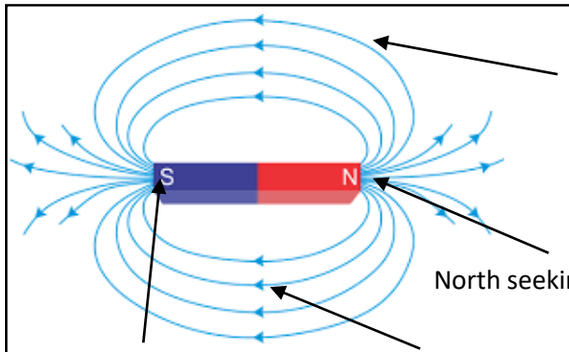
AQA P7 Magnetism and Electromagnetism Combined Foundation

Permanent and Induced Magnetism

Key word	Definition	Detail
Magnet	Materials attracted by magnets	**The magnet uses a non-contact force to attract magnetic materials.**
North seeking pole	End of a magnet pointing north	**A compass needle is a bar magnet and points north.**
South seeking pole	End of a magnet pointing south	**Like pole (N-N) repel, unlike pole (N-S) attract.**
Magnetic field	Region of fore 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.**



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

North seeking pole

South seeking pole

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

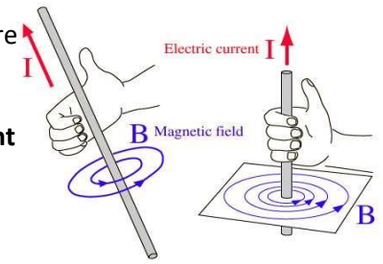
The 3 magnetic materials are:
- **Iron**
- **Cobalt**
- **Nickel**

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

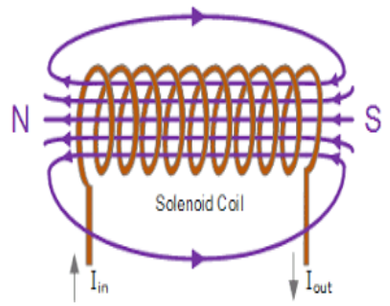
Electromagnetism

- Current flowing through a wire produces a magnetic field around it.
- **Thumb → direction of current**
- **Fingers → direction of magnetic field**



- 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**

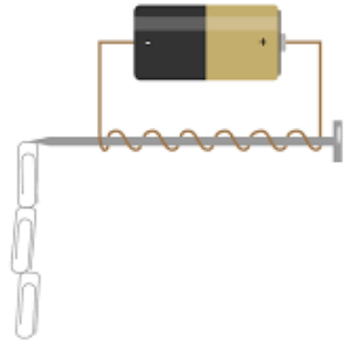


An electromagnet can be made stronger by:
- Using a larger current
- Adding more turns of the wire
- Putting the turns of the wire closer together
- Using an iron core through the coil

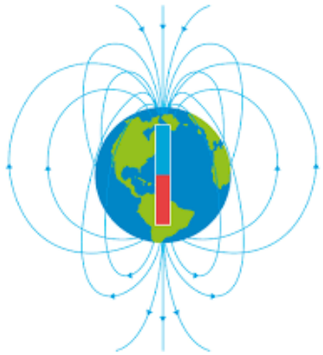
Electromagnetism practical

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.