Heat conduction in metal rods – transcript

This experiment will show how the heat conductivity of a solid can be easily and quickly demonstrated. It will show which of five different metals is the better conductor of thermal energy.

The equipment is set up by placing the heat resistant plate on the tripod. The heat resistant plate acts as an insulator and is a barrier between the metal rods and the tripod.

Some petroleum jelly is transferred to a dish. It will be used on the metal rods.

To the end of each metal rod a generous amount petroleum jelly is added. About the same amount of petroleum jelly is used on each rod. This ensures that the results are not distorted by different melting rates of larger, or smaller amounts of petroleum jelly.

The rods are placed on top of the heat resistant plate, with either end of the rod clear of the plate edges.

A drawing pin is placed gently on the petroleum jelly at the end of the rod

This is continued with the other rods in the same way. Eventually the rods will all be arranged in a fan shape like this.

To tell how well each of the rods conduct thermal energy the rods will be heated and the time taken for the drawing pins to fall off will be observed and recorded.

The Bunsen is lit and brought to a gentle blue flame.

The Bunsen flame is placed at the ends of the rods opposite the drawing pins. A gentle heat is used otherwise the softer metals may begin to melt.

The timer is started.

As the metal rods are heated, thermal energy starts to move along the rods towards the other end.

Consider how the thermal energy moves along the rod.

The particles in the metal rod nearest the flame start to vibrate as they absorb thermal energy. Adjacent particles also start to vibrate as the thermal energy is transferred from one particle to the next gradually along the rod.

The drawing pins and petroleum jelly on the end of each of the metal rods are observed closely. The petroleum jelly begins to melt as the thermal energy heats the end of the rod until the drawing pins begin to fall one by one.

The time taken in seconds for each drawing pin to fall is recorded.

Carry on recording the times for each of the metal rods until all the drawing pins have dropped.

You should end up with a table of results like this.

Remember to turn off your Bunsen and allow the rods to cool fully before handling them.

The results can be illustrated by drawing a bar chart like this

For these results, what can be concluded about the relative conductivity of these metals?

The drawing pin that dropped the quickest was from the copper rod at 12 seconds. It can be concluded that the copper rod was the best at conducting thermal energy in this experiment. Zinc took the longest to conduct thermal energy with the drawing pin dropping at 80 seconds. It is the worst conductor of thermal energy in this experiment.

The thermal conductivity of different metals is important to us in our everyday lives.

Consider if you were to use the experiment results to design a cooking pot. What metal would it be made it out of? Would the handle or other parts of the pot be made of the same material?

Think about other products where thermal conductivity is important. What materials are they made from and why is that?