

Physics Knowledge Map - Magnetism

Exploring Magnets and Magnetic Materials

- Magnetism is a non-contact force.
- Magnets have 'poles'. North to North repels. South to South repels. North to South attracts.
- Nickel, cobalt and iron are magnetic elements. Metals are nearly always magnetic.
- A permanent magnet keeps its magnetism for a long period of time and has its own magnetic field. Iron, Nickel and Cobalt are examples.
- A temporary magnet is one that is attracted by a magnet and shows magnetic properties in the presence of a magnetic field. Electromagnets are an example.
- Magnets can be very useful. Everyday applications include computer hard drives, loudspeakers, credit card strips, magnetic fasteners and compasses.

Magnetic Fields

- Sprinkling iron filings onto a piece of paper covering a magnet will form the shape of the magnet's magnetic field.
- The closer the field lines are on a magnetic field diagram, the stronger the magnet.
- Magnetic field diagrams must have arrows travelling from the magnet's North pole to the South pole.
- The Earth's iron core causes the Earth its magnetic field.
- Charged particles entering the Earth's atmosphere are attracted to the poles. As they collide with the gas particles in the atmosphere, they give off light. This is known as 'Northern Lights'.
- Magnetic materials, usually a metal pin, are used in compasses as they are attracted to the Earth's poles, showing the direction of North and South.

Strength of Magnets

- The strength of a magnet can be tested by either measuring the number of objects it can hold, measuring the distance at which an object is attracted to the magnet or visualising the magnetic field with iron filings and seeing how close together the field lines are.
- Judging field lines by eye can be unreliable, as it is not a definite measurement. Testing the number of object a magnet can pick up would be a more accurate method to use as it is a definite number, there is no 'judgement' involved.

Electromagnetism

- Electromagnets can be made stronger by increasing the current passing through the wire, making the wire into a coil, increasing the number of coils in the wire or putting an iron core in the centre of the coil.
- An electromagnet is any magnet that uses electricity to produce a magnetic field.
- Electromagnets are used in everyday life for amplifying sounds vibrations in loudspeakers, circuit breakers, separating iron and steel from non-magnetic materials and to store information on disks in computer hard drives.

D.C Motors

- Electric motors are used in many common appliances, such as food mixers, vacuum cleaners, cars, washing machines and electric drills.
- Wires produce their own magnetic field when current is passing through them. When this wire is placed in a magnetic field, it moves. The magnetic fields of the magnet and the wire will attract and repel each other, causing movement. This is called the motor effect.
- Motors can be made stronger by increasing the current passing through the wire, increasing the strength of the permanent wire and by making a straight wire into a coil.

Static Charge

- Static charge is a form of electricity that is not flowing.
- Charged materials can attract materials of the opposite charge. This is a non-contact force. This can be visualised by rubbing a balloon on your hair. Electrons build up on the balloon causing a charged surface. When held above hair, hairs are attracted and pulled up towards the balloon without touching them.

Electrostatic Fields

- An electrostatic field exists around a charged object that can exert a non-contact force.
- If a charged rod is held near a stream of water, from a tap usually, the water will be attracted to the charged rod. The charged rod has an electrostatic field existing around it.
- Electrostatics can be used in spray painting, printers and photocopiers.

Keywords you should be confident with by the end of this topic

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| Magnets | poles | attract | repel | domains | magnetic field |
| | | | motors | | |
| | | generator effect | | electromagnets | |
| static electricity | | charge | electron transfer | | electrostatic fields |