Heat and temperature

When we know the **temperature** of something, we know how hot it is, not how much **heat** energy (**thermal energy**) is in it.

Temperature is measured in **degrees Celsius** (℃).

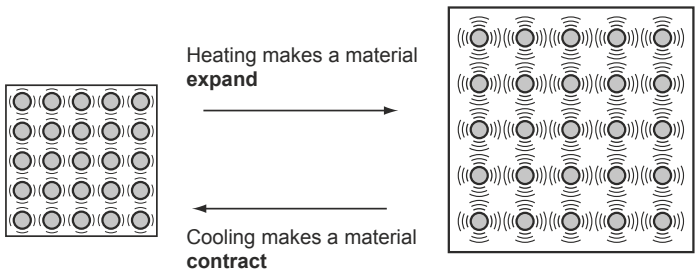
Heat (thermal) energy is measured in **joules (J)**.

The amount of heat or thermal energy in something depends on:

- how hot it is (its temperature)
- the material it is made from
- its mass.

Transferring heat energy

The **particle model of matter** helps to explain how some forms of heat energy travel. The theory suggests that everything is made of moving or vibrating particles. When these particles are heated, they move faster and further, so they take up more room. The material expands.



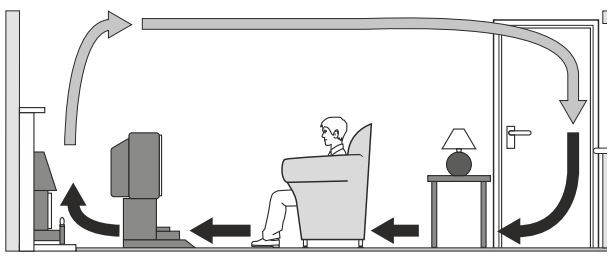
Heat energy can be transferred in three different ways.

Conduction takes place in solids and can also happen in liquids (although not very well). The particles in a solid are held together tightly. When they gain energy they vibrate faster and further, and the vibrations are passed on. Metals are the best **conductors**. Most other solids are poor conductors.

Particles are not as close in a liquid, so conduction is not very good. Particles are a long way apart in gases, so gases hardly conduct heat at all. Something that does not conduct heat very well is an **insulator**. Liquids, gases, and solids that contain a lot of trapped air are insulators.

Convection takes place in **fluids** (liquids and gases).

When the air near the fire is heated, the particles spread further apart and the air becomes less dense and rises. As it rises it meets cooler air and passes the energy on. Having passed on the energy, it cools and becomes denser. The denser air sinks, setting up a cycle or **convection current.**



Infrared radiation can transfer heat energy through empty space. Radiation does not require the movement of particles. Any hot or warm object gives off or **emits** radiation. When something takes in heat energy from radiation, it is said to **absorb** it.

Infrared radiation is similar to light. It can be absorbed or **reflected**, and it can also be focused.

Black, matt objects are good at absorbing and emitting radiation.
White, shiny objects are bad at absorbing and emitting radiation.

Magnets and electromagnets

Magnetism is a **non-contact force**. A magnet does not have to be touching something to attract it. Magnets attract **magnetic materials**. Iron, nickel and cobalt are magnetic materials. Mixtures, like steel, that include a magnetic material will also be attracted to a magnet. Other metals, such as aluminium or copper, are not magnetic and will not be attracted to a magnet.

north-seeking pole and the **south-seeking pole**, or **north pole** and **south pole** for short.

attract each other.

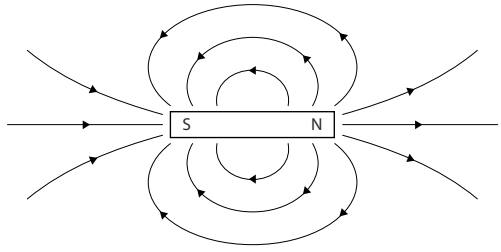
repel

A bar magnet is a **permanent magnet**,
E B B A B ; B (; B B A ; E E B
; B B E B B B A ; B E ; B B A E

Y

Magnetic fields

magnetic field
B A B B ; A ; A
or using a **plotting compass**
. B A B ; (**compass** is a small magnet



This is the shape of the magnetic field of a bar magnet. The magnetic field of an electro magnet is a similar shape.