

When two bodies at two different temperatures are near to each other or in contact, heat flows from higher temperature body to

Conduction takes place  
in all forms of matter,  
viz. solids, liquids, gases  
and plasmas, but does  
not require any bulk  
motion of matter.

As density decreases  
so does conduction

**Is conduction possible in vacuum. Why or why not?**

**No**

**Material medium  
is required for  
conduction .**

# Experiment to demonstrate conduction.

# **Explanation for conduction**

**Heat is transferred  
from hot end to  
cold end of the  
solid by the  
vibration of atoms.**

# **Explanation for conduction**

**Atoms vibrate with larger amplitude .**

**Collide with  
neighbouring atoms and  
transfer a part of  
energy to them .**

# **Explanation for conduction**

**This in turn  
increases Kinetic  
energy of the atoms  
and start vibrating  
and process  
repeats..**

**Eskimos make double walled ice houses .why ?**

**Air enclosed b/w the walls is a bad conductor of heat, which reduces out flow of heat from inside the houses.**



# Explanation for conduction

**In metals, in addition to the above , free electron movement enhance the conductivity .**

# Atoms movement , Drude free electron

Generally good conductors of heat are good conductors of electricity too. Exception mica is a good conductor of heat , but poor conductor of electricity.

**Eg: metals and Hg.**

# Good and Bad conductors

Liquids except Hg are poor conductors of heat. Gases are still poorer conductors of heat .

## **Insulators.**

**Eg. Glass, wood .cloth air pure ( distilled ) water, wax ,paper , clay, Ebonite , asbetos etc.**

# **Good and Bad conductors**

**Rate of transfer of heat through solid is different for different substances.**

**Drift of free electrons is seen only in metals.**

# **Good and Bad conductors**

**So metals are good  
conductors.**

**Non metals are poor  
conductors.**

**Why no heat sensation is felt when a burning match stick is held in the fingers?**

**Wood is a bad conductor of heat .  
So little heat reaches the hand.**

At what temperature would a block of wood and a block of metal feel equally cold or equally hot , when touched ?

**If the temperature of both wood and metal are same as that of the temperature of human body.**



**A cloudy night is hotter than a clear sky night . Why ?**

**This is because in the cloudy night heat radiated from earth is reflected back to earth and hence temperature of earth does not fall.**

Two thin blankets are warmer than a single blanket of double the thickness. Why?

**Air layer b/w the layers is a bad conductor of heat reduces the thermal conductivity of the blankets considerably.**

**Birds swell their feather in winter. Why ?**

**By doing so , they enclose more air /w feathers and their body. Air being bad conductor of heat slows down the flow of body heat to outside.**

We feel warmer in a fur coat. Why ?

**Air enclosed in the fur coat cannot escape because fur is a bad conductor of heat.**

**if air is bad conductor of heat, why do we not feel warm without clothes ?**

**This is because when we are without clothes, air carries away heat from our body due to convection and hence we can feel cold.**

Stainless steel cooking pans  
are preferred with extra  
copper bottoms. Why ?

**Thermal  
conductivity of  
copper is more than  
that of steel .**

# Why snow is a better heat insulator than ice?

Sometimes ,when atmospheric temperature falls below  $0^{\circ}\text{C}$  , water vapours , instead of condensing , freeze directly as small ice particle .

These particles coalesce to form snow.

Snow has air enclosed in it. Which reduces the chance of heat loss by conduction .



When glass and copper rods are heated upto some temperature and then if the hot areas are touched , why copper piece seems warmer than the glass rod?

**Copper is a good conductor of heat , glass is bad conductor of heat.**



**Ventilators are provided in rooms just below the roof . Why ?**

**Air respired out is hotter and hence rarer. It rises up in the room . So it finds its way out of the room through the ventilators which are provided just below the roof .**

**A brass tumbler feels colder than a wooden tray in winter. Comment.**

**Brass is a good conductor of heat . When we touch brass tumbler, our body heat is quickly conducted to the brass tumbler. Wood is a poor conductor of heat.**

# **Explain why coolant coil fitted on the ceiling of the refrigerator?**

**Air in the upper part becomes denser on cooling and moves downward while the warm and lighter air in the lower part moves upward and establishes a convection current .**

**Why is it hotter at the same distance over the top of a fire than in front of it?**

**Convection is in upward direction**

A body with a large reflectivity is a poor emitter . Why?

**It will be a poor absorber of heat.  
Poor absorbers are poor emitters also.**

**Why are steam pipes  
wrapped with insulating  
materials?**

**To minimise the  
loss of heat due  
to radiation**

What is the nature of heat  
radiations ?

**Electromagnetic  
waves.**

**The earth without its  
atmosphere would be  
inhospitably cold. comment**

**The atmosphere serves  
purpose of a blanket over  
the earth and it does not  
allow earth's heat to be  
radiated during night**



**Explain why cooking utensils are often blackened at the bottom and polished at the top ?**

**Black is a good absorber of heat radiation . Polished and white surfaces are bad conductors and bad emitters of the heat radiations. ( upper part reduces loss of heat to minimum)**

**Animals curl into a ball when they feel very cold. Why ?**

**The energy radiated per unit time is directly proportional to the surface area of the body. By curling into a ball, the surface area of the body of the animals decreases and hence loss of heat is reduced.**

**An ink dot on a cup of porcelain appears dark. When the same cup is heated to a high temperature , the dot becomes brighter than rest of the cup?**

**Good absorbers are good emitters too.**

**Ink dot appears dark as it is a good absorber .So it is a good emitter when heated.**

# Black body radiation is white. Comment.

**White radiations includes all possible wavelengths. Since BB absorbs all wavelengths, on being heated to a suitable temperature, it will emit radiations of all wavelengths.**

**So BB radiations is white.**

**Two identical rectangular strips of copper and the other of steel are revetted together to form a bimetallic strip. What will happen on heating? (  $\alpha_{\text{Cu}} > \alpha_{\text{steel}}$  )**

**Bimetallic strip bends so as to allow more expansion in the copper strip. ie. Copper strip forms outer ( convex ) side of the bent metallic strip**

The difference between length of a certain brass rod and that of a steel rod is claimed to be constant at all temperatures. Is this possible?

**Yes possible. If the lengths of the two rods are in the inverse ratio of their coefficient of linear expansion.**

$$\Delta l_1 = l_1 \alpha_1 \Delta T$$

$$\Delta l_2 = l_2 \alpha_2 \Delta T$$

As per question

$$\Delta l_1 = \Delta l_2 \quad l_1 \alpha_1 \Delta T = l_2 \alpha_2 \Delta T$$

$$*ie.* \quad l_1/l_2 = \alpha_2/\alpha_1.$$

Concrete flooring is laid in small blocks and not in one continuous piece . Give reason .



The coefficient of volume expansion of glycerine is  $49 \times 10^{-5} \text{ }^{\circ}\text{C}^{-1}$ . What is the fractional change in its density for a  $30^{\circ}\text{C}$  rise in temperature?

*Hint: if  $V$  is initial volume ,*

*Final vol  $V' = 1.0147 V$*

*Initial density  $\rho = m/V$*

*Final density  $\rho' = m/V' = 0.9855 \rho$*

*Fractional change in density =  $(\rho - \rho')/\rho$*

*= 0.145*



A brass rod of length 50cm and diameter 3mm is joined to a steel rod of the same length and diameter. What is the change in length of the combined rod at 250°C, if the original lengths are at 40°C?  $\alpha_{\text{brass}} = 2 \times 10^{-5} \text{ }^{\circ}\text{C}^{-1}$   $\alpha_{\text{steel}} = 1.2 \times 10^{-5} \text{ }^{\circ}\text{C}^{-1}$ .

The woolen blanket  
keeps our body  
warm, but on  
wrapping ice with the  
same blanket, it  
keeps ice cold. Why ?

A piece of paper wrapped tightly on a wooden rod is observed to get charred quickly when held over a flame as compared to similar piece of paper when wrapped on a brass rod .

Explain why ?

The bulb of one thermometer is spherical while that of the other is cylindrical. Both have equal amounts of mercury. Which one will respond quickly to temperature changes ?

For a given volume , the surface area of a cylinder is larger than that of sphere. So heat will be quickly conducted through the cylindrical bulb. ( which will respond quickly. )

On a hot day , a car is left in sunlight with all the windows closed . After sometimes, it is found that the inside of the car is considerably warmer than the air outside. Why?

A body is at  
 $0^{\circ}\text{C}$  . Is it  
radiating  
heat ?