Conduction – travelling heat

Heat travels from hotter objects to colder ones. If the objects are touching, the way the heat moves is called CONDUCTION.

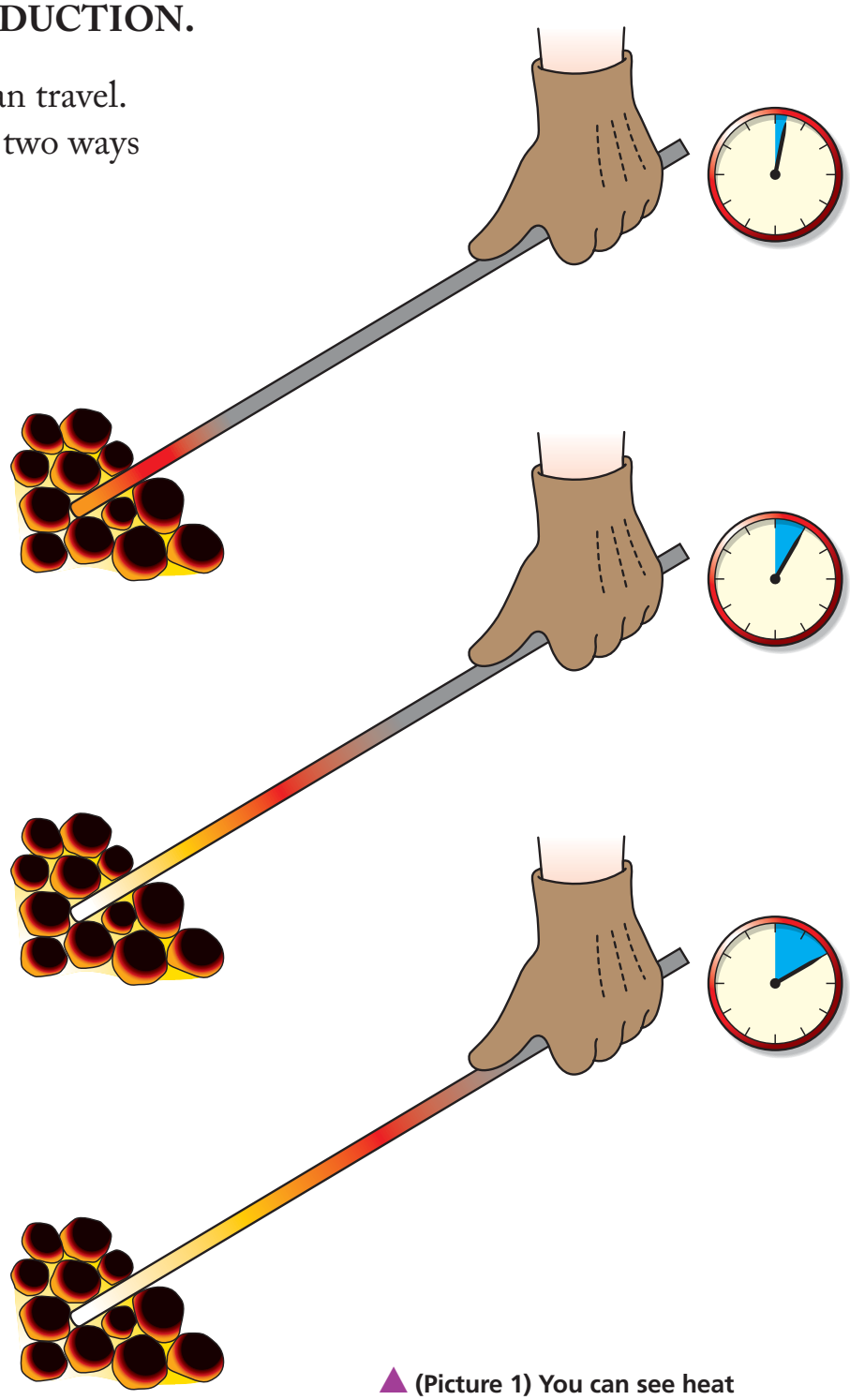
There are three ways that heat can travel. One way is given here; the other two ways are shown on pages 10 to 13.

Warmth by touching

If you placed a poker in a fire, the end in the fire would get hot because it would be touching the fiery coals (Picture 1). But after a few moments, more and more of the poker would start to get hot until, if it were kept in the fire too long, the poker would be too hot to touch even at the end furthest from the fire. Notice that the heat has travelled from the coals to the rod, and then from the hot end of the rod to the cold end. You should remember that heat always travels this way – from hotter places to colder ones.

Conductors

Some things are very good at allowing heat to travel through them. They are called **CONDUCTORS**. Metals are very good conductors of heat, as you could tell from what happened to the poker in the fire.



▲ **(Picture 1) You can see heat travelling up a poker by the way the metal changes colour. As the metal gets hotter, it becomes first red, then white.**

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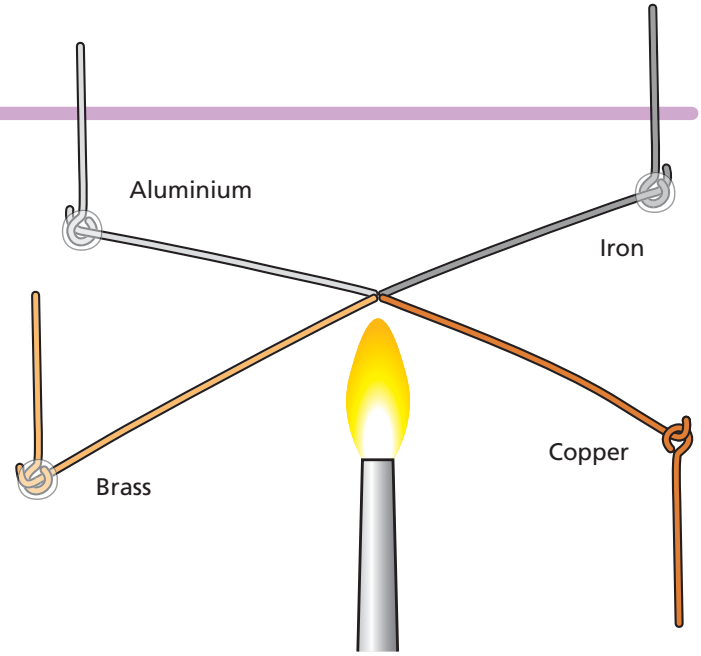
The reason a metal object at room temperature feels cold to the touch is because the metal is conducting heat away from your skin.

Some metals, however, are even better conductors of heat than others (Picture 2). Copper is one of the best conductors, which is why it is used in high-quality cooking pans. Aluminium is cheaper, and almost as good a conductor, so it is used in cheaper pans. Iron is not as good a conductor, so is less commonly used for pans.



▲ **(Picture 2) In this experiment, copper, aluminium, iron and brass hooks are attached to wires of the same metals with blobs of wax. When the wires are heated, the copper conducts heat best and so the wax melts first and the copper hook falls first.**

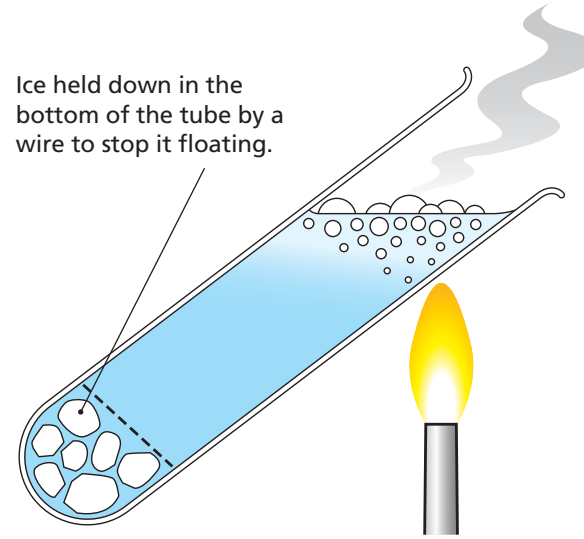
Insulators

Things that conduct heat poorly are called **INSULATORS**. Nearly everything besides metal is a poor conductor – and therefore an insulator. For example, the air around us is an insulator, as is water.

One way to show that water is a poor conductor is to put a pan of water under a grill and heat it from above. It is easy to get the water to boil at the top of the pan while the water in the bottom stays cooler. You can even keep ice and boiling water near each other in the same tube for several minutes before the ice melts (Picture 3).

Skin is a poor conductor of heat. This is why, if you touch a hot object, you are likely to burn yourself: the heat cannot be carried away quickly, and so the surface of your skin gets hot enough to burn.

Note: metals are usually good conductors of both heat and electricity.



▲ **(Picture 3) Water conducts heat very slowly. In fact, you can boil water in the top of a tube without melting ice cubes at the bottom. (To find out why the water is heated from the top in this case, see convection, page 10.)**

Summary

- **Conduction is the flow of heat between two things that are touching.**
- **Heat travels from the hotter object to the colder one.**
- **Metals are the best conductors.**
- **Water and air are poor heat conductors, and are called insulators.**