wymondham high

Yr 8 Science P2.2

Section 1- Food and Fuels

Energy is measured in **joules** (J).
1000 J = 1 **kilojoule** (kJ).
There are different amounts of energy in the **chemical store** of food and fuel.

Food	Energy (kJ) per 100g
apple	200
chips	1000
chocolate	1500

You need different amounts of energy for different activities:

- Sitting uses 6kJ per minute
- Walking uses 13kJ per minute
- Running uses 60kJ per minute

Section 2 - Energy Adds Up

The **law of conservation of energy** states "Energy cannot be created or destroyed; it can only be transferred"

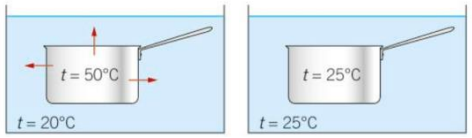
Energy Store	Associated object/action
Chemical	Food, fuel, batteries
Thermal	Hot objects
Kinetic	Moving objects
Gravitational potential	Position in a gravitational field (can fall)
Elastic	changing shape, squashing or stretching

When thermal energy is transferred to the surroundings we say the energy has **dissipated**.

Section 3 - Energy and Temperature

Thermometers measure temperature in degrees **Celsius (°C)**.
Temperature measures the *average energy* present.
The thermal energy store is the *total energy* present.
As we heat things particles gain kinetic energy and vibrate faster. The energy required depends on:

- The mass of material.
- What the material is made of.
- The temperature rise required.

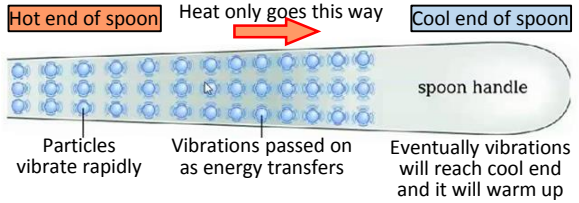


Energy will transfer from the hot pan to the cold water until it is in **equilibrium**.

Section 4a - Energy Transfer - Conduction

Thermal energy can be **transferred** by **conduction**, **convection** or **radiation**.

When particles in a solid are heated they begin to vibrate, this causes them to collide; passing on the energy.

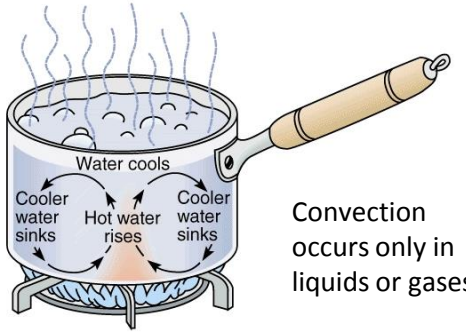


Materials that let energy pass through them easily are called **conductors**.
Conduction happens most efficiently in solids; liquids are poor conductors.

Materials that do not allow energy to pass through them easily are called **insulators**.

Section 4b - Energy Transfer - Convection

When particles are heated they begin to vibrate this allows them to move apart; becoming less dense. The heated particles rise.
As they cool the particles move closer together again becoming denser; this causes them to sink. They heat again at the bottom.
This creates a **convection current**.

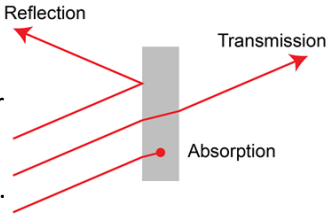


Convection occurs only in liquids or gases.

Section 5 - Energy Transfer - Radiation

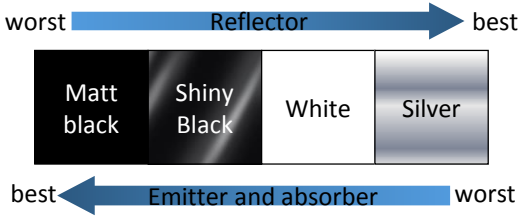
This type of heat transfer does not involve particles. Heat is transferred by infrared radiation, which is a wave of energy; this is how energy is transferred from the Sun.

Radiation can be reflected, transmitted or absorbed.



All objects **emit** infrared.

The amount emitted depends on: temperature, the colour of the surface and how rough or smooth that surface is.

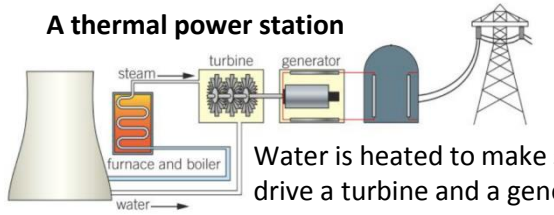


Section 6 - Energy Resources

Renewable source	Non-Renewable source
Wind Turbines Tidal power Wave Power Solar Power Hydroelectric Geothermal Biomass	Fossil Fuels: Oil,Gas,Coal Nuclear

Fossil fuels are burnt in a **thermal power station**. They produce carbon dioxide a greenhouse gas.

A thermal power station



Water is heated to make steam to drive a turbine and a generator.

Section 7 - Energy and Power

Power is the rate at which we transfer energy, it is measured in **watts** (W).
1000 W = 1 **kilowatt** (kW).
You can calculate your energy usage in kW/hour

$$\text{power (W)} = \frac{\text{energy (J)}}{\text{time (s)}}$$

Section 8 -Work, Energy and Machines

Sometimes energy is transferred by doing **work** e.g. lifting a book against the force of gravity.

$$\underset{\text{(J)}}{\text{work done}} = \underset{\text{(N)}}{\text{force}} \times \underset{\text{(m)}}{\text{distance}}$$

To make the work easier you can use a **lever**. This increases the force you are using. E.g. opening a paint tin with you hand or a screwdriver.

Gears work in a similar way; they are turning levers. Gears can be used to increase the force, change direction or go faster.