



BAL BHARATI PUBLIC SCHOOL, PITAMPURA, DELHI – 110034

SUBJECT:-SCIENCE

CHAPTER:- HEAT

TOPIC:- TRANSFER OF HEAT

GUIDELINES FOR STUDENTS

Dear Students

- * Refer to the following contents of the chapter HEAT
- * There are two assignments. Solve these assignments in the Science notebook.
- * Suitable video links have been provided.
- * Do read textbook or NCERT too for better understanding of these.

<http://ncert.nic.in/textbook/textbook.htm?gesc1=4-19>

(PG NO. 40, 41, 42)

Living Science Book

<https://bbpspp.balbharati.org/wp-content/uploads/2020/05/HEAT.pdf>

(Readpage 44,45,46,47,48 and 49 from the Living Science Book)

Subtopics: Conduction and Convection.

Let us first discuss conduction in detail.

I. Conduction: The mode of transfer of heat in solids.

When we heat water on a gas stove in a metallic container, it becomes hot .On taking it off fire for some time, it becomes cool again.

It cools down because:

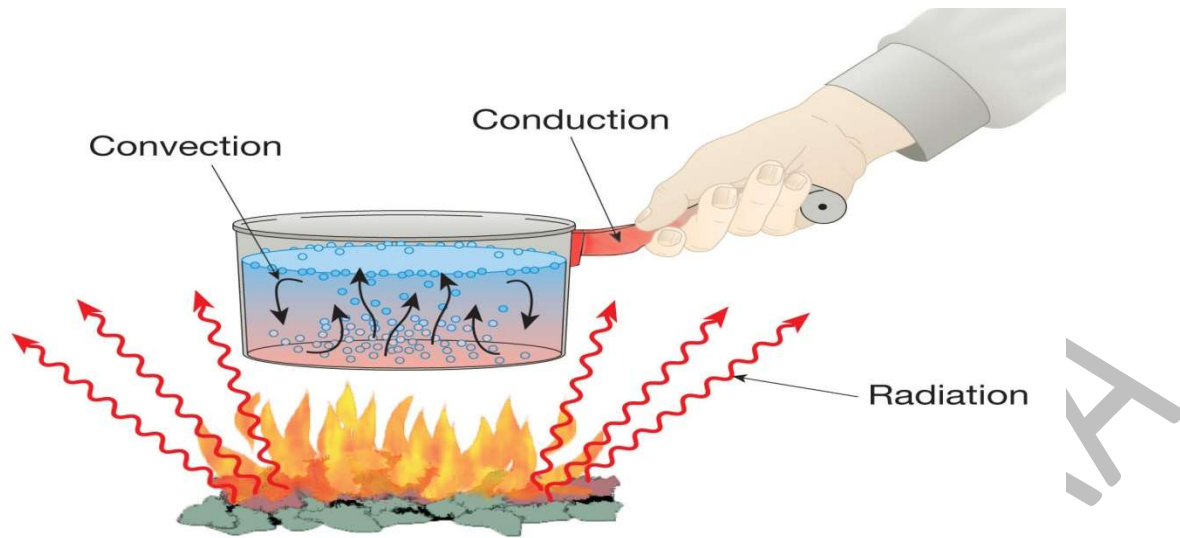
- *There is a transfer of heat to the surroundings.
- * Heat always gets transferred from hotter objects to colder objects.
- *The heat transfer continues till both the bodies attain the same temperature.

MODES OF TRANSFER OF HEAT

The transfer of heat can occur through any of the following three methods:

- (i) **Conduction (solids)**
- (ii) **Convection (liquid & gases)**
- (iii) **Radiation (empty space)**

In this lesson plan we will discuss in detail the transfer of heat by Conduction and Convection.



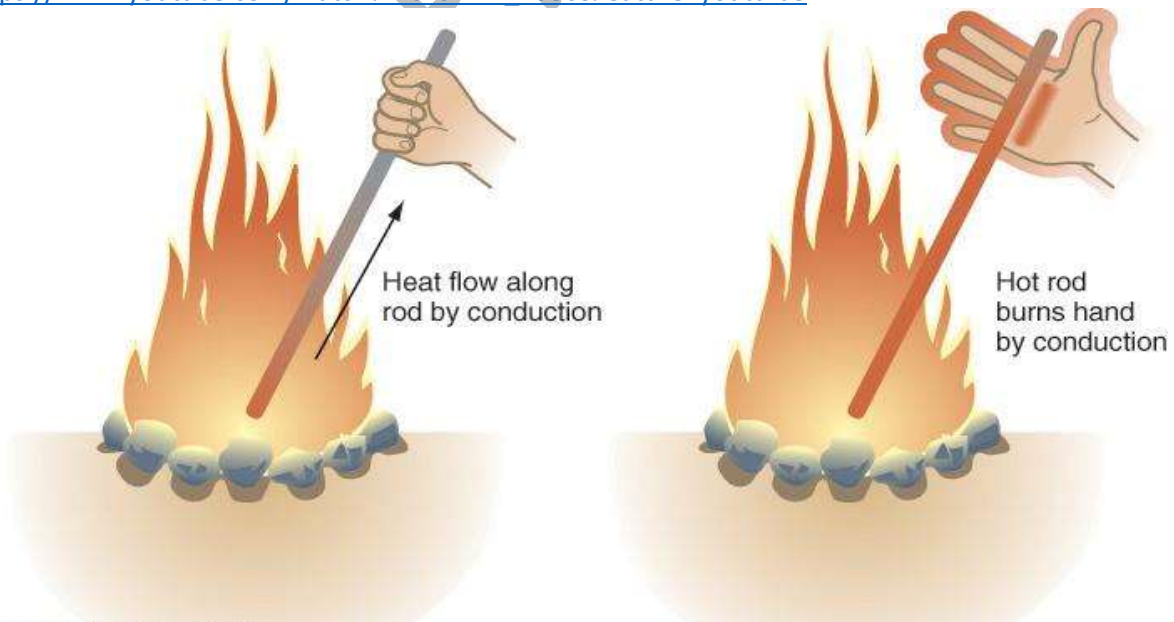
Conduction

When an iron rod is placed on a flame, the end touching the flame starts heating first as shown in the figure. Slowly, this heat travels to the other end and the other end becomes hot too. **This process of transfer of heat from the hotter end to the colder end of an object is called conduction.**

Watch these videos for better understanding:

<https://www.youtube.com/watch?v=3N30EpGbNOU&feature=youtu.be>

https://www.youtube.com/watch?v=uLtwRK_Pd5c&feature=youtu.be



CONDUCTION IS FASTEST IN SOLIDS. The molecules of solids are closely packed. They vibrate about their fixed positions, on being heated, their vibrations become more pronounced and hence acquire more energy which leads to rise in temperature and this way heat travels from one end to another.

Watch the following video:

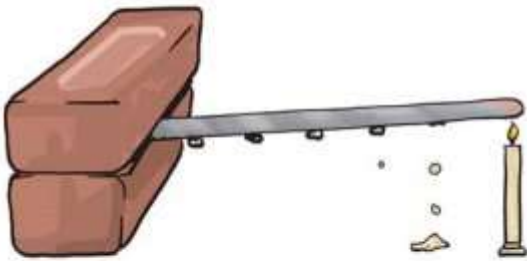
<https://www.youtube.com/watch?v=3N30EpGbNOU&feature=youtu.be>

ACTIVITY(Demonstration only)

TO PROVE THAT HEAT TRAVELS IN METALS VIA CONDUCTION

- We take an iron rod
- Fix four iron nails on it with wax.
- Place the rod as shown in fig 4.8
- Heat the free end of the rod with a candle.

We will observe that the iron nail closest to the heated end of the rod falls as the wax melts. After some time, the second nearest nail falls and so on. From this activity we can conclude that **HEAT TRAVELS FROM ONE END TO ANOTHER THROUGH CONDUCTION**



Flow of heat through a metal strip



Conduction of heat by different materials



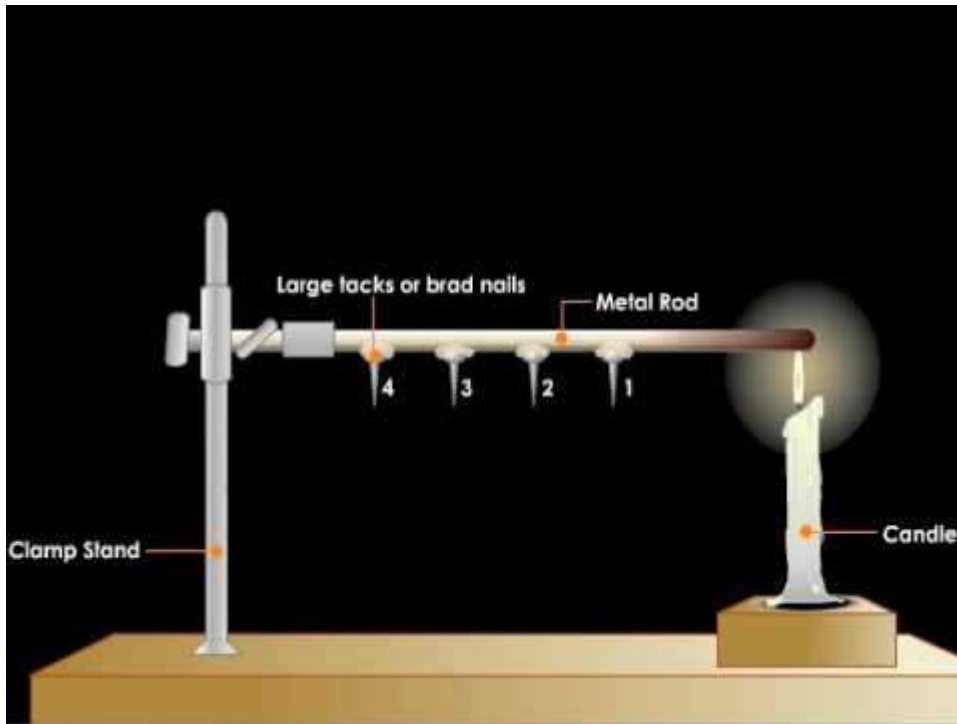


Figure 4.8

CONDITIONS FOR THE CONDUCTION TO TAKE PLACE

- (a) The two objects must be in contact
- (b) The temperature of the two objects should not be the same

Conduction

heat transfer through one substance to another through direct contact




Conduction

Energy is transferred by direct contact.



PLEASE NOTE:

The materials which allow heat to pass through them easily are known as **conductors of heat**.

For example - aluminium, iron and copper.

The materials which do not allow heat to pass through them easily are **poor conductors of heat**

For example - plastic and wood.

Poor conductors are known as insulators.

| Ser | Good Conductors | Bad Conductors |
|-----|-----------------|----------------|
| 1 | Silver | Glass |
| 2 | Copper | Asbestos |
| 3 | Aluminium | Wood |
| 4 | Brass | Water |
| 5 | Iron | Cork |
| 6 | Lead | Cotton wool |
| 7 | Mercury | Air |



Some practical applications of good conductors of heat

- Cooking utensils are made of metals so that heat can easily get transferred.

- Refrigerator coils are made of copper so as to conduct away the heat.

Some practical applications of bad conductors of heat

- The handles of cooking utensils are made of bad conductors of heat, such as wood or ebonite. They do not get heated and can be held comfortably.

NOW SOLVE THE ASSIGNMENT IN YOUR PHYSICS NOTEBOOK

ASSIGNMENT 1

- Q1. How does the transfer of heat take place in solids?
 Q2. List any one effect of heat.
 Q3. Suggest two applications each of good and bad conductors of heat.
 Q4. Describe an experiment to show conduction of heat in solids.
 Q5. Distinguish between conductors and insulators by giving examples.
 Q6. Explain why the handles of metallic kettle are covered with strips of cane.

Q7. In the arrangements A and B shown in Figure 4.7, pins P and Q are fixed to a metal loop and an iron with the help of wax. In which case are both the pins likely to fall at different times? Explain.

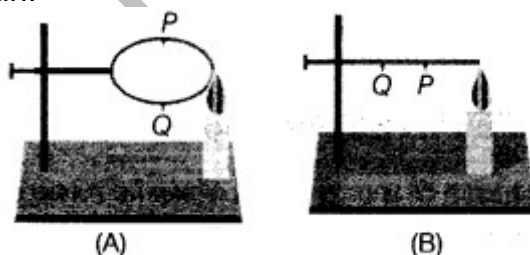


Fig. 4.7

- Q8. (a) Shopkeepers selling ice blocks usually cover them with jute sacks. Explain why.
 (b) To keep her soup warm, Neeta wrapped the container containing soup with a woollen cloth. Can she apply the same method to keep a glass of cold drink cool? Give reason for your answer.

Living Science Book

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II. Convection

Liquids (except mercury) and gases are poor conductors of heat. They cannot be heated by conduction. Then how are they heated? Let us find out this.

Watch the video links given below to make your concepts more clear.

LINKS

<https://www.youtube.com/watch?v=DzwnlzmW-Z0&feature=youtu.be>

<https://www.youtube.com/watch?v=ySvAq0cQArQ&feature=youtu.be>

CONVECTION

In convection, heat is transferred from the hotter part of the substance to the colder part by actual movement of hot particles in it.

NOTE: Since convection requires moving molecules, so it can take place in liquids and gases and henceforth cannot take place in solids as the molecules of solids are closely packed.

LET US UNDERSTAND THIS MORE CLEARLY FROM THIS ACTIVITY.

(Demonstration only)

* We take a conical flask and keep it on an iron stand

* Fill it half with water.

* Then we add few crystals of potassium permanganate.

* Allow it to burn as shown in figure.

We observe that some of the crystals dissolve and give pink colour to the water and the hot water rises up and the cold water takes its place.

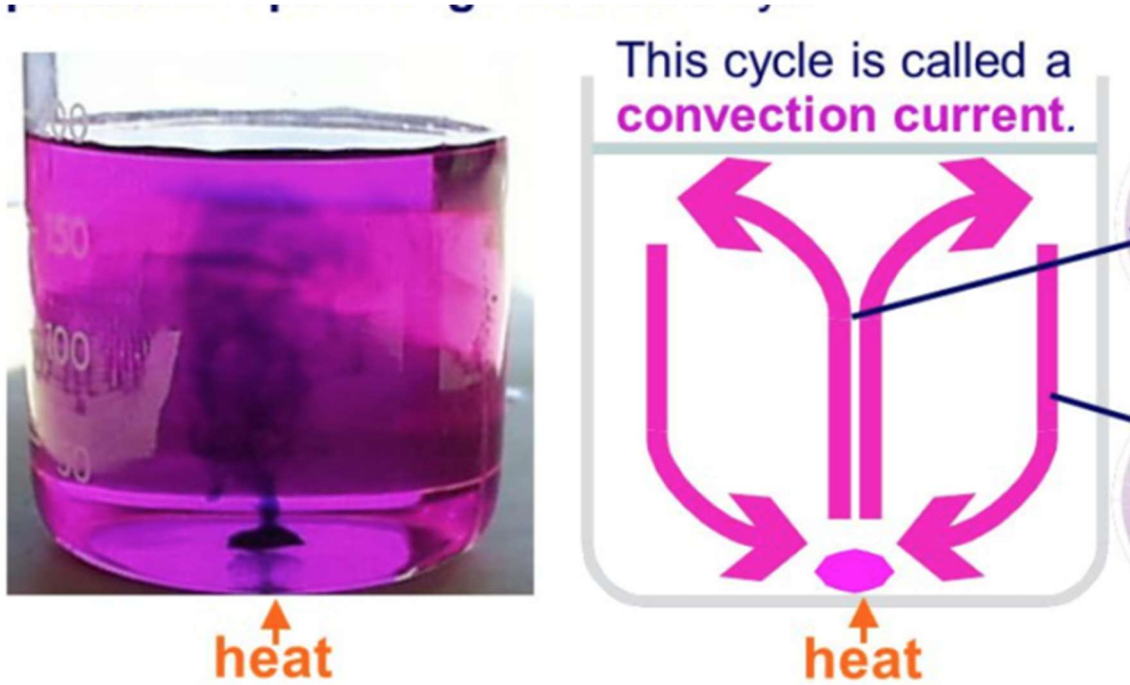
This shows that water transfers heat by the movement of molecules from hotter to colder regions.

<https://www.youtube.com/watch?v=6Z3nEMLpstU&feature=youtu.be>

<https://www.youtube.com/watch?v=adEhYWb3CYo&feature=youtu.be>



Convection of heat in water



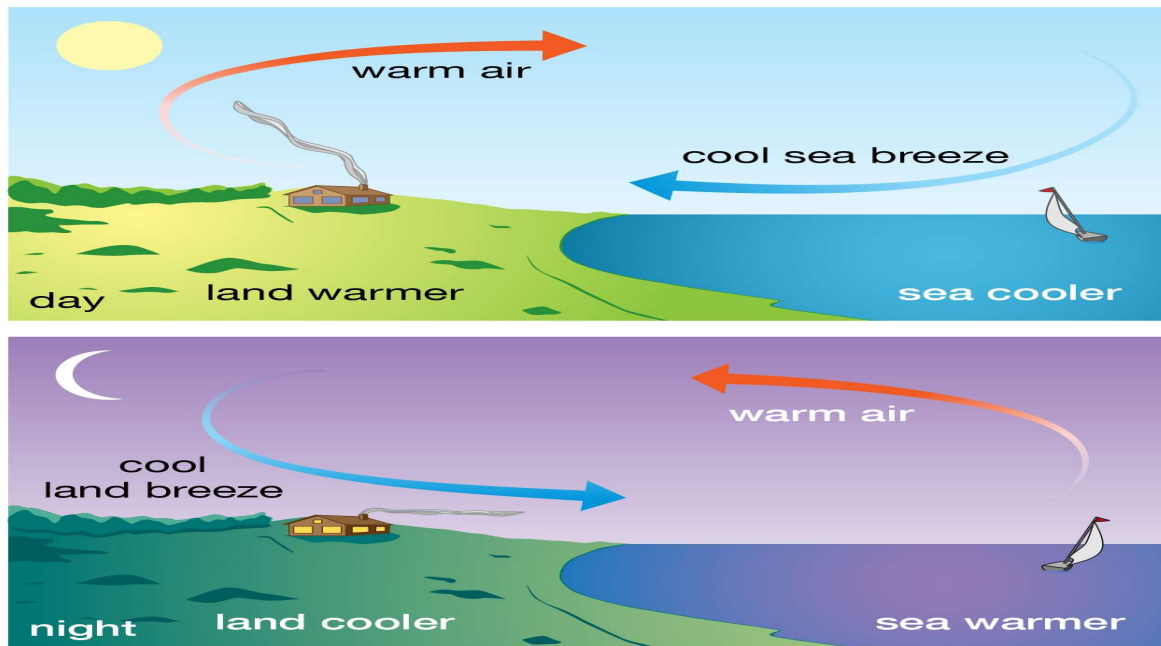
USES OF CONVECTION CURRENTS

1. **Ventilators and exhaust fans** are placed usually near the ceiling of a room because the air we breathe out is warmer and lighter, so it goes out through the ventilators. This causes a drop in the pressure in the room, thus more fresh air enters the room through the windows and doors.



2. **Smoke and gases**, being hot, rise and escape through chimneys in industrial furnaces.
3. **Heaters and blowers** heat the room by setting up convection currents.
4. **Firemen** usually crawl while entering a building where fire has broken out because the hot air and smoke rises upwards.

5. **Sea breeze and land breeze** are actually convection currents. In coastal areas, the breeze generally blows from sea to the land during the day. At night, the breeze flows from land to sea and is called land breeze.



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Watch the video links :

<https://youtu.be/DzwnlzmW-Z0>

6. **The monsoon** is also a convection current set up due to difference in temperature between sea and land.

7. **Birds** use convection currents of air to rise high and glide effortlessly without flapping their wings.



NOW SOLVE THE ASSIGNMENT IN YOUR SCIENCE NOTEBOOK

ASSIGNMENT - 2

1. How do land and sea breeze occur? Explain with the help of a diagram.
2. In what way conduction is different from convection?
3. What is convection? Does it need any medium for transfer of heat?
4. State two applications of convection.
5. Name a natural phenomenon which is caused by convection.

BBPS, PITAMPURA