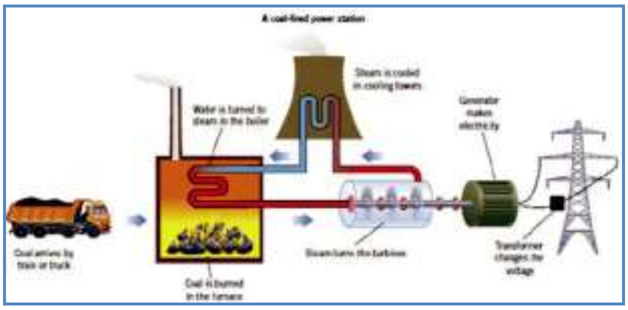
KS3 Physics Knowledge Organiser - Energy Transfers and Energy Resources

Energy cannot be created or destroyed

just transferred from one store to another

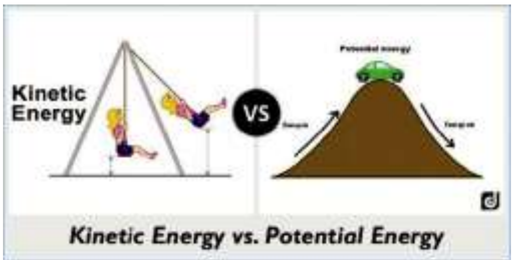
Fuel	Material that is burned to release its energy
Joule	Unit of energy, symbol J
Kilojoule	Unit of energy equal to 1000J symbol kJ
Energy resource	A source of stored energy that can be released in a useful way.
Power (W)	Amount of energy something transfers each second Power(W) = energy transferred (J) ÷ time taken (s)
Watt (W)	Unit of power. Rate of transfer of energy
Kilowatt (kW)	Unit of power. Equal to 1000J
Kilowatt hour	Energy transferred per hour
Energy used	Energy used (kWh) = power (kW) x time (h)
Fossil fuel	Coal, natural gas, oil. Formed from remains of living organisms
Non renewable	An energy source that will eventually run out
renewable	An energy source that will not run out
dissipated	When energy is wastefully spread out
Cost of energy	Cost = energy used (kWh) x price of energy per kWh



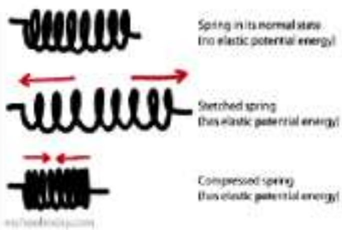
energy is transferred from different stores to provide us with the energy we need for the appliances in our homes to work. Energy is also released from the food we eat. We have to pay for the energy we use in our homes. We must use our resources and appliances responsibly so not to waste energy

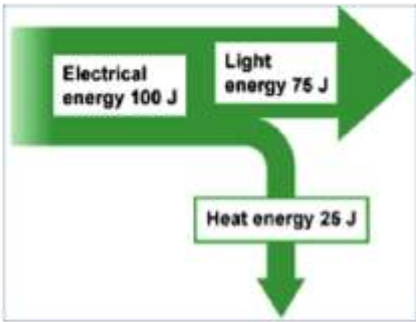
Nutritional Information per 100 g

Protein	18.1 g
Fat	16.2g
Of Which Saturates	(5.2 g)
Carbohydrates	26 g
Of Which Sugars	(7.2 g)
Sodium	0.468 g
Potassium	906 mg
Salt	1.2 g
Fibre	4.7 g
kCalories	322 kCal
kJoules	1347 kJ



Potential energy	the energy in a body due to its position
Kinetic energy	the energy which an object contains because of a particular motion
Elastic energy	energy stored as a result of deformation of an elastic object

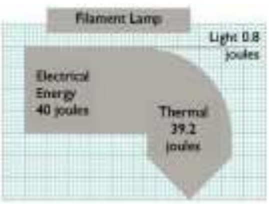


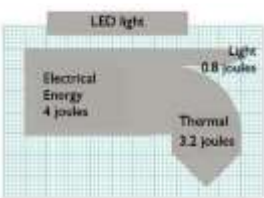


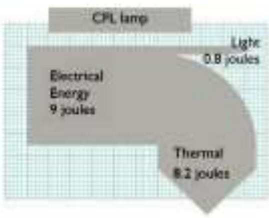
Energy can be stored or transferred, but energy cannot be created or destroyed. This means that the total energy of a system stays the same.
When we use the word system we mean objects that might transfer energy e.g. a plug to a lamp to the surroundings.
The idea that the total energy has the same value before and after a change is called conservation of energy.

The key to understanding this idea is to be able to use Sankey diagrams. These diagrams (shown below and on the left) show how much energy is transferred into the system and where this energy goes.
The numbers on the arrows out of the system should add up to the value of the energy that went into the system. E.g. in the diagram to the left 75J + 25J adds up to the 100J that went into the system.

Any arrow that goes towards the right is a 'useful' energy transfer (i.e. it is what we want the object to do). The arrows facing downwards show wasted energy transfers.
Can you see which object transfers the greatest amount of useful energy?







Energy Resources and Transfers

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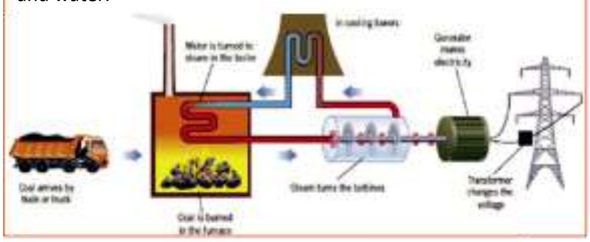
Fossil fuels are burned to release their stored energy. This energy Is transferred into electrical energy in a power station and then sent to our homes to power our appliances. Fossil fuels are non-renewable and will one day run out so we now are using more renewable energy sources such as wind, solar and water.



When we eat food, the energy stored in the food is **transferred** to energy stored in our bodies.
This energy is then transferred again during the body's metabolic processes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Power - Some appliances transfer energy more quickly than others. We say they are more powerful. The quicker they transfer energy, the more expensive they are to run and the more energy they transfer. We can calculate the power of an appliance by using the formula;

$$\text{Power} = \frac{\text{energy transferred (J)}}{\text{time taken for energy transferred (s)}}$$

Energy used (kWh) = power (kW) x time (h)

Electrical appliance	Power rating (W)	Time of usage	Energy consumption (J)
Iron	1200	0.5 hour	1200 × 0.5 × 60 × 60 = 2 160 000
Iron	1200	1.0 hour	1200 × 1 × 60 × 60 = 4 320 000
Kettle	1500	7 minutes	1500 × 7 × 60 = 630 000
Kettle	2000	7 minutes	2000 × 7 × 60 = 840 000

An energy bill shows how much energy is being used and the charges for the electricity and gas is used in a home. Energy used by appliances can be calculated using the formula below

Cost = energy used (kWh) x price of energy per kWh

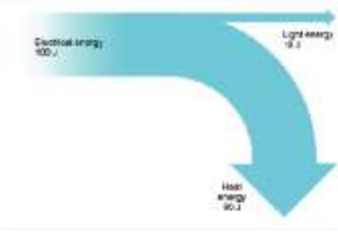
We can use our energy more responsibly by changing to low energy appliances such as energy efficient light bulbs as well as relying more on renewable energy sources

Energy store	A form in which energy can be stored
Energy transfer diagram	Arrows that show how energy is transferred from one store to another
Efficient	How much of the useful energy that was transferred (%)
Sankey	Energy transfer diagram
molecules	Atoms join together to form a molecule
gravitational field	the region of space surrounding a body in which another body experiences a force of gravitational attraction.

kinetic energy KE	Moving things have kinetic energy. The energy store fills up when a moving object speeds up.
Chemical energy	Energy that is released during a chemical reaction
elastic potential energy	Energy stored when a material is stretched or compressed
gravitational potential energy GPE	Energy an object has because of its position in a gravitational field
magnetic energy	Some objects can be magnetised and create magnetic fields. They can exert forces on other magnetised objects, or on magnetic materials
Thermal energy	Energy store filled when an object is warmed up

The higher the object is, the more GPE it has. When the object falls this energy is transferred into KE.
If a cyclist has 6000J of GPE at the top of a hill, at the bottom of the hill all of this energy would have transferred into the KE store. He will have 6000J KE

Energy diagrams
Energy cannot be created or destroyed. Just transformed from one form to another. This is shown in energy diagrams.



A Sankey diagram shows the relative amounts of energy transferred by a device.
The arrow width shows how much energy is transferred.
Wasted energy is shown by a downwards arrow.
Energy transferred out of the system must equal energy transferred into the system.
The greater the useful energy transfer, the more efficient the device