Year 8 topic 2 – Electricity, magnetism and energy resources

Part 1 – Electrical circuits

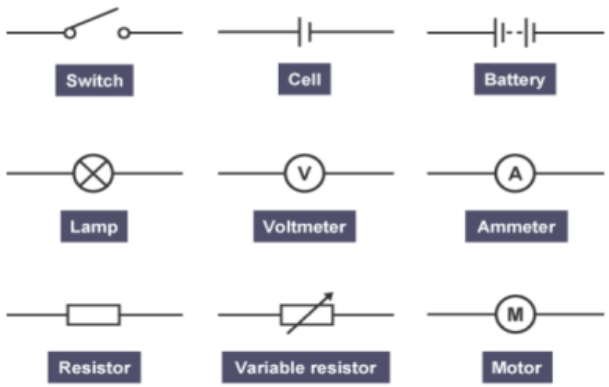
Keyword	Definition
Ammeter	A device used to measure electric charge.
Ampere	Unit of current. E.g. The current in the bulb is 4 amps or amperes (A).
Cell	A store of internal energy that can be transferred as an electric current in a circuit.
Conductor	A material which allows charge to move easily through it.
Electron	Sub atomic particle which flows in a circuit carrying a negative charge.
Series Circuit	A circuit connected in a way that the same current flows through each component in turn.
Parallel Circuit	In a parallel circuit, the current divides into two or more paths before recombining to complete the circuit.
Insulator	A material that does not allow charge or heat to pass through it easily.
Ohms	The unit of electrical resistance. Unit is **Ω**
Resistance	The opposition in an electrical component to the movement of electrical charge through it. Resistance is measured in ohms.
Potential Difference	The potential difference (or voltage) of a supply is a measure of the energy given to the charge carries in a circuit.
Volt	Unit of voltage. E.g. the voltage across the lamp was 6 volts (V).
Voltmeter	A device used to measure potential difference or voltage.

Further Reading:

https://www.bbc.co.uk/bitesize/guides/zsfgr82/revision/1

Use the following link to set up some circuits using the simulation.
https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc-virtual-lab

Circuit Symbols



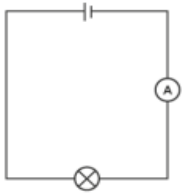
Electric Charge

Some particles carry an electric charge. In electric wires these particles are called electrons. An electric current is a flow of charge, and in a wire this will be a flow of electrons.
For an electric current to flow we need:

- Something to transfer the energy to the electrons, such as a cell, battery or power pack.
- A complete path for the electrons to flow through (a complete circuit).

Current

Current is measured in amperes (A). 20A is a bigger current that 10A. An ammeter is used to measure the current. The ammeter must be connected in series.



Equations To Remember

Current

$$\text{Current} = \frac{\text{Charge}}{\text{time}} \qquad I = \frac{Q}{t}$$

Current in Amps (A), Charge in Coulombs (C), Time in Seconds (s).

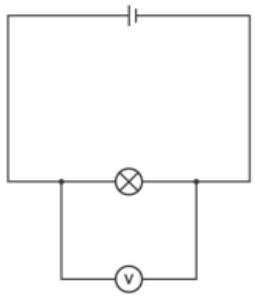
Potential Difference:

Potential Difference = Current x Resistance
V = I x R

Potential difference in Volts (V), Resistance in Ohms (**Ω**), Current in Amps (A)

Potential Difference

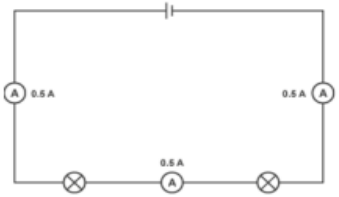
Potential difference is a measure of the difference in energy between two parts of a circuit. The bigger the difference in energy, the bigger the potential difference.
Potential difference is measured in volts. A 230V is a bigger potential difference than 12V.
A voltmeter is used to measure the potential difference, and must be in parallel.



Series Circuit

In series circuits:

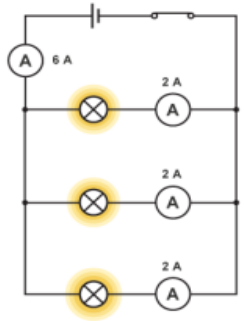
- You get several components one after another.
- If a component breaks, the circuit is broken and all the other components stop working.
- The current is the same everywhere in a series circuit no matter where you put the ammeter – it will give the same reading.



Parallel Circuit

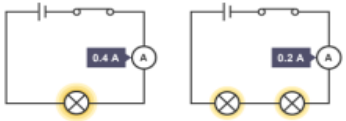
In parallel circuits:

- Different components are connected on different braches.
- If a component breaks, the components on the different braches keep working.
- Unlike series, the lamps stay bright If you add more lamps in parallel.
- Current is shared between the components.



Resistance

The wires and other components in a circuit reduce the flow of charge through them – this is resistance.
The resistance increases when you add more components in series.
The resistance of two lamps is greater than the resistance of one lamp, so less current will flow through them.



Part 2 Magnetism

Bar Magnets
Bar magnets have two poles, a North pole (N) and a South pole (S), **opposite poles attract and like poles repel.**
Magnets create magnetic fields. These cannot be seen. They fill the space around a magnet where the magnetic forces work, where they can attract or repel magnetic materials.
Although we cannot see magnetic fields, we can detect them using iron filings. The tiny pieces of iron line up in a magnetic field. We can draw simple magnetic field line diagrams to represent this. In the diagram, note that:

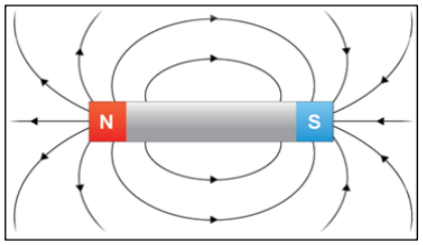
- **field lines have arrows on them**
- **field lines come out of N and go into S**
- **field lines are more concentrated at the poles.**

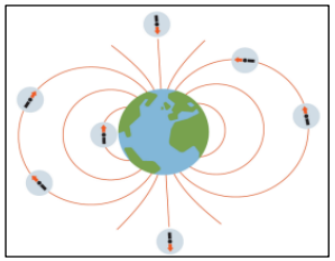
The **magnetic field is strongest at the poles**, where the field lines are most concentrated.
The Earth has a magnetic field because the core rotates, it acts like a giant bar magnet.

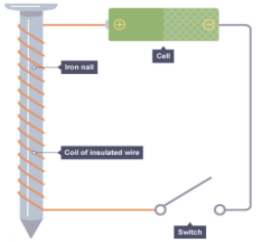
Key Terms	Definitions
Electromagnet	A magnet created by the flow of electricity in a wire
Magnetic Field	The area around a magnet, where the magnetic field acts

Electromagnets

When an electric current flows through a wire, it creates a magnetic field, this can be used to make **an electromagnet**, by making the wire into a coil.
You can increase the strength of an electromagnet by doing three things:
1. Increase the number of coils
2. Increase the current
3. Add a soft iron core







Part 3 The greenhouse effect and climate change

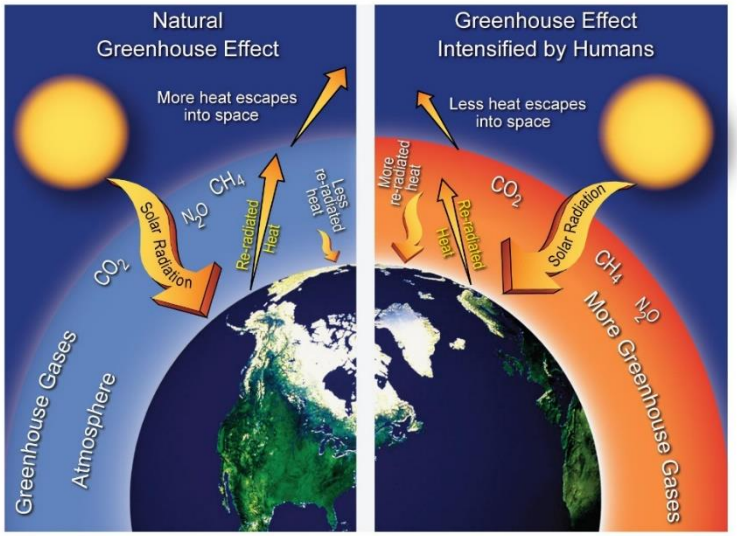
The **greenhouse effect** is a natural effect and has allowed life on earth to develop, but is now being affected by human activity, leading to the 'Enhanced Greenhouse Effect' which is a major cause for concern around the world.

1. The atmosphere allows heat from the sun to pass through it and heat the earth

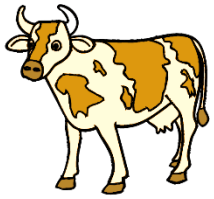
2. The earth gives off heat

3. The heat is trapped by greenhouse gases like methane, carbon dioxide (CO_2) and nitrous oxide

Human Influence on the Greenhouse Effect



Human beings are contributing to an increase in the level of greenhouse gases by burning fossil fuels in power stations (coal, gas), cars (petrol) and homes (coal gas and oil, especially in central heating systems). Burning fossil fuels releases carbon dioxide which is a greenhouse gas.



Trapped greenhouse gasses in the atmosphere

CAUSE

Animal Farming (release of methane)

Solution

Encourage vegetarianism

Vehicles (burning fossil fuels)

Solution

Encourage carpooling, walking, biking, electric cars

Global Warming

EFFECT

Rising Temperatures

Will lead to

Melting of glaciers & Rising sea levels

Will lead to

Ecological destruction, human and animal displacement, animal extinction (example: polar bears)

Weather irregularities (storms, hurricanes)

Will lead to

Human and animal displacement, economic loss, destruction of infrastructure

HINDERANCES

Denialists: those who do not believe the scientific findings related to global warming and insist that it is a hoax

Government ties & economic interests

Slow pace of switching to environmentally-safe products

All of these are wasting time!

DEFINITIONS:

GREENHOUSE EFFECT: the characteristic of certain gases (called greenhouse gases) to trap heat (not necessarily a bad thing in the last 600 million years!)

GLOBAL WARMING: the fact that increased levels of greenhouse gases are storing more heat energy than before and the atmosphere is therefore getting hotter.#

CLIMATE CHANGE: the change to weather patterns around the world caused by the increased temperatures in the atmosphere.

Effects of global warming

1.Climate change. Climate Change means 'Change in Weather patterns around the world' - especially to an increase in unpredictable weather, in particular an increased number of violent storms

2. The Polar ice caps are melting and raising sea levels —between 1901 and 2010 the sea rose by 0.19m. If left unchecked, this will lead to flooding of large areas of land and

3. The increased temperatures in the atmosphere

Climate change management

Increased use of renewable energy - solar, wind, tidal power reduces the use of fossil fuels, so less CO_2 is produced

Planting trees reduces CO_2 levels in the atmosphere because trees absorb carbon dioxide during photosynthesis

International agreements - countries sign treaties e.g. the Kyoto Protocol in 2005 to reduce carbon emissions. Each year countries from all over the world meet to review progress towards these targets and make new plans.

The work of Geoscientists

Making renewable energy sources more **reliable** by storing the energy they produce in some way.

An increase in the use of Geothermal energy in countries like the UK where large quantities of Geothermal energy are not waiting just beneath the surface

Y8 Physics Unit 2 – Electricity, magnetism and energy resources

What I know from previous learning

Primary Science: Changes in weather, Fossil formation

Magnets: Some forces need contact between 2 objects, but magnetic forces can act at a distance.

How magnets attract or repel each other and attract some materials and not others

The names of some magnetic materials – iron nickel cobalt steel

Magnets have 2 poles. Opposite poles attract but like poles repel.

Year 7 Electric circuits - current, circuit diagrams, energy transfers in a circuit

To classify circuits as series or parallel and explain the difference Investigating how to make the best battery Predicting how combinations of batteries affect the current	Explaining how resistance and potential difference can affect the current of a circuit. Comparing the current in series and parallel circuits.	Explain what a magnetic material is and give examples Describe and draw a magnetic field of a simple magnet and of the Earth	To know that a wire carrying a current will act as an electromagnet To understand the different ways that an electromagnet can be made stronger. To explain (using examples) the uses and benefits of electromagnets	Describing how electricity is generated. Explaining the causes and effects of global warming Being able to describe the research areas of Geoscientists: - energy storage - better use of geothermal energy especially in the uk

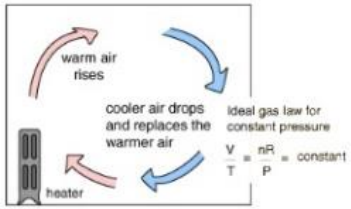
Future learning

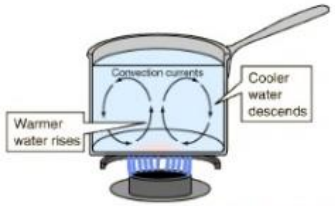
GCSE electricity, GCSE magnetism and electromagnetism, GCSE energy resources

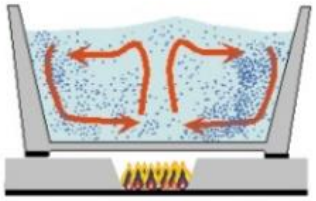
A level electricity and magnetiems

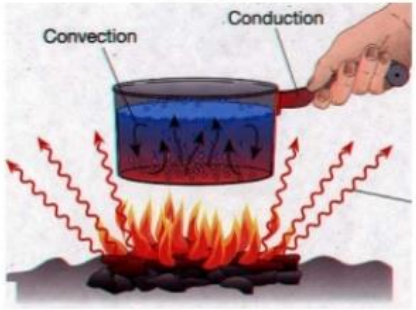
Vocabulary:

Potential Difference/Current/Cell/Circuit Diagram/Bulb/Resistance/Circuit symbol/ Magnetic field/North pole/South pole/Bar magnet/Attract/Repel/Magnetic Material/ Electromagnet/Current/Core/Coil/ Greenhouse gas, Carbon dioxide/Global Warming/Climate Change/Geophysicist/Geothermal energy/Renewable/Non-renewable/Energy storage



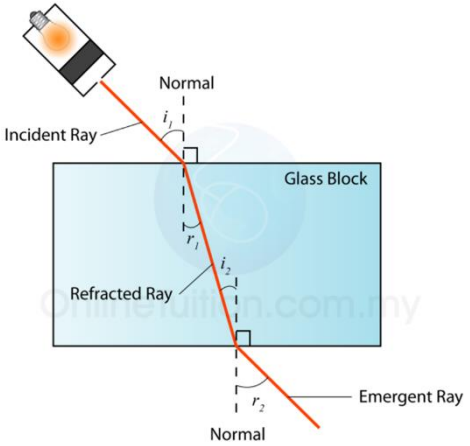



SINGLE CONVECTION CELL



What I know from previous science:

- The arrangement of particles in solids liquids and gases.
- Thermal energy as heat energy
- What type of objects give out light
- What objects do to give out sound



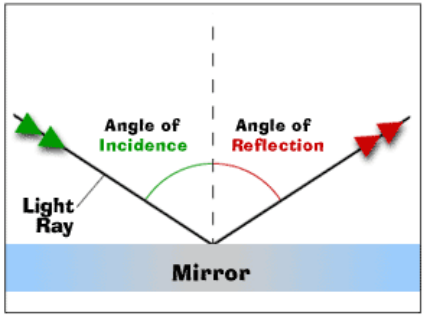
Know that thermal energy is required to increase temperature Describe the difference between temperature and thermal energy Describe what happens to particles in a solid, liquid or gas when it is heated	Know that solids expand when heated and explain why this happens Know that liquids/gases rise when heated and explain why this happens	Describe evaporation as a change of state from liquid to gas without heating Know that evaporation causes a deceases in the temperature of a liquid Describe factors affecting the rate of evaporation of liquids.	Know that light travels in straight lines called rays Describe how shadows and images are formed using ray diagrams Explain what is meant by the law of reflection	Know that refraction is a change of direction of light rays when they pass from one medium to another Explain reflection due to changes in the speed of light rays	Know the three primary colours of light Know that white light is made from the three primary colours mixed together Explain how the colour that an appears depends upon the colour of the object and the colour of the light shining on it.	Know that frequency of a sound wave is the number of oscillations per second and explain the link between frequency and pitch Describe what is meant by the amplitude of a sound wave and explain the link between amplitude and loudness	Describe how the ear allows us to hear sound Explain ways in which our hearing can be affected and lost.

Future learning

Energy stores and transfers

Waves and the electromagnetic spectrum

Ultrasounbd and its uses



Vocabulary: heat tempertaure vibration expand contract convection evaoration rate transparent opaque ray angle incidence reflection normal refraction primary secondary frequency pitch amplitude loudness