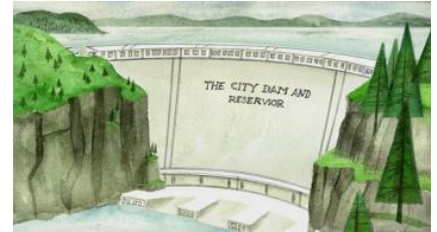


Chapter 37 – Energy

Energy is the ability to do work. It is measured in units called **Joules (J)**. In science, ‘doing work’ can mean a variety of things. We will examine the different type of energy.

Types of Energy

Potential Energy –this is energy something has because of its position or its condition. Good examples of potential energy include water behind a dam (position) and a stretched elastic band (condition)



Chemical Energy – this is energy stored with a substance e.g. food or oil. We release the energy stored in food by digesting it, and energy is released from oil by burning it.

Kinetic Energy – this is the energy something has because it is moving. Examples include a person walking or running.

Heat Energy – the hotter something gets the more energy it will have. If water is heated enough it will turn into steam, steam has the ability to make things move.



Electrical Energy – the ESB supplies us with electrical energy in our homes, but we can also get electrical energy from a battery or a single cell.

Light Energy

The bulb gives out light energy.



Sound Energy

The radio gives out sound energy.



Magnetic Energy

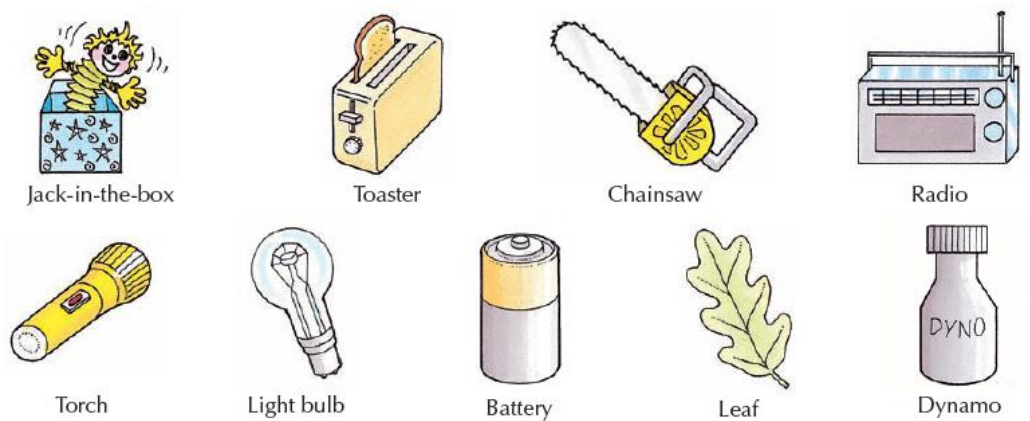
The magnet has magnetic energy Which can make the pins move.



Energy Sources

All energy we have on the Earth comes from the sun in some shape or form. Even oil and gas which we burn is made up the remains of plants and animals that lived on earth millions of years ago. These plants and animals lived off energy from the sun. It is important to realise that we do not create energy. The **Law of Conservation of Energy** states that **energy cannot be created nor destroyed; it can only be changed from one form to another.**

See if you can identify the energy changes present in **all** the pictures below.



Energy conversions – experiments

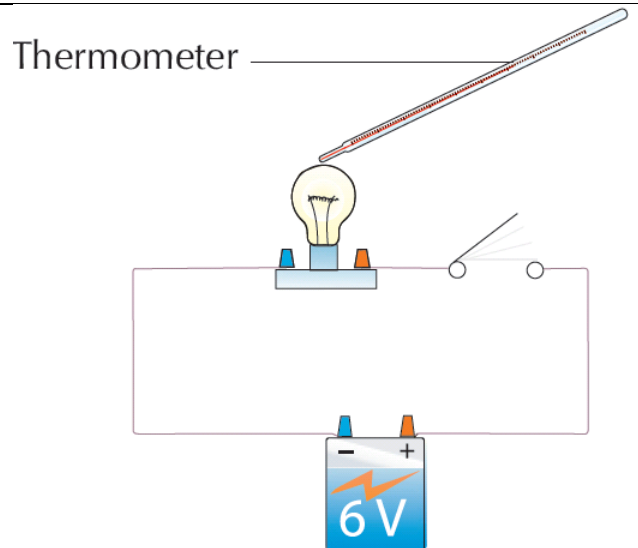
To show the conversion of chemical energy to electrical energy to heat energy

Procedure: set up as shown in the diagram, close the switch and observe what happens.

Result and Conclusion:

The chemical energy in the bulb causes a flow in electric charge, this electric charge causes the bulb to heat up (we can measure this with the thermometer). It heats up so much that it gives off white light. We now have the following energy conversion:

Chemical energy → electrical energy → heat energy → light energy

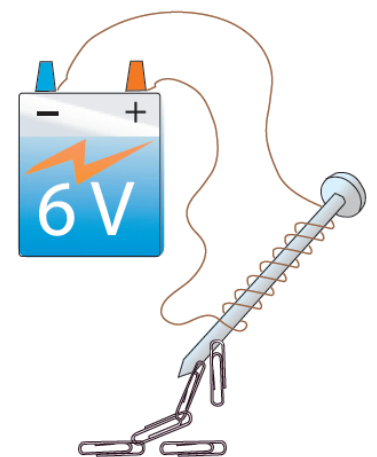


To show the conversion of electrical energy to magnetic energy to kinetic energy

Procedure: set up as in diagram, close the switch and observe what happens.

Result and Conclusion: the nail picks up the paper clips like a magnet when the switch is closed. The electrical energy flowing through the wire has caused magnetic energy in the nail which has caused the clips to move (kinetic)

Electrical energy → Magnetic Energy → Kinetic Energy

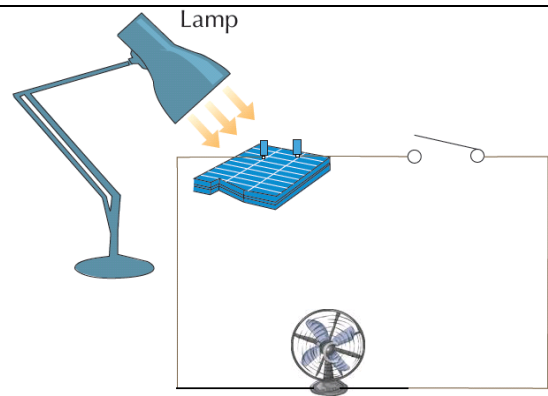


To show the conversion of light energy to electrical energy to kinetic energy

Procedure: set up as in diagram and shine a bright light on the solar cell.

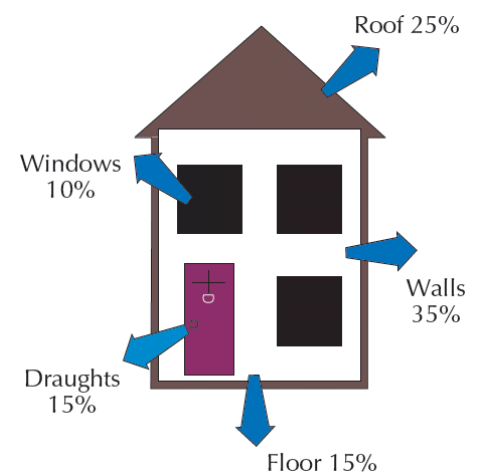
Result and Conclusion: the solar cell converts light energy to electrical energy; the motor then converts this electrical energy into kinetic energy causing the fan to spin.

Light energy → electrical energy → kinetic energy



Energy in the home

Because of the cost of energy and the threat to the supply of oil and gas etc, we need to play our part in helping the environment by not wasting energy. One way to do this is not to leave electrical items switched on when not in use. We also need to ensure our houses are properly insulated from heat energy loss. This diagram shows how much energy could be lost without proper insulation.



Non-renewable energy sources

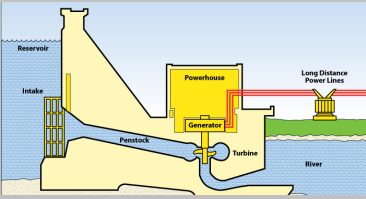



A fuel is any substance that can be used as a source of energy. A lot of our energy comes from burning 'fossil fuels', this is oil, coal and gas which is made up of the remains of plants and animals that lived on the earth millions of years ago.

Unfortunately, fossil fuels will not last forever, they will eventually run out; this is why they are a **non-renewable source**.

Another problem with fossil fuels is that the burning of them causes air pollution leading to the speeding up of the greenhouse effect and global warming.



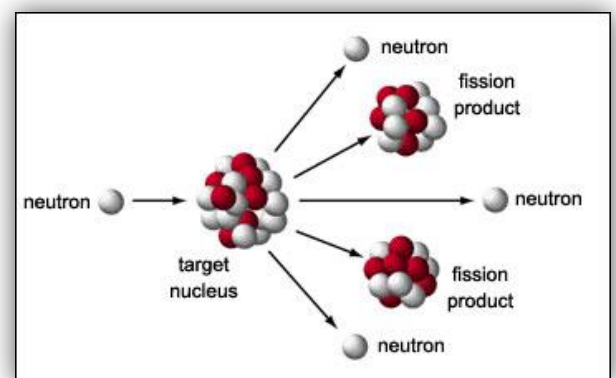
Renewable sources of energy

Type of energy	How it is produced	Disadvantages
Hydroelectricity 	<p>A dam is built across a river forming a lake. Water flowing through the dam turns a generator to produce electricity</p>	<p>Not all rivers and lakes are suitable and it can ruin the habitat of plants and animals where the lake is built</p>
Wind Energy 	<p>Large windmills are used to turn generators.</p>	<p>They are expensive to build, they do not give out a lot of energy, and few areas are suitable. They can be unsightly if located in a scenic area.</p>
Tidal Energy 	<p>A dam is built across an estuary. The flowing water of the tide going in and out turns generators producing electricity.</p>	<p>They are expensive to build and few areas are suitable.</p>
Solar Energy 	<p>The sun's energy is trapped by solar panels and is used to heat water, other solar cells can produce electricity.</p>	<p>The energy is most needed in winter when the sun is at its weakest.</p>
Biomass	<p>Fast-growing plants are used to make alcohol which can be used instead of petrol</p>	<p>Very large areas of land are needed.</p>

Nuclear Energy

Nuclear energy is the energy stored in the nucleus of an atom.

Some substances on the Earth are unstable and give out energy in the form of **radioactivity**; substances such as **uranium** and **polonium**. A much greater amount of energy can be released by a process called **nuclear fission**, this is where a neutron particle strikes a nucleus splitting it up and releasing a huge amount of energy. This also frees up more neutrons and the reaction keeps happening, this is called a **chain reaction** and can be seen in the diagram on the right.



Advantages**Disadvantages**

A fairly large supply of fuel is available. Huge amounts of energy can be released from a tiny amount of fuel.

Reactors are very expensive to build and maintain. Dangerous nuclear waste is produced.

