

Temperature & Heat

Heat is a type of energy. It is measured in **joules (J)**.

Temperature is a measure of how hot or cold something is. It is measured in **degrees Celsius (°C)**.

Heat energy travels from hot places to cold places. There are 3 main methods of heat transfer: **conduction, convection & radiation**.

Conduction

Heat travels through a solid by conduction. Good conductors let heat travel through them easily. Most metals are good conductors.

Some materials prevent heat from travelling through them. These materials are called **insulators**. Most non-metals are insulators.

Insulators

Trapped air is an excellent insulator. Double glazing keeps a house warm because there is a layer of air trapped between the two panes of glass.

This is also why clothes keep you warm. Clothes have tiny pockets of air trapped between their fibres and this prevents body heat escaping.

Convection

Heat travels through liquids and gases by **convection**. When you heat water in a pot, the hot water rises. This is because it becomes less dense. Colder water from the top of the pot is denser, so it sinks.

This sets up a **convection current** that moves all the water past the heat source, eventually heating it evenly. All liquids and gases heat up in this way.

Radiation

Heat can travel through gases by radiation. The radiation travels in straight lines and is also known as infrared rays. Radiation is the only way that heat energy can travel through a vacuum. The heat that gets to Earth from the sun travels through space by radiation.

Shiny surfaces and light colours reflect heat rays, and they are poor at radiating heat.

Dull, dark surfaces absorb heat well, and also radiate it well.

Objects that need to be kept cool are often painted white or silver, to reflect heat.

Objects that need to be as warm as possible are painted dark colours.

Heat in the Home

Heat energy travels from hot areas to cold areas. This means that houses are always losing heat to their surroundings. The colder it is outside, the quicker the heat energy is lost.

Quite apart from making your house feel colder, this also wastes money and isn't environmentally friendly! Houses should be **insulated** to stop heat losses. Common ways of insulating a house are:

- double glazing
- cavity walls
- cavity wall insulation (foam between the walls)
- loft insulation
- draught excluders

Heat loss from a house is caused mostly by conduction. Heat passes through the structure of the building (walls, windows, ceilings and floors). However, heat is also lost by convection (hot air rises and escapes through the loft) and radiation.

Making the Most of a Free Gift

If less heat is lost from a house, less fuel is needed to heat it. This saves money and also ensures the world's fuel supply will last longer.

Every day, large amounts of heat energy reach Earth from the Sun. It is usually lost again at night by radiation. Houses can be designed to take advantage of this free energy and to make sure it doesn't escape easily.

Energy Production

The difference between renewable and non-renewable energy sources is that renewable sources will not run out.

Non-renewable sources are **finite** so they will run out.

Fossil fuels

Most of our energy is provided by burning fossil fuels. There are three main types:

Coal

Oil

Gas

You should be able to say that they are cheap **but** they are finite. This means that they will eventually run out. Because of this we need to conserve them and look for alternatives if possible. They also contribute to air pollution and global warming.

Other Energy Sources

You need to be able to describe the advantages and disadvantages of different energy sources. For example:

Hydro

Tidal

Wave

Solar

Wind

The **advantage** of all of these is that they are renewable. They also provide cheap power once they are set up. However, the **disadvantages** are that they cost a lot of money to set up at the start. They can't be relied upon (it is not always sunny or windy) and the most suitable places are often far from where the power is needed.











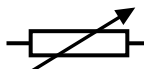

Nuclear – One advantage is that it produces no carbon dioxide so it does not contribute to global warming. One disadvantage is that it produces nuclear waste which needs to be disposed of safely.

Remember, nuclear is a non-renewable source. It uses uranium which will eventually run out.

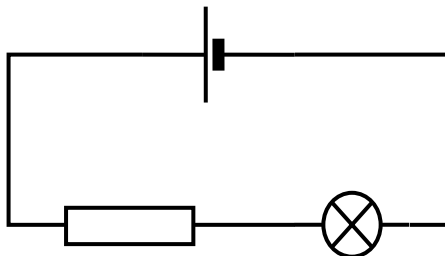
Circuits

For current to flow around an electrical circuit it must be continuous. There must be no break in the circuit.

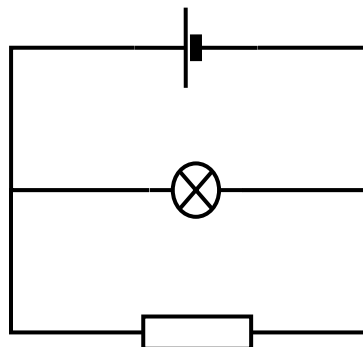
In electrical circuits, diagrams are used to clearly and neatly describe a circuit. They must be drawn using clear symbols which everyone understands. When drawing a circuit remember to always use a ruler and never place symbols at corners. You must be familiar with these symbols:

 Cell	 Resistor	 Voltmeter
 Battery	 Bulb	 Ammeter
 Switch	 Motor	 Ohmmeter
 Fuse	 Variable Resistor	 Loudspeaker

If all the components are in the same branch the current can only follow one path. This is called a **series circuit**.



If the current can follow more than one path this is called a **parallel circuit**.



Electricity in the Home

What is power?

Power is a measure of how much energy is used each second.

Power is measured in watts (W).

The ratings plate

Most appliances which plug into mains electricity will have a ratings plate which gives information about the power it uses.

The ratings plate shown here is for a fridge freezer. It shows it is rated at 450 Watts.



Appliances like irons or kettles which heat up usually have high power ratings.

Money Saving Tips

When we pay our electricity bills, we pay for the energy we use so we can save money by either:

- Using appliances for **less time**.
- Using appliances which have a **lower power rating**.

The best way to save money on your electricity bills is to make sure that appliances, lights and heating are switched off when not needed.

You can also:

- Use energy saving light bulbs where possible.
- Switch off lights when not in use.
- Do not leave the oven on when not cooking food.
- Only boil as much water as you need in a kettle.
- Switch off TV's, computers etc when not in use.

Safety

You should know that you should be careful when using electricity around water.

Also, fuses are used to make circuits safer. If too much current flows then the fuse melts. This stops current flowing and makes the circuit safe.

Electricity Production

Electricity is produced by moving magnets next to wires. This causes current to flow in the wire. Usually we use a coil of wire.

To make the current stronger you can:

- Make the magnet stronger
- Move the magnet faster
- Use more turns on the coil.