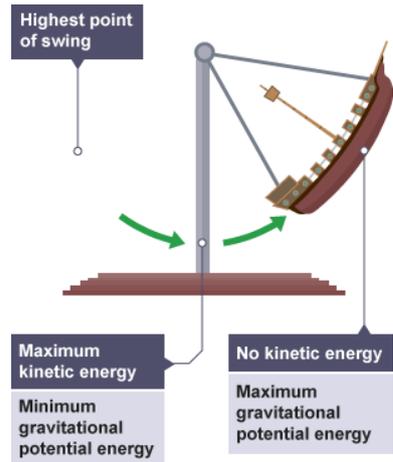
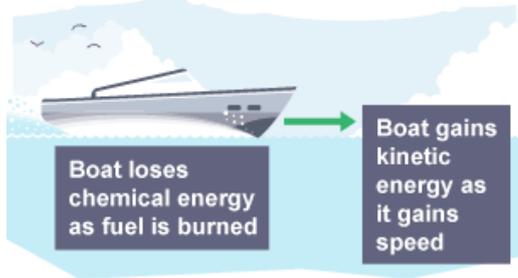


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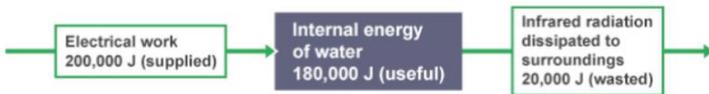
Systems and stores

Energy cannot be created or destroyed only transferred. This means that the amount of energy at the end is the same as the beginning just in different forms

Examples of energy transfers include:



Energy is useful if its transferred into a form you want for example electrical energy goes into a lamp. This is converted to light energy (useful) however no system is 100% efficient energy is always wasted – transferred into non useful forms for example in a lamp energy is transferred into light (useful) and heat (wasted). The less efficient a device the more expensive it will be to use because less energy is transferred into a form which is needed.



When work is done on an object, energy is transferred. The *rate* at which this energy is transferred is called *power*. So the more powerful a device is, the more energy it will transfer each second.

specific heat capacity The amount of energy needed to raise the temperature of 1 kg of substance by 1°C. To calculate practically you need to know:

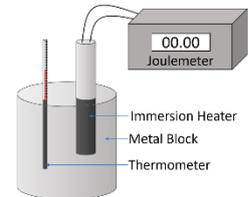
The mass of the material – Measure with a balance

The energy transferred by the immersion heater – Use a joulemeter for this)

The temperature change – measure with a thermometer

Calculate using the equation of the sheet (rearrange it for C)

(This would get you four marks on a six mark practical question)



The major energy resources available to produce electricity are *fossil*

fuels, nuclear fuel, bio-fuel, wind, hydroelectricity, geothermal, tidal, water waves and the Sun.

Ultimately, all the energy on Earth originally comes from the Sun but has been stored as different energy resources.

Energy is needed in:

- homes - for cooking, heating and running appliances
- public services, eg schools and hospitals - running machinery and warming rooms
- factories and farms - operating heavy-duty machines and production chains
- transport - buses, trains, cars and boats all need a fuel source and some trains and trams connect to an electricity supply

However, producing and distributing electricity can cause damage to the environment. Releasing energy from some stores causes pollution and harmful waste products. **Burning fossil fuels releases carbon dioxide, adding to the greenhouse effect, and sulphur dioxide which causes acid rain.**

Renewable energy resources rely on factors mostly outside of human control such as the weather being windy or sunny, the tides coming in at certain times or rain filling reservoir. Non renewables are more reliable as they are chemical energy stores which can be stockpiled for when they are needed, start up time is the amount of time required for these generation methods to come online. In the exam question they will tell you the start up time. The quicker the start up time the

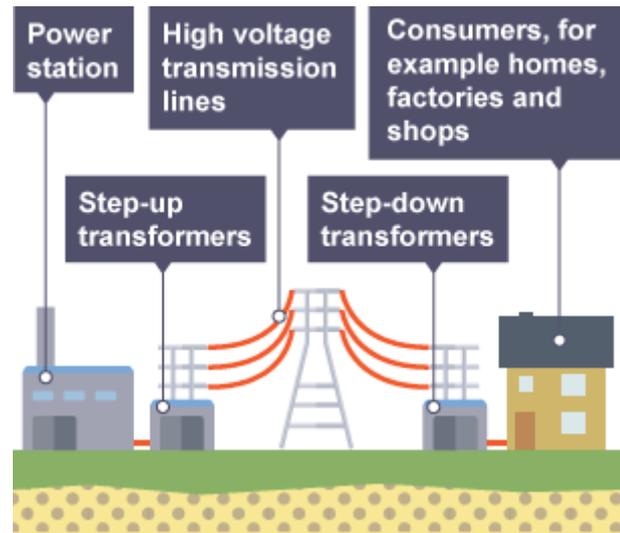
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faster they can meet changing demands. Nuclear has the longest start up time so is used to provide baseload energy (constant flow at a roughly set level)

The *National Grid* distributes electricity across the country. The National Grid connects power stations to homes, workplaces and public buildings all around the country. The electricity may be produced by a conventional power station turning a *generator* or by another **method**.

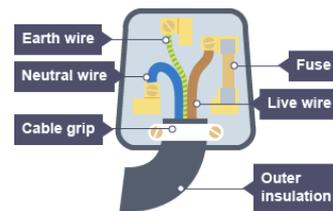
In the National Grid, a *step-up transformer* is used to increase the voltage and reduce the current. The voltage is increased from about 25,000 Volts (V) to 400,000 V causing the current to decrease. Less current means less energy is lost through heating the wire.

To keep people safe from these high voltage wires, pylons are used to support transmission lines above the ground. Before reaching the end user, a *step-down transformer*, reduces the voltage from the transmission voltage to the safer voltage of 230 V for home use.



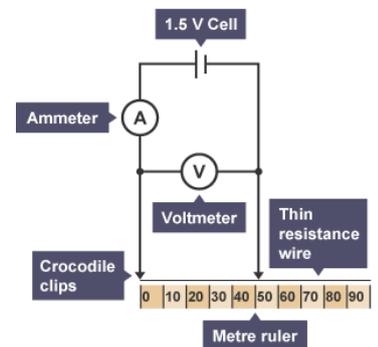
Features of a plug	Function
Outer insulation	All three wires in the cable are bundled together and there is extra plastic insulation wrapped round them all for safety
Cable grip	This holds the cable tightly in place so that wires do not become loose
Live wire	Copper wire coated with brown plastic along which the current enters the device
Fuse	A glass or ceramic canister containing a thin wire that melts if the current gets too high
Neutral wire	Copper wire coated with blue plastic that also connects to the cable in the wall and completes the circuit
Earth wire	Copper wire coated in striped plastic that provides a path for current to flow from the case of the device to the ground if there is a fault

There are two types of *current*: direct and alternating. In a *direct current*, the flow of *electrons* is consistently in one direction around the circuit. In an *alternating current*, the direction of electron flow continually reverses.



There are different ways to investigate the factors that affect resistance. In this practical activity, it is important to:

- record the length of the wire accurately
- measure and observe the *potential difference* and *current*
- Connect the circuit as shown in the diagram above.
- Connect the crocodile clips to the resistance wire, 100 centimetres (cm) apart.
- Record the reading on the *ammeter* and on the *voltmeter*.
- Move one of the crocodile clips closer until they are 90 cm apart.
- Record the new readings on the ammeter and the voltmeter.
- Repeat the previous steps reducing the length of the wire by 10 cm each time down to a minimum length of 10 cm.
- Use the results to calculate the resistance of each length of wire by using $R = V/I$, where R is resistance, V is voltage and I is current.
- Plot a graph of resistance against length for the resistance wire.



Use the equation sheet for all equation questions. If it says which equation links potential difference, current and resistance find the equation which has those three things off the sheet and write it down. If it tells you to calculate something find that equation on the sheet and write it down.