

**KNOWLEDGE ORGANISER**  
**BIG IDEA: ENERGY**  
**TOPIC: HEATING and COOLING**

Key Word	Definition
<b>temperature</b>	A measure of the energy of individual particles. Measured in degrees Celsius, °C.
<b>thermal energy</b>	A measure of the total amount of energy in an object. Measured in joules, J.
<b>thermal conductor</b>	Material that allows heat to move quickly through it..
<b>thermal insulator</b>	Material that only allows heat to travel slowly through it.
<b>conduction</b>	Transfer of thermal energy through solids by the vibration of particles.
<b>convection</b>	Transfer of thermal energy through fluids (liquids and gases), when hot particles rise.
<b>radiation</b>	Transfer of thermal energy as a wave. It does not require particles so can occur through a vacuum.

The **temperature** of an object is to do with how hot or cold it is, measured in degrees Celsius. Note that the unit of temperature is written as °C, (not °c or oC).

**Conductors**

A substance that transfers energy easily from the hot part to the cold part is called a **conductor**. Metals are good conductors.

**Insulators**

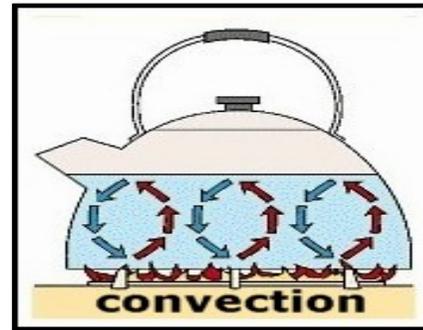
A substance that does not transfer energy easily from the hot part to the cold part is called an **insulator**. Air and plastics are insulators.

Double glazing involves having two panes of glass in the window instead of just one. There is air between the two panes of glass. This reduces energy transfer by conduction. Energy loss through walls can be reduced using cavity wall insulation. Again rapped air is used to reduce conduction and convection. Loft insulation works in a similar way.



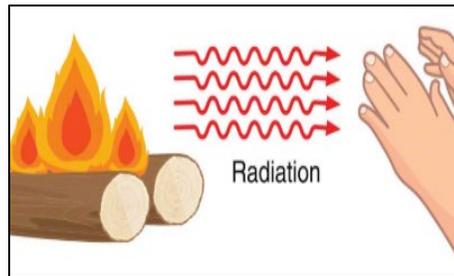
**Conduction**

When a substance is heated, its particles gain internal energy and move more vigorously. The particles bump into nearby particles and make them vibrate more. This passes internal energy through the substance by **conduction**, from the hot end to the cold end.



**Convection**

The particles in liquids and gases can move from place to place. Convection happens when particles with a lot of thermal energy in a liquid or gas move, and take the place of particles with less thermal energy. Thermal energy is transferred from hot places to cold places by convection



**Radiation**

All objects transfer energy to their surroundings by **infrared radiation**. The hotter an object is, the more infrared radiation it gives off.

No particles are involved in radiation, unlike conduction. This means that energy transfer by radiation can work when objects are not touching, even in space:

Radiation is why we are warmed by the Sun, even though it is millions of kilometres away in space

Infrared cameras give images even in the dark, because they are detecting infrared light, not visible light

**Quantities** can be measured. Each quantity has a **unit** of measurement that everyone across the world has agreed to measure it in.

Quantity	unit
Temperature	°C
Thermal energy	J