

9I Electricity and energy...Energy types and transfer

lesson




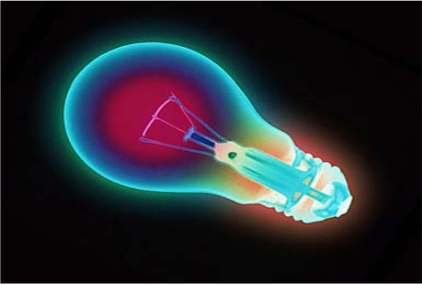




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Types of energy

Energy cannot be *destroyed* or *created*, it can only be *transformed* from one type to another using a device. Energy is measured in joules, for example a 60 watt light bulb uses 60 joules of electrical energy per second. A *KitKat* contains about 900 kilojoules of chemical energy. There are *eight forms* of *energy*.

Energy types:

Type	Electrical	Gravitational	Kinetic	Light
Diagram				
Examples	_____ ? _____ ?	_____ ? _____ ?	London eye _____ ?	Light bulb _____ ?
Type	Heat	Sound	Chemical	Elastic
Diagram				
Examples	_____ ? _____ ?	_____ ? _____ ?	_____ ? _____ ?	_____ ? _____ ?

Energy and the joule

Energy is measured in units called **joules**. Using joules allows you to compare how much energy in joules, something uses per second (*e.g. a light bulb*) or contains (*e.g. a chocolate bar.*) The joule is a very small unit of energy. For example; to lift a **100g weight, one metre** above the Earth's surface, **one joule** of energy is used. Compare this to the energy contained in a *KitKat* which is approximately 900 kilojoules or 900,000 joules. That means to burn off the energy in one *KitKat*, you would have to lift the 100g weight one metre above the Earth's surface a mere 900,000 times !

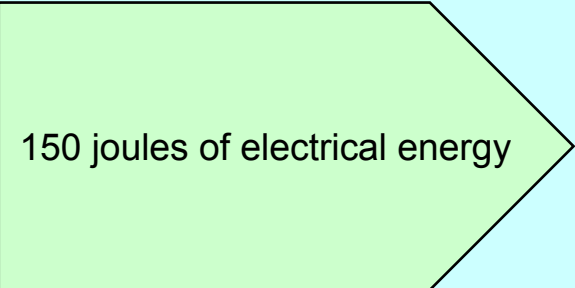

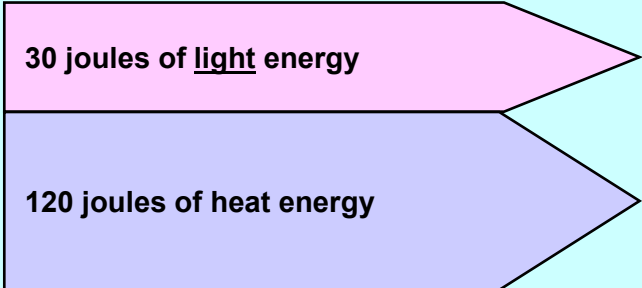
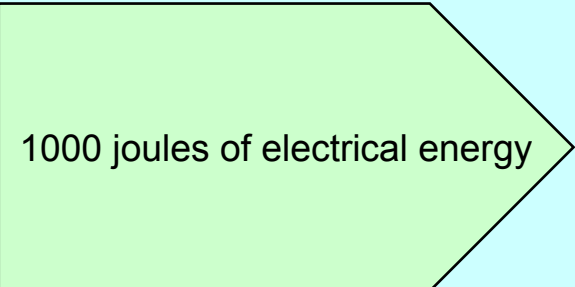

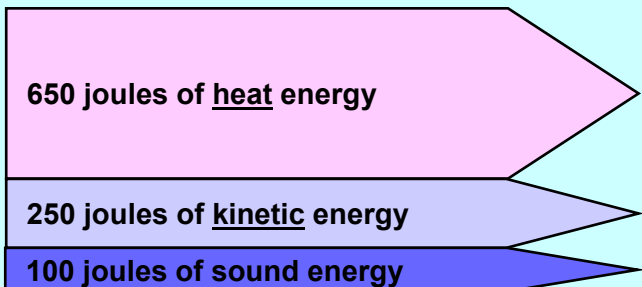
Energy and the joule:

	Bulb	Chocolate	Hairdryer	Burger meal
Diagram				
Notes	A 60 watt bulb uses 60 joules per second. <i>How much would a 100 watt light bulb use in one second, five seconds and one hour ?</i>	A <i>KitKat</i> bar weighing just 50 grams contains 900 kJ. <i>If your daily allowance is 12,000kJ, how many Kitkats can you eat to fulfil your daily energy requirements ?</i>	A 900 watt hairdryer will use 900 joules of electrical energy per second. <i>How many joules would this hairdryer use in one minute ?</i>	A burger meal with fries and a sugary fizzy drink supplies almost 5000kJ. This is just under half the kilojoules you require for a whole day. <i>Why is junk food linked to obesity ?</i>

Energy transformations

Energy can be transformed from one type to another by using a device like a bulb, motor or buzzer. During *energy transformation*, some useful energy can be lost to the environment. A simple device like a light bulb, for example transfers electrical energy to light and heat energy. Only the light energy is useful energy with the heat energy being lost to the environment. *Work out the energy transfers when you a) light a firework, b) digest a KitKat & c) Burn wood ?*

Energy transformations:

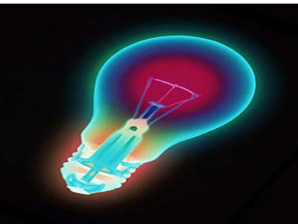


Diagram			
Notes	<p><i>A Light bulb transforms electrical energy into which forms of energy ?</i></p>		
			
Notes	<p><i>A hairdryer transforms electrical energy into which forms of energy ?</i></p>		

Energy transformations and efficiency

When energy is transformed into another form, some useful energy is lost to the environment. The efficiency of a device can be worked out by comparing the total input energy against the useful output energy. Using a engine as an example, for every 100 joules of chemical energy, only 20 joules of kinetic energy is produced giving the engine a 20% efficiency rating. *Look at the examples below, the useful output energy is underlined.*

Energy efficiency = Useful energy out/total input energy x 100 (units %)




Energy transformations:

Example	Energy in	Device	Energy out	Energy efficiency
One	150 J of electrical		30 J of <u>light</u> energy 120 J of heat energy	Calculation: $30J/150J \times 100 = 20\%$
Two	10,000 kJ of kinetic		7500 kJ of <u>electrical</u> energy 2500 kJ of heat energy	Work out using the formula, the energy efficiency of a wind turbine ?
Three	100 kJ of electrical		25 kJ of <u>sound & light</u> energy 75 kJ of heat energy	Work out using the formula, the energy efficiency of a plasma television ?

Sources of energy

Energy comes in both **renewable** and **non renewable** forms. Non renewable **fossil fuels** like coal, natural gas and oil, are rich in the element carbon and can be combusted with oxygen, producing energy in the form of heat. They are fossil fuels because they are formed from once living organisms. Remember that solar energy was the original energy source. **Burning fossil fuels produces carbon dioxide which is termed a greenhouse gas ...Why ?**

Main forms of fossil fuels:

Fuel	Oil	Coal	Natural gas
Diagram			
Source	Remains of dead organic material.	Remains of dead plants.	Found with cruel oil deposits.
Uses	Heating, transport, and generating electricity.	Heating, generating electricity.	Heating, and generating electricity.
Due to run out	60-70 years	300 years	30-40 years