Knowledge organiser

Y8 topic: Magnetic Forces

I have already learned:
In KS2:
- Forces and Magnets
- Electricity
- **In KS3:**
- Y7 Forces Intro
- Y8 electrical Energy

This topic links to:
KS4:
- P7 Magnetism and Electromagnetism

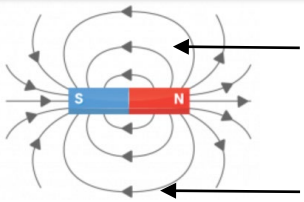
It is important to study about Magnetic Forces because…
In the modern world, we use magnets in an overwhelming number of different ways. From the way that a fridge door closes to the way in which your headphones play music, from the generation and transmission of electricity, to the motor in your car. All of these use magnetic force in some way or another. Without them we'd have no way to move electric currents across the country. All of our electric motors would be useless. And we wouldn't be able to talk across distance – as we have become so used to doing.
As such, we shouldn't take these particular things for granted. Rather, we should – all of us, that is, not just the scientists – try to understand what they are all about: how they work, what the special relationship is between electricity and magnetism, and how they make our world go around.

Possible careers involving magnetism are…
- **Robotics engineers**
- **MRI technicians**
- **Electrical engineering**
- **Geomagnetist**
- **Meteorologist**

KNOWLEDGE ORGANISER
BIG IDEA: FORCES
TOPIC: MAGNETIC FORCES

Key word	Definition	Detail
magnetic force	Force from a magnet on a magnetic material.	**Magnetic force is a non-contact force**
magnetic material	materials attracted by magnets	**The magnet uses a non-contact force to attract magnetic materials.**
north pole	end of a magnet pointing north	**A compass needle is a bar magnet and points north.**
south pole	end of a magnet pointing south	**Like pole (N-N) repel, unlike pole (N-S) attract.**
magnetic field	region of force around a magnet	**Field lines close together → strong field → large force.** **Field lines far apart → weak field → small force.** **Field/force is strongest at the poles.** **Arrows on field lines are drawn in the direction of north to south.**
permanent	a magnet that produces its own magnetic field	**Will repel or attract other magnets. Will attract magnetic materials.**
induced	a temporary magnet	**Becomes a magnet when placed in a magnetic field.**
solenoid	Coil of wire	**Wire wound into a tight coil, part of an electromagnet**
core	Iron bar which the solenoid is wrapped around.	**Iron becomes an induced magnet. Iron is magnetically soft and can be easily magnetised/demagnetised**

Magnetic Field



magnetic field lines – area in which *a* **magnetic material** will experience a force. The closer together they are the stronger the force

arrows indicate the direction of the magnetic field – from north to south

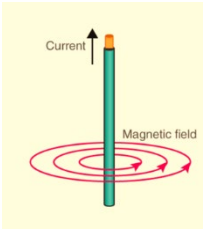
The 3 magnetic materials are:
- **iron**
- **cobalt**
- **nickel**

Steel is also a magnetic material as it contains iron.

Although the field lines are invisible we can plot where they are using either iron filings or mini compasses:
- Place a compass near a pole of the magnet.
- Remove the compass and mark on the paper with an arrow the direction the compass pointed.
- Repeat this, moving the compass around from one pole to the other.

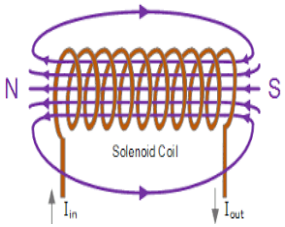
Electromagnetism

- Current flowing through a wire produces a magnetic field around it.



- If the current is small, the magnetic field is weak
- If the current is large, the magnetic field is strong
- Further away from the wire the magnetic field is weaker
- If the current is reversed, the direction of the magnetic field reverses

- A solenoid is a coil of wire with a current flowing through it
- The magnetic field from each loop (turn) adds to the next
- **The advantage of an electromagnet like this is it can be turned off**

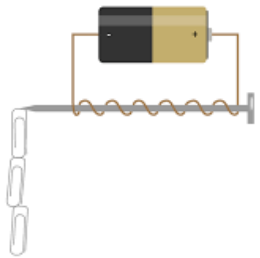


An electromagnet can be made stronger by:
- Using a larger current
- Adding more turns of the wire
- Putting the turns of the wire closer together
- Using an iron core through the coil

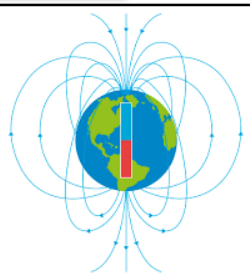
Electromagnetism practical

We can investigate the strength of an electromagnet by :
- coiling a wire around an iron nail
- connect the ends of the wire to an electrical supply like a battery
- measure how many paper clips can be picked up
- change either the number of turns of the wire or the voltage of the power supply
- measure again the number of paper clips the electromagnet can hold

NOTES:
- The direction of the current does not effect the strength of the magnetic.
- Changing more than one variable e.g. number of turns in the coil and the voltage will give an invalid result as you will not be able to tell which variable caused the change.



The Earth



- The Earth's has a magnetic field surrounding it due to it's iron core.
- It is effectively a giant bar magnet.
- Compass needles are made from iron and line up along the magnetic field line of the Earth to seek out north.