Knowledge organiser – Year 9I - Where do we get power from?

<table>
<tr><th colspan="2">Energy sources</th></tr>
<tr><th>Learning objectives</th><th>Key Information</th></tr>
<tr><td>Describe the main energy sources available for us to use on Earth</td><td>
<table>
<tr><th></th><th>Renewable energy sources</th><th>Non-renewable energy sources</th></tr>
<tr><td>Fuels</td><td>Biofuels which come from living material such as wood, ethanol or methane.</td><td>Nuclear fuels and fossil fuels</td></tr>
<tr><td>Other sources of power</td><td>Solar, tidal, wind, waves, geothermal (hot rocks beneath the ground), hydroelectric (water high up behind dams)</td><td></td></tr>
</table>
</td></tr>
<tr><td>Explain the difference between renewable and non-renewable energy sources</td><td>Renewable sources of energy will not run out for millions of years. Non-renewable sources of energy take millions of years to form, so cannot be replaced in our lifetimes. Non-renewable sources of energy were formed in stars (nuclear fuels) or from effects of heating and pressure on the remains of wood and sea creatures over millions of years (fossil fuels).</td></tr>
<tr><td>Describe how we use energy sources</td><td>The three main uses for energy sources are:
<table>
<tr><th>1. Heating</th><th>2. Transportation</th><th>3. Generating electricity</th></tr>
<tr><td>Fossil fuels, biofuels, solar heating, water pumped into hot rocks are all used for heating.</td><td>Fossil fuels (e.g. petrol, diesel and LPG) and biofuels (e.g. ethanol) are used for transport.</td><td>Fuels (fossil, nuclear and bio) and renewable sources of power (solar, tidal, wind, wave, geothermal and hydroelectric) are all used to make electricity.</td></tr>
</table>
</td></tr>
<tr><td>Describe renewable alternatives to using non-renewable fossil fuels</td><td>The main alternatives to using fossil fuels are described below:
<table>
<tr><th>Heating</th><th>Transportation</th><th>Generating electricity</th></tr>
<tr><td>Build homes which receive more sunlight. Install a solar water heating system. Heat</td><td>Use biofuels. Use electric vehicles.</td><td>Install solar panels (photovoltaic tiles), or other renewable sources of power (wind, wave etc).</td></tr>
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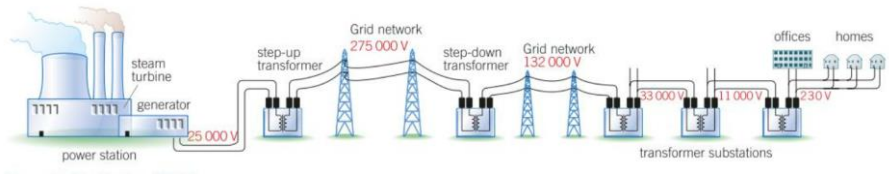
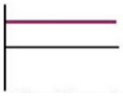
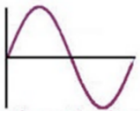
	houses with hot water from the ground.		
	Issues: All of these alternatives are expensive, some release carbon dioxide into the atmosphere (biofuels), some may use fossil fuels in their manufacture (electric vehicles) and some only work in certain conditions (e.g. wind, solar).		

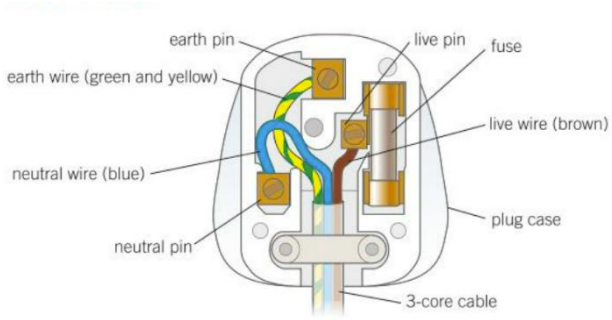
Using energy resources	
Learning Objectives	**Key information**
Explain why our **use of energy** has **changed** over time.	Increases in **world population**, greater use of **devices** and machines, and the need to make **more electricity** have all meant we are using more energy. Global energy use has increased dramatically since the Industrial Revolution (1760-1840) and the invention of automated vehicles in the 1920s.
Describe **problems** with **energy supply**.	**Demand** for energy is very **high** because people expect a certain quality of life. Fossils fuels are a **finite** resource and will eventually be extracted from remote places, which is expensive, and then will **run out**. Burning fuels, such as fossil fuels and biofuels, **releases carbon dioxide** which causes **climate change** – one of our biggest challenges globally and biggest threats to the environment. The warming of the earth is causing sea levels to rise, causing flooding, and extreme weather events.
Describe **factors** which governments need to consider when **choosing** energy sources.	**Cost** of setting up and eventual removal. Effect on the **environment** due to pollution. Impact on **climate change**. How long the source of energy will **last**.

Electricity – the basics	
Key word	**Key information**
Current	This is the amount of charge flowing per second. It is measured in amps (A) using an ammeter.
Potential difference	The potential difference of a cell tells you the size of the push on charges and how much energy can be transferred by them. Potential difference is measured in volts (V) using a voltmeter.
Circuits	Series circuits have only one loop and the current is the same everywhere. Parallel circuits have branches and the current in all the branches add up to make the total current.
Resistance	A component with a high resistance has a small current running through it. Resistance is measured in ohms (Ω). You can calculate the resistance of a component by measuring the potential

	difference across it and dividing this by the current running through it. Conductors have a very low resistance. Insulators have a very high resistance.

The National Grid	
Learning objectives	**Key information**
Describe the **National Grid**	 The **power stations** are where the electricity is **generated**. The **transformers change** the **potential difference** of the electricity. The **grid network** is made up of **underground cables** and **overhead wires** held up by **pylons.** Electricity is **supplied** to homes and offices.
Explain why the National Grid is an **efficient** way of transferring energy	**Step-up transformers increase** the potential difference to about 400,000V. This **decreases the heating effect** on the cables and makes energy transfer **efficient**. **Step-down transformers** reduce the potential difference to 230V which is safe to supply to homes.

Mains electricity	
Learning objectives	**Key information**
Describe the **domestic electricity supply** in the UK	**Mains electricity** is supplied to homes at **230V**. This is known as the '**domestic supply'**.
Explain the difference between **direct** and **alternating voltage**	The voltage from a **cell** or battery is **direct voltage** and does not change direction. The voltage is direct because the **current** is only **flowing one way**.  The voltage generated in **power stations** and supplied by the mains is **alternating voltage**. It is called alternate because the **current** continually **changes direction**. 
Describe the **functions** of the **wires** in a **plug**	The **brown live wire and blue neutral wire** together make a **complete circuit** with the appliance and **connect** to the **mains**. The **green and yellow earth wire** is not connected to the mains. It is **connected to 'earth'** which is a large metal pole buried in the ground outside your home.

	
Explain why a **live wire** may be **dangerous** even if an appliance **is not switched on**	If there is a **fault**, such as a **live wire becoming loose** and **touching** the **metal casing** of an appliance, then the **appliance becomes live** and touching it could cause 230V to flow across your body. This is very dangerous. For **safety**, the **earth wire connects** the **outer case** of an appliance to the **ground**. If there is a **fault** the electricity **would flow to earth** rather than through you, because earth wire has less resistance than you. Some appliances have **plastic casings**. They are known as '**double insulated**. They are safer as their cases do not become live. They do not need to have an earth wire.