7 Keeping in the heat

To keep things warm, a material must stop heat being lost.

We all know how important it is to wear warm clothes in cold weather (Picture 1).
A material that holds the heat in is called an **INSULATOR**.

Testing insulators

There is no easy way to see whether a material lets heat through quickly or not. The only way is to test it.

▼▶ **(Picture 1) All of the materials used in ski clothing are thick. This is especially true of the clothes used to protect hands and feet, which suffer from the cold most of all.**

A simple test is to find out about how well the materials stop heat from flowing through them.

In Picture 2, the same amount of hot water has been poured into three coffee cups (the cups are made from thick foam). Three different thin materials have been placed on top of each of the cups (a piece of aluminium foil, a sheet of paper and a handkerchief).

After 30 seconds, each of the materials was touched carefully to see if the heat could be felt flowing through it. In a second test, a thermometer was used to measure the temperature of each material (Picture 3). This was a more accurate test than the touching test.

Finally, the materials were all doubled up in thickness and the test tried again. This showed that the thicker the material, the less heat flowed through.

Any materials that let heat through easily are not good insulators. They are good **CONDUCTORS** of heat.

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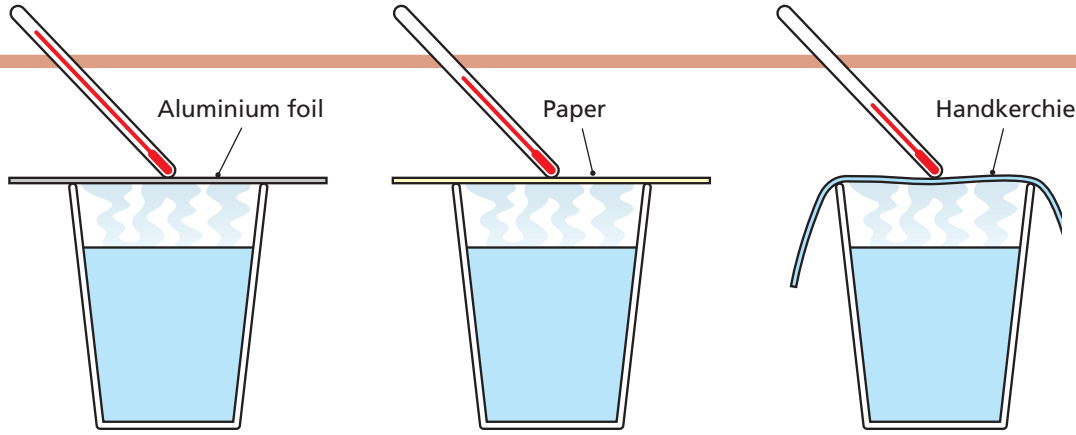


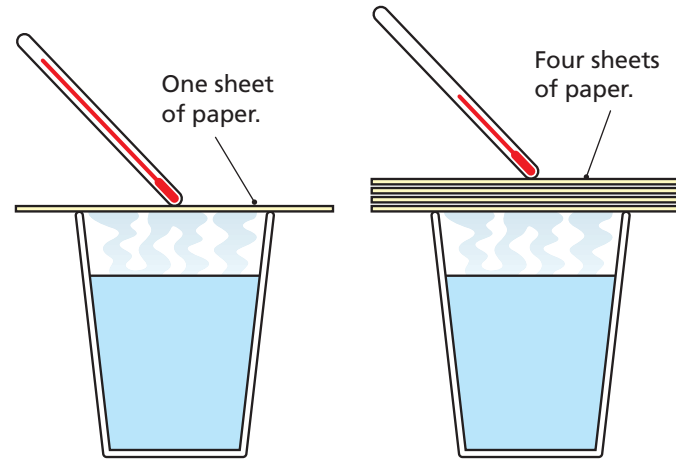
◀ **Picture 2) The rate that heat can flow through a material depends on what it is made from.**

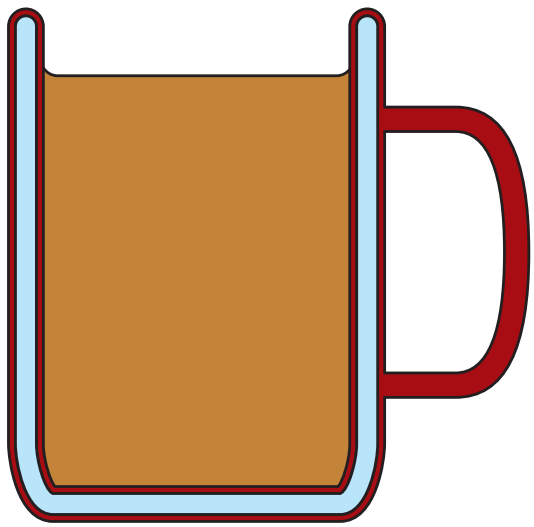
Invisible insulator

There are many solid materials that won't let heat through. But there is one surprising substance that holds heat in. You can't see it, you can't touch it and you can't smell it. So what is it? It is air.

You can see lots of examples of this. Look at an insulated mug. It is made from two walls of plastic with air trapped between them (Picture 4).

▼ **Picture 3) Thickness affects how fast heat can flow through a material.**





▲▶ **Picture 4) An insulated mug has a double wall of plastic to hold the liquid. Air is trapped between the walls. Plastic and air together make a good lightweight insulator.**

Care with hot water

Summary

- **Heat flows more quickly through metals than through any other material.**
- **Insulators can be solid or they can make use of trapped air.**

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