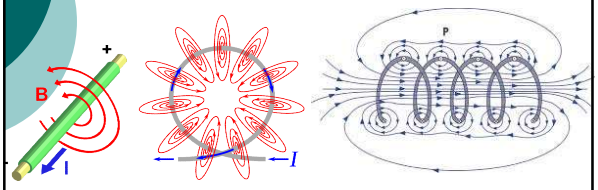
Write this title into your notebook.

5.14 MAGNETIC FIELDS AND ELECTRIC CURRENT



1

Write this in your notebook.

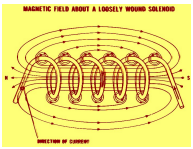
- A magnetic field is created whenever an electric current flows through a conductor.
- This is **electromagnetism.**
- The conductor can be a:
  - "straight-line conductor" (straight wire) or
  - solenoid (coiled wire)

2

Write this in your notebook.

A Solenoid:

- Is a wire wrapped around a core.
- When a current flows through the wire ….
  a magnetic field is generated in the core.



Electromagnet

3

Write this in your notebook.

Cores:

- A ***Core*** is the object that is inserted into the solenoid, creating an electromagnet.
  - Must be easy to align or misalign the domains
- Different **ferromagnetic metals** can be used for the core: iron, nickel or cobalt.
  - **Iron** is most commonly used because when you turn off the electricity it demagnetizes easily!
  - **Steel** is usually not used because it is difficult to demagnetize.

4

Write this in your notebook.

5.15 The Left Hand Rules

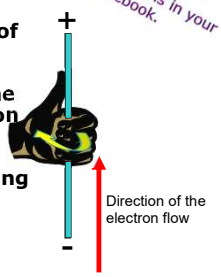
- This rule will help you determine the direction of the magnetic fields created by an electric current.
  - **The 1st Left Hand Rule** is used with a straight wire (uncoiled).
  - **The 2nd Left Hand Rule** is used with a solenoid (or coil)
  - **Remember electrons flow from – to + !!!!**

7

#1 Straight Line Conductors (Uncoiled)

Write this in your notebook.

1. **Find the + and - ends of the wire**
2. **Point your thumb in the direction of the electron flow (towards +end)**
3. **Your fingers are pointing in the direction of the field**

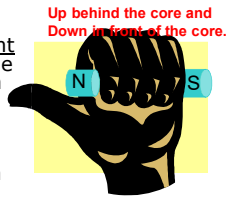


8

Write this in your notebook.

#2 Solenoids (or coils)

1. Find the +and - ends of the wire
2. Draw arrows on the front of the coil pointing in the direction of the electron flow (towards +).
3. Place your hand on the page with your fingers pointing in the direction of the electron flow.
4. Your thumb will point towards the **north** end of the solenoid.

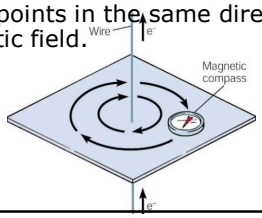


10

Write this in your notebook.

5.15 continued

- Remember that straight line conductors:
  - Do not have a North or South Pole.
  - The magnetic field flows in a continuous circle around the wire.
  - The compass points in the same direction as the magnetic field.

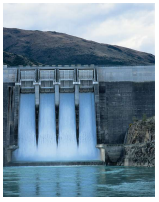


18

Write this in your notebook.

5.16 Electromagnetic Induction

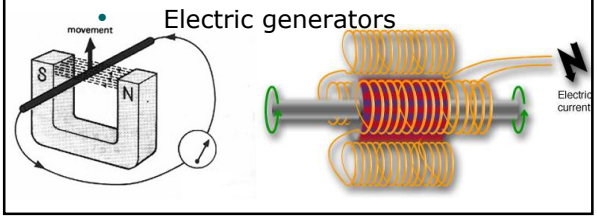
- Is the process where you use a moving magnetic field to produce an electrical current. (p171)



19

Write this in your notebook.

- This is achieved by:
  - Moving a conductor perpendicularly inside a magnetic field
  - Moving a magnet around a conductor
    - eg. Hydro electricity
    - Electric generators



5.17 Factors that affect the magnetic field strength of an electromagnet.

Write this in your notebook.

1. **The core material**
   - Made of ferromagnetic material
   - Low magnetic resonance (easy to realign domains)
2. **The current intensity**
   - Higher current = stronger magnetic field
3. **Number of loops** (number of turns)
   - More turns = stronger field.

Important

Write this in your notebook.

5.18 Mathematical Relationship

To find the strength of the electromagnet the following equation is used:

$$F = IN$$

F = force or strength of the electromagnet
I = the current intensity traveling through the wire
N = the number of loops around the core

Remember