

Types of Energy

| | |
|--------------------|---------------------|
| Heat (thermal) | Light |
| Atomic | Electrical |
| Chemical* | Gravitational (GPE) |
| Kinetic (movement) | Strain* (Elastic) |
| Sound | |

* Potential (stored) energy

Conservation of Energy

Energy can not be created or destroyed. It can only be transferred from one type to another.

Chemical Electrical Light and heat

Sankey Diagrams

Input energy Useful energy

Waste energy

Sankey diagrams show energy transfer. The width of each arrow represents the amount of energy.

Units Joules (J) kilojoules (kJ) % kWh

Calculating efficiency

$$\text{Efficiency} = \frac{\text{useful energy out}}{\text{total energy in}} \times 100$$

Energy in Food

The energy in food is measured in kcal (kilocalories) or kJ (kilojoules)

Sea Salt Fudge

| Nutrition Information per 100g as sold | |
|--|--------------------|
| Energy | 1400 kJ / 335 kcal |
| Fat | 7.8g |
| - of which saturates | 4.9g |
| Carbohydrate | 62.9g |

1kcal = 4.2kJ

Your **GDA** (guideline daily amount) is the recommended amount of energy you require in a day.

Typical GDA (depends on level of activity)
 Adult man 2500kcal Adult woman 2000kcal Child 1800kcal

Calorie is another way of saying kilocalories.

Investigating energy in Food

Independent variable
Type of food

Dependent variables
Change in temperature (°C)

Control variables
Mass of food, volume of water, distance to boiling tube, etc.

Paying for Electricity

The amount of energy transferred is:

$$\text{Energy transferred (kWh)} = \text{power (kW)} \times \text{time (h)}$$

$$\text{Cost (£ or p)} = \text{Energy transferred (kWh)} \times \text{price (£ or p)}$$

e.g. A kettle with a power rating of **3kW** is used for **1.5hrs** a day. The electricity company charges **£0.14** per kWh.

$$3\text{kW} \times 1.5\text{h} = 4.5\text{kWh} \times \text{£}0.14 = \text{£}0.63$$

Conduction

Thermal energy transferred from one particle to the next by vibration

Hot to cold

Heat ↑

Some substances are better **conductors** than others (**insulators**)

Radiation

Thermal energy transfer via infra red radiation (waves).

Thermal energy radiates through space from the sun.

Thermal energy radiates through air from a fire

Radiation

Investigating insulation

Independent variable
Type of insulation

Dependent variables
Decrease in temperature (°C)

Control variables
Type of beaker, volume of water, start temperature, time

Water

No insulation Cardboard Bubblewrap

Thermometer

01:00 min:sec Stopwatch