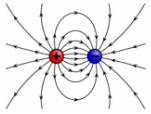
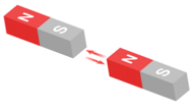
ATHERTON HIGH SCHOOL

Science: Energy

1. Energy stores

Energy is in different energy stores and is measured in Joules (J).

Energy is needed to do 'work'.

Chemical	Stored in food, fuel and batteries	
Electrostatic	Stored when particles have charge	
Magnetic	Stored when magnetic poles come together	
Elastic potential	Stored when a material is stretched or squashed	
Nuclear	Stored in the nucleus of an atom, and the Sun	
Thermal	Stored in objects that are warm	
Kinetic	Stored in objects that are moving	
Gravitational potential	Stored in objects that have height	

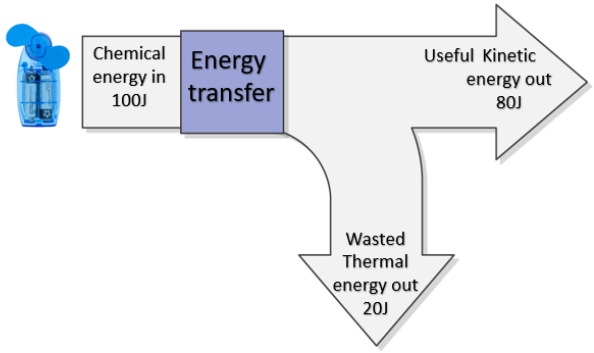
Energy can be transferred between stores in different ways	• By heating • Mechanically • Electrically • By radiation

2. Conservation of energy

*Energy **cannot be created or destroyed**, only transferred from one store to another.*

Total energy in = Total energy out

Wasted energy is not useful so is lost to the surroundings. It **dissipates**



Efficiency measures how much energy is used in a useful way

The less energy that is wasted, the more efficient the machine

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

3. Heat and temperature

Heat	A store of thermal energy, measured in Joules (J)
Temperature	A measure of how much thermal energy a substance has
Thermometer	Used to measure temperature
Degrees Celsius ^{o}C	The units for measuring temperature

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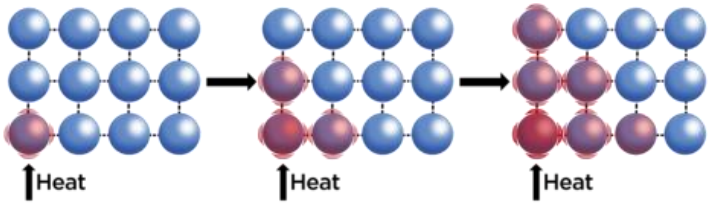
4. Heat transfer - conduction

Conduction	The transfer of thermal energy by vibration of particles
Conductor	A material that easily transfers thermal energy through vibrating particles
Insulator	A material that does not easily transfer thermal energy through vibrating particles

When one end of the substance is heated, energy is transferred to the particles. These particles collide into the next particle along, transferring that energy from one particle to another along the material.



Metals are very good conductors of heat because they contain free electrons that can move freely throughout the material. This means that the vibrations can pass quickly from one end of the material to another.

5. Heat transfer - convection

As particles near the heat source are heated, they spread out and become less dense, so they rise.

Cooler, more dense particles will take their place at the bottom.

This creates a constant flow of particles.

This is known as a **convection current**

6. Heat transfer - radiation

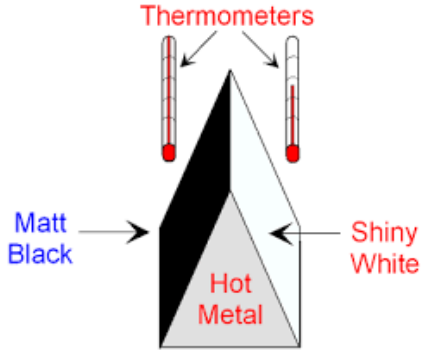
Radiation is method of transferring energy without the need for particles.

Thermal energy is transferred from the Sun to the Earth in this way as there are no particles in space. This is known as **infrared radiation** and it travels as an energy wave. The hotter an object, there more infrared radiation it will **emit**.

The surface of objects effects the amount of infrared radiation it can **emit, absorb and reflect.**

Matt black is the best surface for **emitting and absorbing** infrared radiation

Shiny white surfaces are the best at **reflecting** infrared radiation



7. Energy losses in the home

Energy losses in the home can increase the cost of heating a home. Thermal energy is lost as infra-red radiation.

Energy losses in an uninsulated home.

Type of insulation	How heat lost is prevented.
Double or triple glazing	Layer of air between the panes of glass prevents conduction.
Fibreglass loft insulation	Contains pockets of trapped air to prevent conduction
Cavity wall insulation foam	Contains pockets of trapped air which prevents conduction