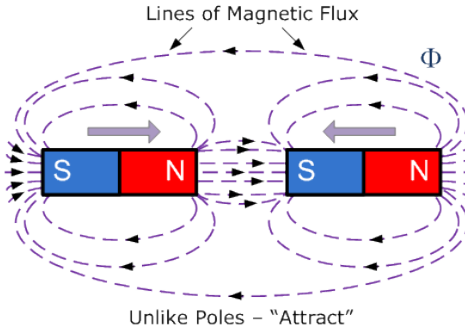
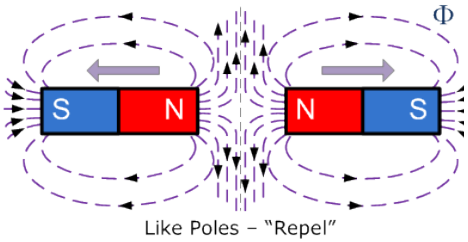
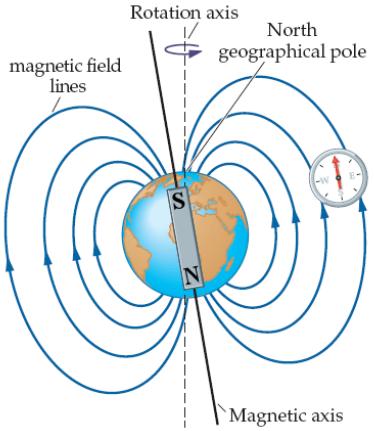
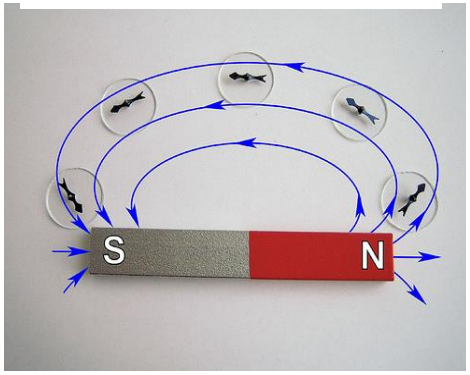


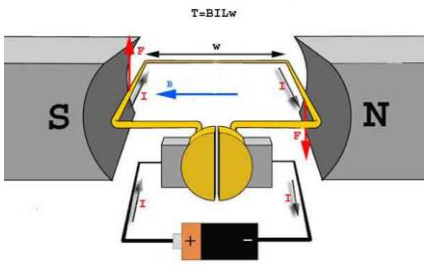

**30 Quick questions: Answer these in your book**

1 In Fleming's left hand rule, what does the thumb indicate?
2 What is the effect called when a conductor carrying a current in a magnetic field experiences a force?
3 Which finger shows the direction of the magnetic field according to Fleming's left hand rule?
4 Is magnetism a contact or non-contact force?
5 What does a permanent magnet do that an electromagnet doesn't?
6 A material that becomes a magnet when placed in a magnetic field is known as what?
7 Can induced magnetism be both attractive and repulsive?
8 Which metal is useful as an induced magnet?
9 Which finger represents the direction that current would flow according to Fleming's left hand rule?
10 How could you make an electromagnet in a school laboratory?
11 A region around a magnet where a force acts on another magnet or on a magnetic material is known as what?
12 What 3 elements can be magnetised?
13 F = BIL. What do each of the letters in this equation stand for?
14 What happens to the strength of a magnetic field as you move further away from a magnet?
15 In which direction do magnetic field lines point?
16 In the equation F = BIL, what is each quantity measured in (i.e. what are the units for F, B, I and L?
17 Why does a navigating compass work?
18 Draw the magnetic field lines around a bar magnet. Include arrows to show the direction of the field.
19 How could you produce a magnetic field around a conducting wire?
20 How is the strength of an electromagnet related to the current flowing through the wire?
21 What is a solenoid?
22 How does making a coil (solenoid) out of a piece of wire affect the strength of the magnetic field?
23 How could the strength of a magnetic field be increased in a solenoid?
24 What do we call a solenoid with an iron core?
25 Draw the magnetic field lines around a solenoid
26 Draw the magnetic field pattern around a current carrying wire
27 Why is copper wire used in electromagnets?
28 Why does the current in an electric motor have to change direction every half a turn as it rotates?
29 When testing an electromagnet with paper clips, why do some of the clips cling on when the current is switched off?
30 If the force on the left hand side of a coil in a motor causes it to rotate in a clockwise direction, in which direction is the right side rotating?

# Module 7 Electromagnetism

## REVISION MAT

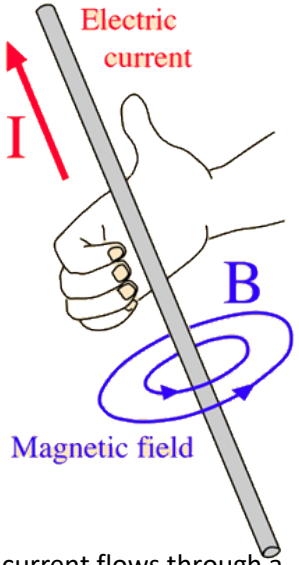
## HIGHER




Name:

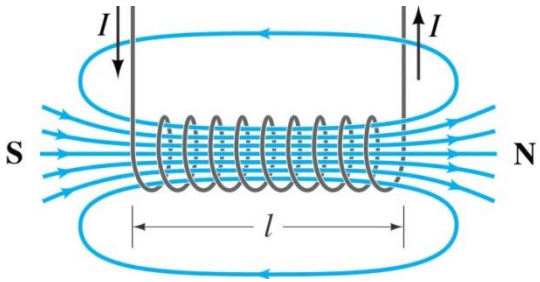
**KEY WORDS/IDEAS TO REMEMBER**

**Magnetic flux density**
**Motor effect**
**Catapult field**
**Induced magnet**
**Permanent magnet**
**RH grip rule**
**Magnetic field**
**F=BIL**
**Solenoid**
**Tesla**
**Motor**
**Fleming's left hand rule**



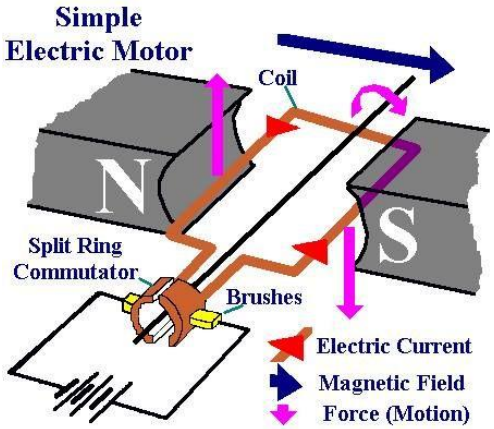

When a current flows through a conducting wire a magnetic field is produced around the wire. The **strength** of the magnetic field depends on the **current** through the wire and the **distance** from the wire. If you use your right hand and point your thumb in the direction of the current (positive to negative), the field will be shown by the curve of your fingers. This is usually known as the 'right hand grip' rule. Is the field above going clockwise or anti-clockwise?

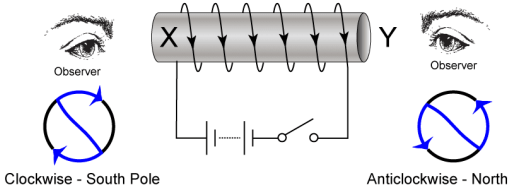
If the wire is coiled up (a solenoid) it increases the strength of the magnetic field. An iron core turns it into an electromagnet. You can work out which end is the north pole and which is the south pole by looking at the diagram on the right.....



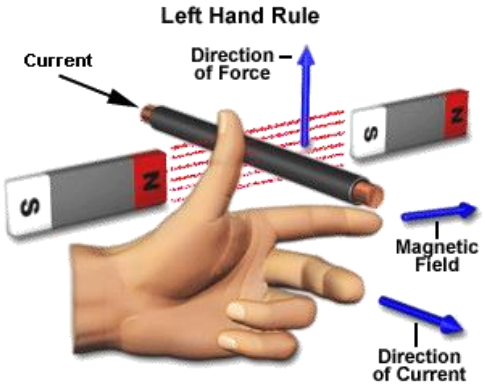

**Fleming's left hand rule**

The thuMb (direction of motion or force)
The First finger – direction of the magnetic Field, from north to south
The seCond finger – direction of the current, from positve to negative.




There is a strong and uniform magnetic field inside the **solenoid**. Compare this field shape with the one around a bar magnet on the other side of this sheet. They are very similar.




The **electric motor** looks complicated but just remember the following:

- Use FLH rule to work out in which direction the coil will turn.
- Conventional current flows from positive to negative.
- The B (magnetic) field goes from north to south.
- The split ring commutator ensures that the current 'flips' every half term so it is always flowing in the same direction and the force is always turning the coil in the correct direction.

How could you
i) reverse the direction of rotation?
ii) increase the speed of rotation?

A simple electromagnet can be made by coiling a copper wire (solenoid) round an iron core (like a nail or bolt shown above). This induces magnetism in the core. The strength of the magnetic field can be increased by: i) increasing the current in the wire; ii) increasing the number of turns on the coil*; iii) Adding the iron core in the first place.

*A **common mistake** is that students say "increase the number of coils." There is only one coil, you need to <u>increase the number of turns</u> on the coil.

Permanent magnets are made from **nickel**, **cobalt** and most **steels** (an alloy of iron and carbon).