Convection – rising heat

Heat makes liquids and gases expand and get lighter. As a result, they rise. We call the rising heat CONVECTION.

Water and air are very poor conductors, but they still allow heat to travel very efficiently. How do they do this?

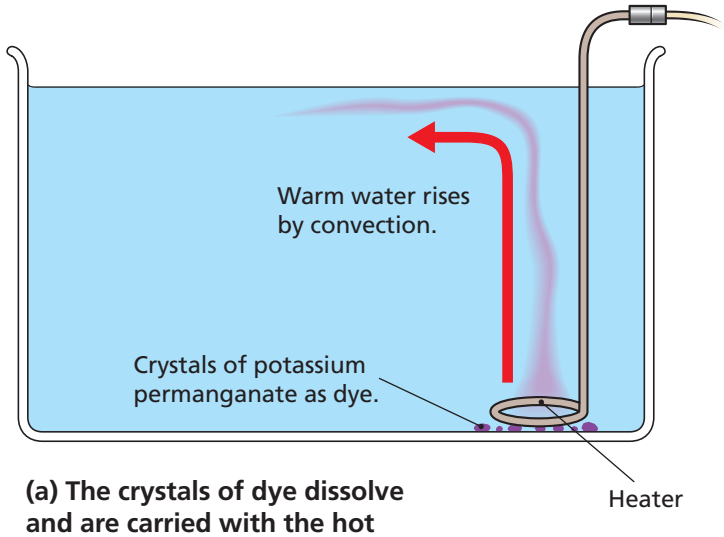
Rising heat

To understand why heat travels through gases and liquids like air and water, we first need to know that liquids and gases both flow easily. We also need to know that hot things weigh less than cold things – they get lighter as they warm up. These two properties explain how heat moves through air and water – it moves by something we call convection.

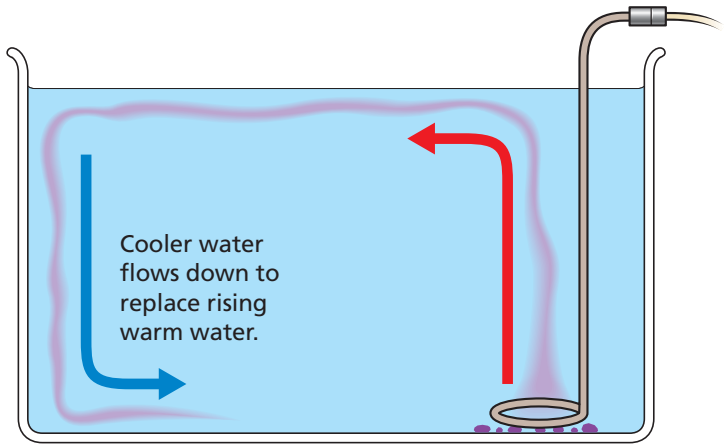
How convection works

Remember that in Picture 3 on page 9, we heated water from above. In that example, the hot water stayed on top of the ice because it was lighter than the water below. But when water is heated from below, something very different happens (Picture 1). The water at the bottom gets lighter and rises up through the colder water, bobbing to the surface like a cork. At the same time, colder water sinks to the bottom, and is heated in turn.

As you can see, the result is a natural churning, or overturning movement, that makes sure that the heat is spread evenly through the water.



(a) The crystals of dye dissolve and are carried with the hot water, showing its path as it rises to the surface.



(b) The hot water on the surface cools and sinks on the opposite side of the tank, while more hot water rises.

▲ **(Picture 1) The way convection works is easily seen by using a dye to trace the flow of water. After a while the water in the tank becomes uniformly coloured, showing how convection stirs the water up. For convection to work the heater must be placed at the *bottom* of the tank.**

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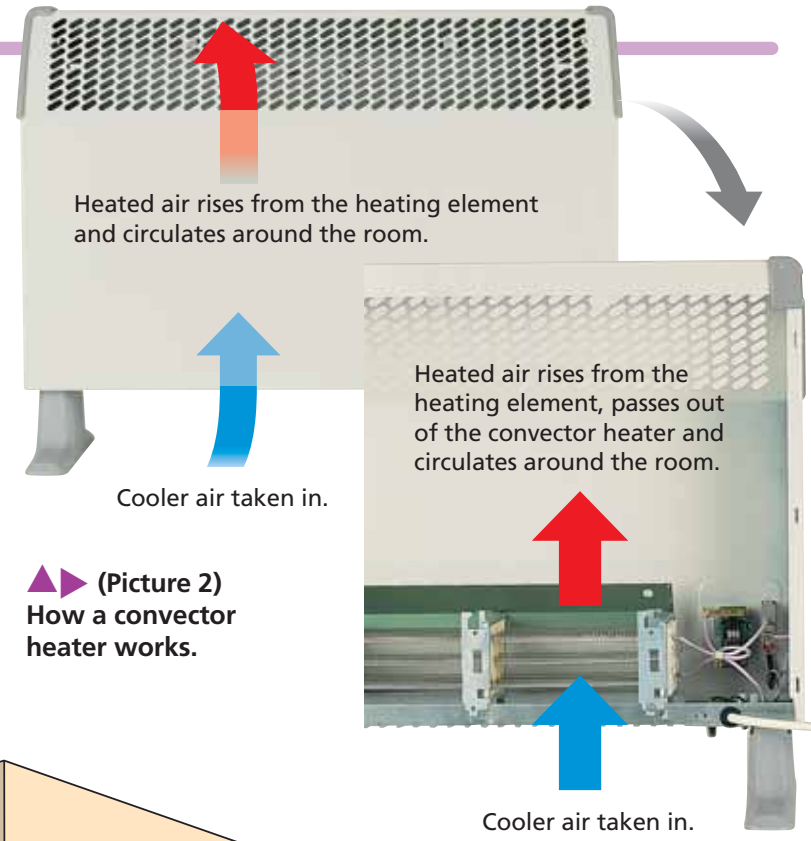
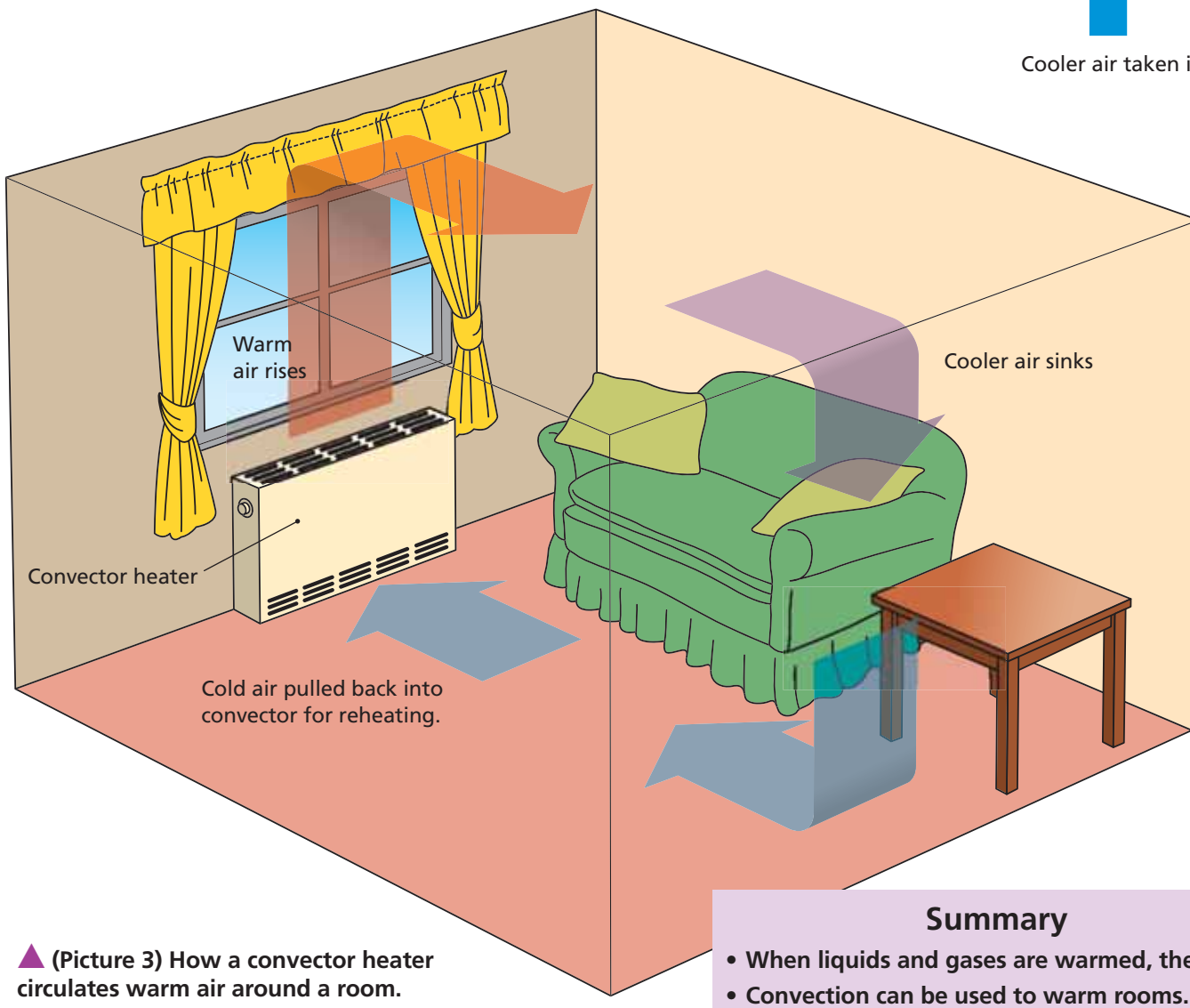
Convectors

A convector heater is a very effective way of heating air (Picture 2). It works like a chimney with an electric heater at the bottom. As the heater warms the air, the air gets lighter and rises up the 'chimney' inside the heater. Cold air is then drawn in from below.

Using this method, warm air can be circulated around a room without using any fan or motor (Picture 3).



(Picture 2) How a convector heater works.



(Picture 3) How a convector heater circulates warm air around a room.

Summary

- When liquids and gases are warmed, they rise.
- Convection can be used to warm rooms.

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