



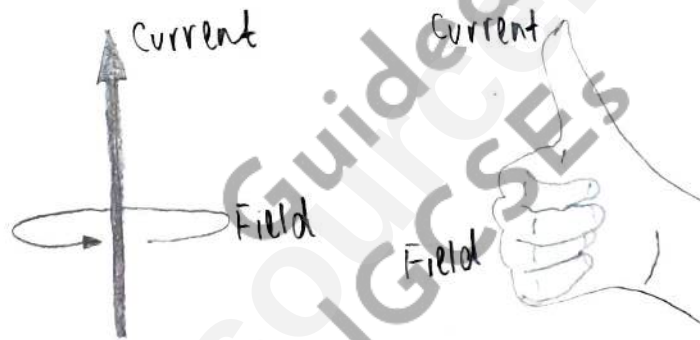
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Right hand Grip Rule

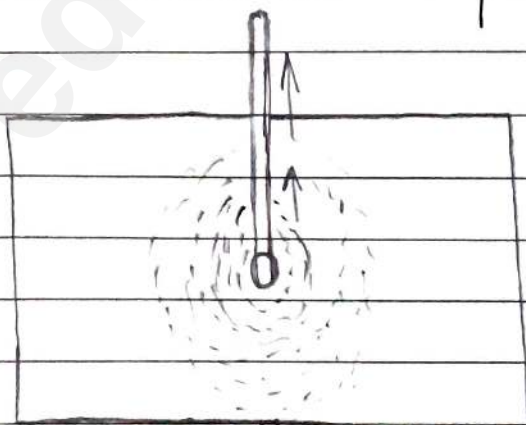
states that: when a wire carrying current is placed in the right hand such that the direction of the current is indicated by the direction of the thumb. The direction of the magnetic field lines are indicated by the direction of the fingers.

To increase the strength of the magnetic field, the amount of current needs to be increased. It could also be made into a coil.

Right Hand Grip Rule -



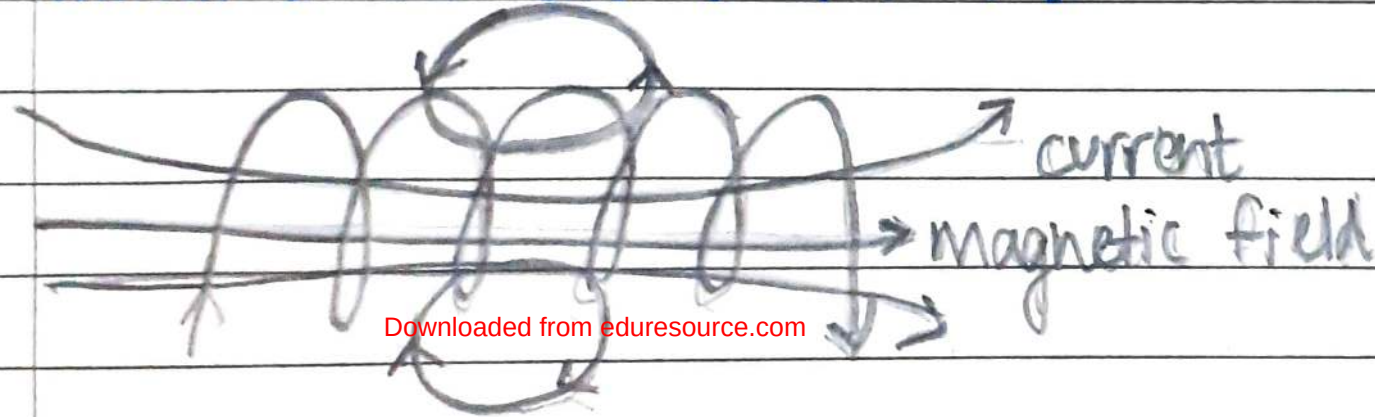
consider a wire carrying current a cardboard containing Fe fillings such that the wire passes through the cardboard.



reversing current, reverses direction of magnetic field.

2. Describe a solenoid with a diagram.

A solenoid is a long coil of wire wound around a tube that may contain an iron core or be air-filled.



S pole : current in coil
N pole : current out of coil.

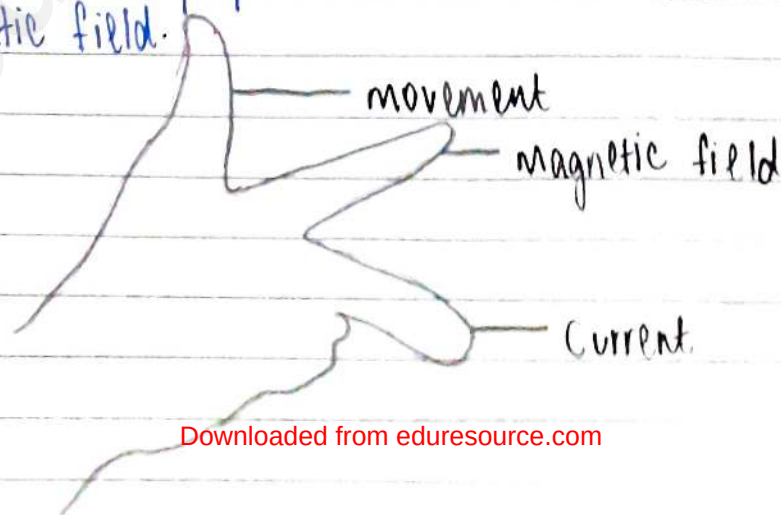
P7.2 Force on a current-carrying conductor

Force factors

1. Force can be increased by
 - increasing the current
 - using a stronger magnet
2. direction of force is reversed if either:
direction of current is reversed or direction of magnetic field is reversed.
3. force depends on angle between current and magnetic field.
 - when it is perpendicular, it is the greatest.
4. direction of force is at right angles to current and magnetic field.

Fleming's left hand rule

if a wire carrying current is placed in a magnetic field such that the direction of the current and magnetic field are perpendicular to each other, then the wire will experience a force in a direction perpendicular to the direction of current and the magnetic field.



Simple DC Motor P1.3

a current-carrying coil in a magnetic field experiences a turning effect. $\rightarrow$ converts electric energy to mechanical energy

This effect could be increased by:

- increasing number of turns of coil
- increasing the current
- increasing strength of magnetic field

current flows towards the south pole side of the magnet

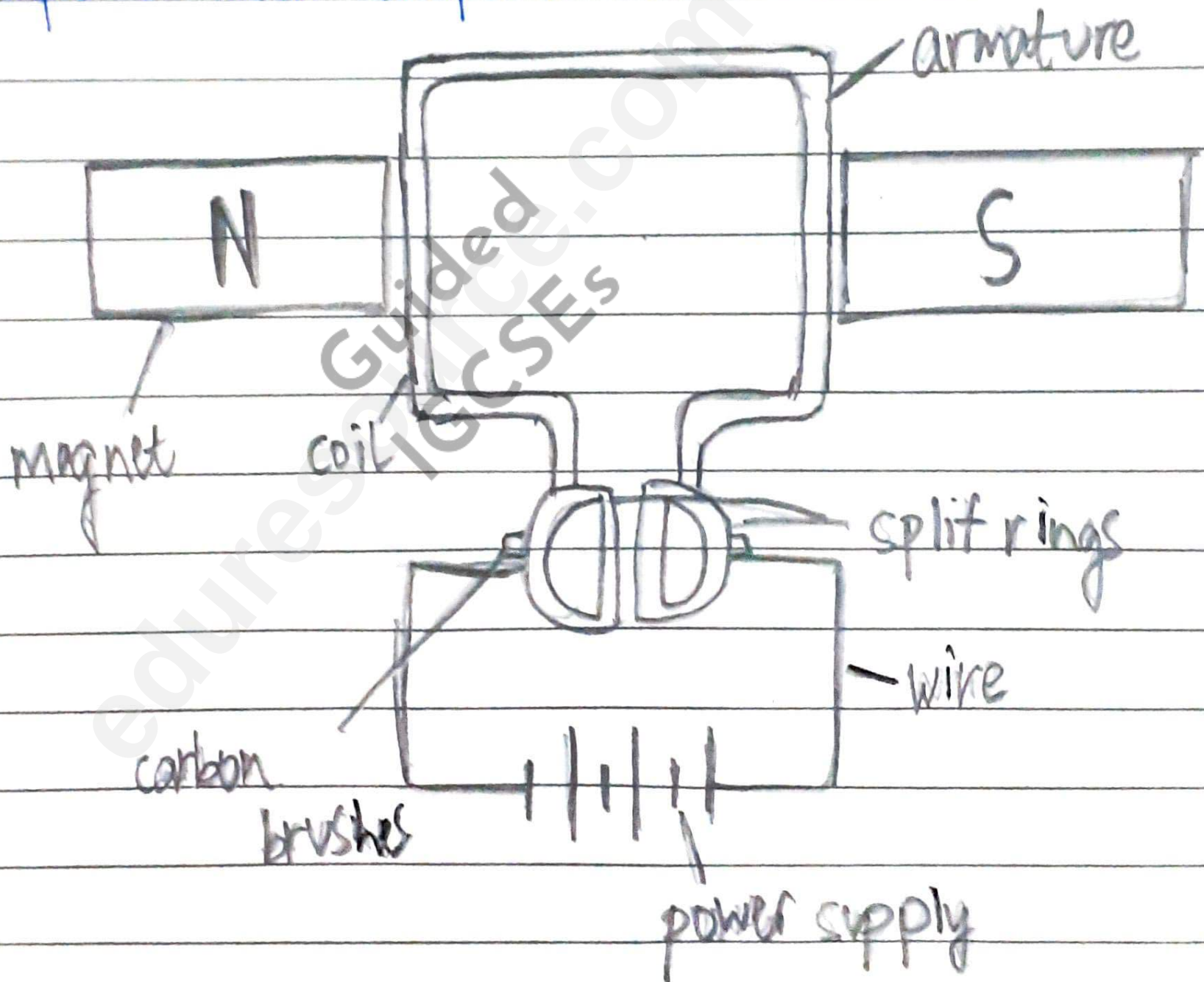
It consists of

- a strong magnet
- a coil
- two split rings
- carbon brushes
- an armature
- external power supply (cell)

split-ring commutator

- reverses current around the coil every half-turn of the coil.

The simple DC motor comprises of :



As the current in the coil is perpendicular to the magnetic field, the coil experiences a force or a thrust in a direction perpendicular to both.

The split-ring commutator reverses current every half-turn. This causes the coil to rotate in the same direction.

- Conversion of electrical to mechanical energy.

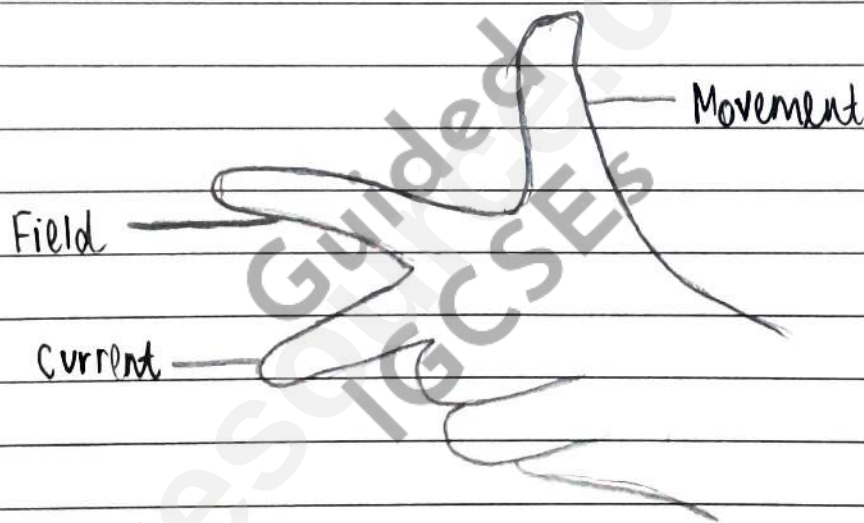
P7.4 Electromagnetic induction

Fleming's right hand rule

- when a wire moves across a magnetic field, an electromotive force is induced in it. When it is connected to a complete circuit, current is induced.

Factors affecting magnitude of an induced e.m.f

- moving wire more quickly.
- using a stronger magnetic field.
- increasing length of the wire.



Pr. 9 a.c. generator

- works on the basis of electromagnetic induction.
- converts mechanical energy to electrical energy.

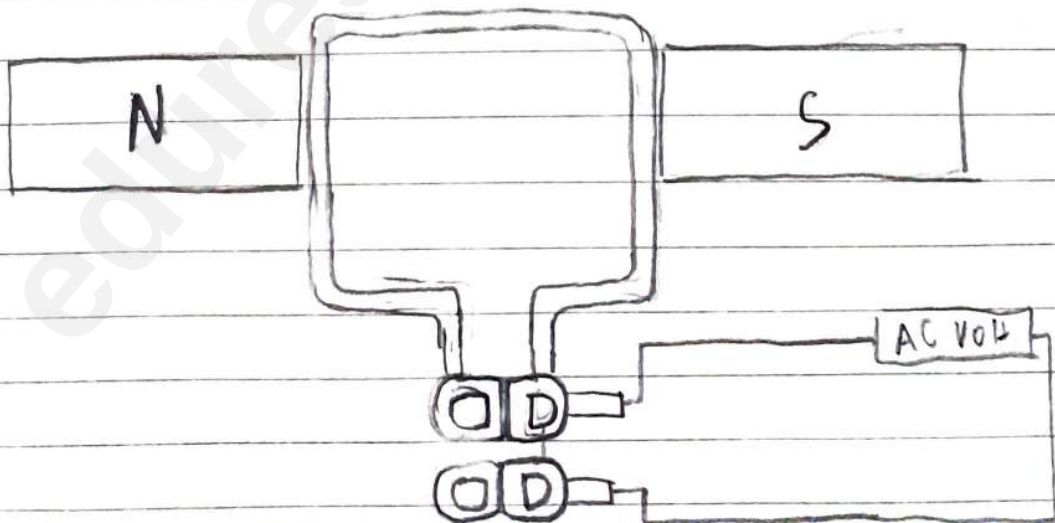
consists of :

- two slip rings
- two carbon brushes
- strong magnet
- armature coil

How rotation of coil and slip rings produce an a.c. current:
Coil cuts magnetic field.

Coil experiences a changing magnetic field.
emf induced in coil producing a current
emf/current reverses every half turn
slip rings prevent tangling of wires.

A.C. current produced as coil moves upwards and then downwards.



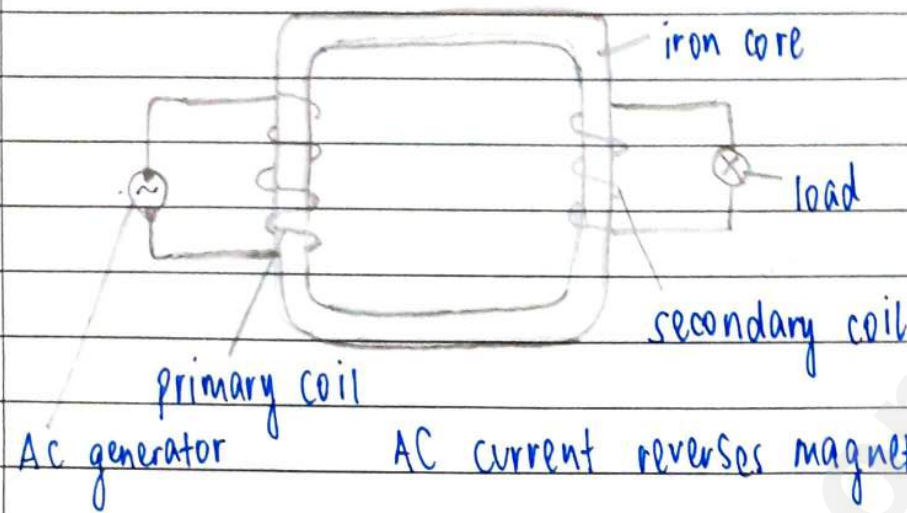
emf lowest when coil is horizontal as it does not cut field lines.

sinosodial graph to represent current (y) and time (x).

P7.6 Transformer

A transformer works on the principle of electromagnetic induction.

Construction of a basic transformer



AC current reverses magnetic field lines.

Principle Working of a transformer

When an alternating current is supplied to the primary coil, a magnetic field is induced in the soft core of a transformer.

An emf is induced in the secondary coil as the lines of the magnetic field pass through the secondary coil.

If load is connected to the secondary coil, the induced emf causes a current in the secondary circuit.

The output voltage depends on:

- Amount of input AC current
- Number of turns of coil in primary and secondary coil.
- Magnetic field of iron core.

Electrical energy is transferred from primary to secondary coil.

Transformer equation:

$$\frac{\text{Voltage across primary}}{\text{Voltage across secondary}} = \frac{\text{number of turns on primary}}{\text{number of turns on secondary}} ; \frac{V_p}{V_s} = \frac{N_p}{N_s}$$

Step-up transformer

- Secondary voltage is greater than primary voltage.
- N_s is greater than N_p .

Step-down transformer

- Secondary voltage is less than primary voltage.
- N_s is less than N_p .

High-voltage transmission of electricity

$$\text{Electrical power} = \frac{\text{work done}}{\text{time taken}}$$

$$\text{Voltage} = \frac{\text{Work done}}{\text{charge}}$$

$$\text{Voltage} = \frac{\text{Work done}}{\text{current} \times \text{time}}$$

$$\text{Voltage} \times \text{current} = \text{power}$$

Electrical power is supplied to :

large-scale industries

small-scale industries

domestic sector