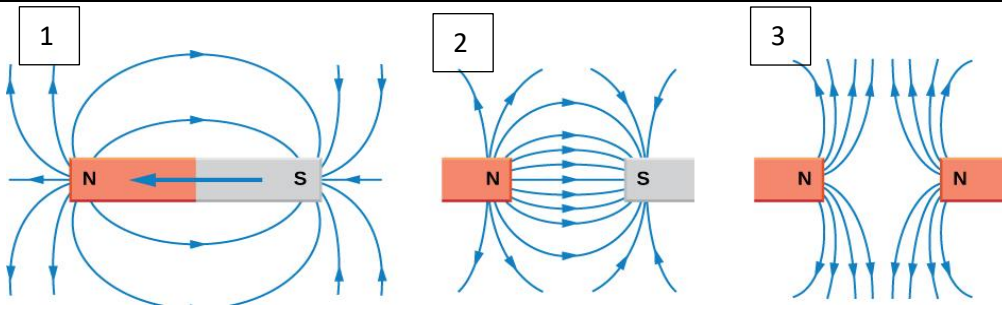


1. Key Words

Permanent magnet	A material that is always magnetic.
Magnetic field	Area around a magnet where the force of magnetism affects an object.
Poles	The ends of a magnet where the magnetic field is the strongest.
Electromagnet	A soft metal core made into a magnet by the passage of electric current through a coil surrounding it.
Magnetic metals	There are 3 pure magnetic metals: iron, cobalt and nickel.
Solenoid	Coil of current carrying wire.

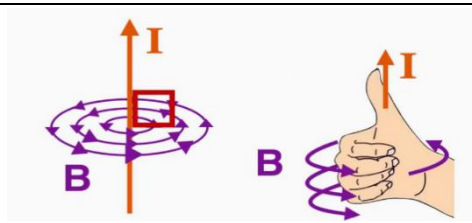
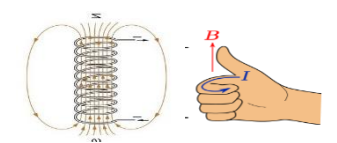
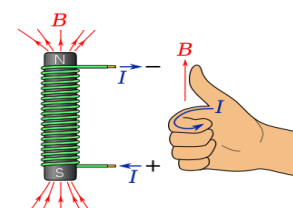
2. Magnetic fields

1	Magnetic field of a bar magnet travels from North to South with the strongest field strength at the poles shown by the lines being closer together.
2	When opposite poles are placed near each other the magnetic field travels from the north to south poles of each magnet causing a force of attraction.
3	When like poles are placed near each other the magnetic field of each magnet repels the other causing the magnets to push away from each other.



3. Current-carrying wire

The right-hand thumb rule can be used to work out the direction of the magnetic field.

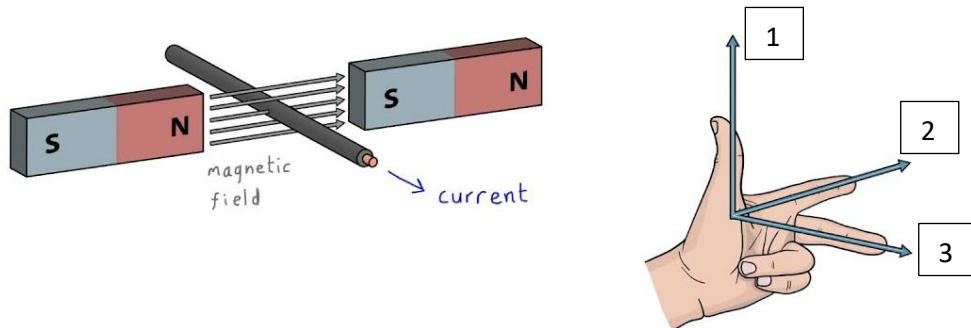
Straight wire	I	Direction of current
	B	Direction of magnetic field
		
Solenoid (coiled wire)	I	Direction of current
	B	Direction of magnetic field
		
Electromagnet	<p>Adding an iron core to a solenoid increases the strength of the magnetic field. An electromagnet can be turned on or off.</p>	
		
<p>Increasing the number of coils of the wire, or increasing the current in the wire will make the electromagnet stronger.</p>		

4. The Motor Effect – HT only

The motor effect is when a magnet and a current carrying conductor exert a force on each other.

Flemings Left Hand Rule

1	Direction of the force
2	Direction of the magnetic field
3	Direction of the current



5. Magnetic Flux Density – HT only

The magnetic flux density is a measure of the total magnetic field passing through an area.

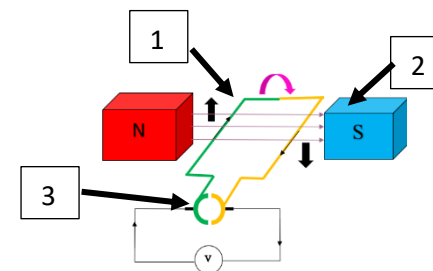
The size of a force on a conductor can be calculated using the following formula.

$$F = BIl$$

F	Force in Newton's (N)
B	Magnetic flux density in tesla (T)
I	Current in amps (A)
L	Length in metres (m)

6. Electric Motors – HT only

- 1 Current carrying wire – when a current is passed through the wire, a magnetic field is generated. The current flows from positive to negative.
- 2 Magnets – these generate a magnetic field that goes from North to South.
- 3 Split-ring commutator – this changes the direction of the current every half turn to keep the wire ring rotating in the same direction.



Direct current is passed through the wire.



This generates a magnetic field in the wire.



The magnetic field of the wire interacts with the magnetic field of the magnets causing a force to be exerted on the wire.