which, it circulates through pipes that go through the room.

RADIATION

Conduction and convection are the two methods to transfer the heat through any medium. Molecules of the medium transfer the heat from one place to other place. When we sit near fire or in sun light, we feel warm. However, the air between us and fire is a bad conductor of heat and does not get heated up much. A method of transfer of the heat without any medium is called radiation.

Radiation is much faster mode of transfer of heat than conduction or convection. It can take place whether a medium is present or not. When we sit in front of a room heater, we get heat by this process. A hot utensil kept away from the flame cools down as it transfers. Heat to the surrounding by radiation. Our body too gives heat to the surroundings and receives heat from it by radiation.

Application of Radiation

1. We wear white and light weighted clothes in the season of summer because they reflect most of the heat and absorb only little part of heat. We also feel cool in these clothes whereas dark coloured clothes absorb heavy heat and reflects a very little heat. Therefore in the season of winter, we wear dark-coloured clothes to keep ourselves warm.
2. The base of a cooking utensil is painted black so that it absorbs more heat and hence cooking becomes fast and save heat.
3. The back of refrigerators are coloured dull black to radiate heat effectively and cool down the refrigerator pipes.

Electric room heaters are provided with a polished metal surface behind the heating element. This surface reflects almost all the radiant heat from the element that falls on it, towards us. This makes the room heater more effective and room becomes more heated.



Room heater



Know the Keywords :

Conduction : A mode of heat transfer when the particles of a medium gain energy and transfer energy to the neighbouring atoms by fast vibrations.

Conductors : Substances that allow heat energy to transfer through them.

Insulators : Bodies that do not conduct heat.

Radiation : A process of energy transfer, in the form of electromagnetic waves, without the help of a medium.

Point to Remember

- Conduction and Convection are the two methods to transfer the heat through any medium.
- A method of transfer of the heat without any medium is called radiation.

EXERCISE TIME

A. Answer the following questions :

1. What is conduction ? Explain this process.
2. What are insulators? Give three examples.
3. What is radiation ?
4. What are sea breeze and land breeze ?
5. Why do we prefer white clothes in summer season ?
6. Why are the base of cooking utensils black ?

B. Fill in the blanks :

1. In _____ method molecules of medium travel from one part to other part.
2. Liquids are _____ conductors of heat.
3. The back colour of refrigerators is _____.
4. Conduction takes place in _____.
5. _____ is the best conductor of heat.

C. Match the following :

Column 'A'

1. Rubber
2. Iron
3. Radiation

Column 'B'

- (i) sun energy
- (ii) insulator
- (iii) conductor

D. Give the answer in one word :

1. Which is best conductor of heat ? _____
2. Which type of objects radiate heat ? _____
3. Which is the fastest mode of transfer of heat ? _____
4. Does convection occurs in solids also ? _____
5. Are gases bad conductors of heat ? _____

E. Tick (✓) the correct option :

1. Copper is better conductor of heat than :
(i) aluminium (ii) iron (iii) silver
2. The materials which allow heat to be conducted through them easily are called good conductors of :
(i) air (ii) electricity (iii) heat
3. The process which continues till the whole water get heated is called :
(i) conduction (ii) convection (iii) radiation
4. The air from the sea is called the :
(i) land breeze (ii) sea breeze (iii) both of them
5. A method of transfer of the heat without any medium is called :
(i) Radiation (ii) Convection (iii) Conduction

6. Bodies that do not conduct heat are called :

- (i) Conductors (ii) insulators (iii) none of them



Creative Work

- Write a short note about 'Room heater' and make a picture of it in the space below :
