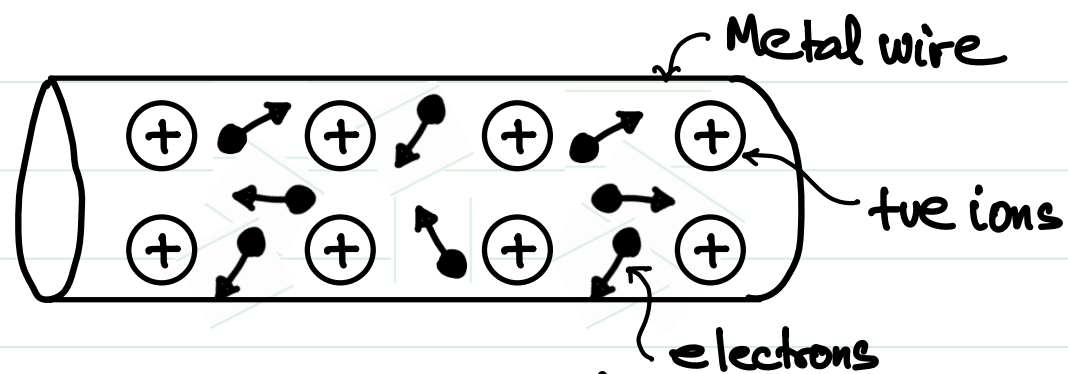
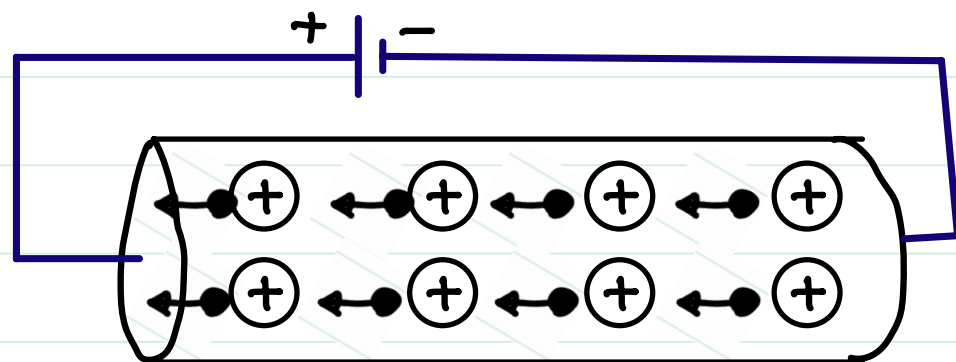


Concept of Resistance



No potential difference



When potential difference is applied

- This opposition to the drift of electrons due to collisions is termed **electrical resistance**
- Electrical resistance is a function of arrangement of atoms and electronic configuration.

- A metal conductor has free electrons and positive ions.
- The positive ions remain stationary, while electrons move.
- When no potential difference is applied, the electrons move in any random direction, while colliding with each other and the ions, causing net flow in any direction to be zero. No current flows.
- When a P.d. is applied across the ends of the metal wire, the electrons are attracted and move towards the positive potential of the wire.
- The electrons do not move in bulk with a continuously increasing speed, but there is an overall drift of electrons towards the positive potential (due to the collisions)

6. Calculate the current flowing through a wire of resistance $5\ \Omega$ connected to a battery of potential difference 3 V .
Ans. 0.6 A

$$I = \frac{V}{R} = \frac{3}{5} = 0.6\text{ A}$$

$$R = 5\ \Omega$$

$$V = 3\text{ V}$$

$$I =$$

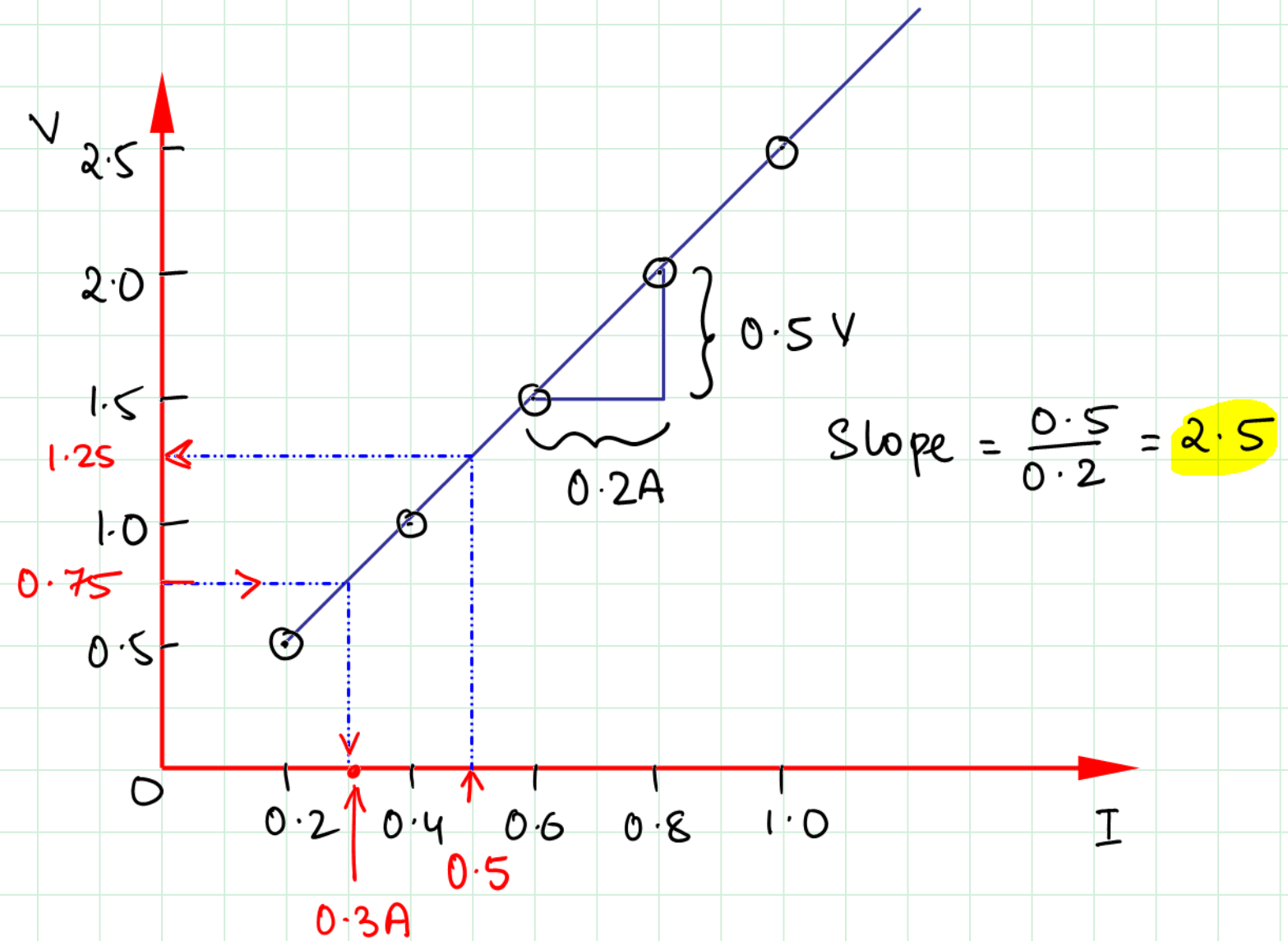
7. In an experiment of verification of Ohm's law, following observations are obtained.

Potential difference V (in volt)	0.5	1.0	1.5	2.0	2.5
Current I (in ampere)	0.2	0.4	0.6	0.8	1.0

Draw a V - I graph and **use this graph to find** :

- (a) the potential difference V when the current I is 0.5 A ,
(b) the current I when the potential difference V is 0.75 V ,
(c) the resistance in circuit.

Ans. (a) 1.25 V (b) 0.3 A (c) $2.5\ \Omega$



a) From graph $V = 1.25\text{ V}$

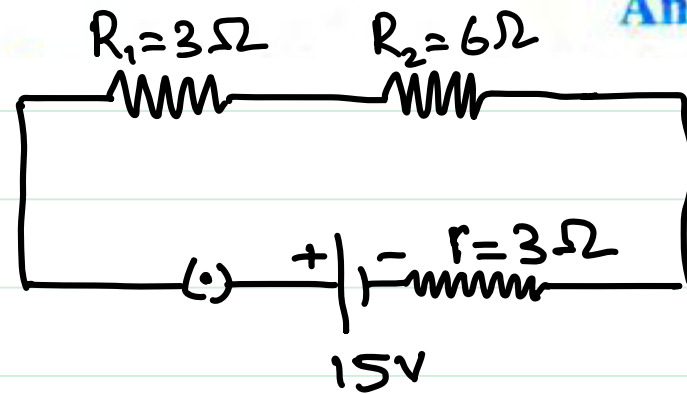
b) From graph $I = 0.3\text{ A}$

c) From graph $R = 2.5\ \Omega$

4. A battery of e.m.f. 15 V and internal resistance 3 ohm is connected to two resistors of resistances 3 ohm and 6 ohm in series. Find :

- (a) the current through the battery,
(b) the p.d. between the terminals of the battery.

Ans. (a) 1.25 A (b) 11.25 V



$$a) R_e = R_1 + R_2 \Rightarrow R_e = 9\Omega$$

$$\mathcal{E} = I(R_e + r)$$

$$15V = I(9 + 3) \Rightarrow I = \frac{15}{12} = 1.25$$

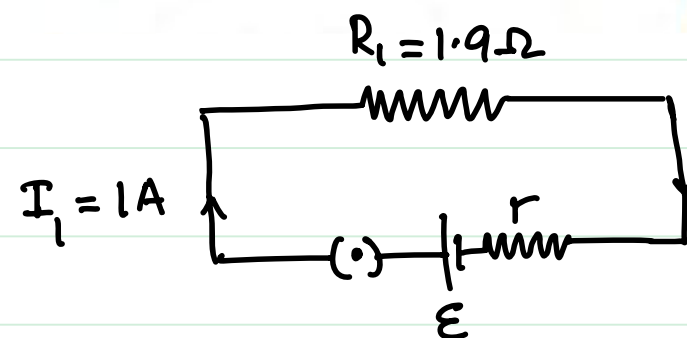
$$I = 1.25A$$

$$b) V = I(R_e) \Rightarrow V = 1.25(9)$$

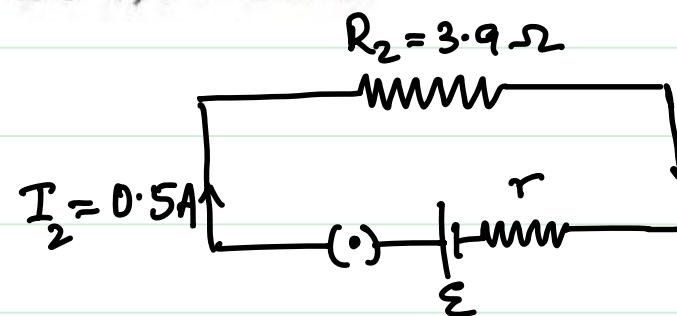
$$V = 11.25V$$

5. A cell of e.m.f. $\mathcal{E}$ and internal resistance r sends current 1.0 A when it is connected to an external resistance 1.9 Ω . But it sends current 0.5 A when it is connected to an external resistance 3.9 Ω . Calculate the values of $\mathcal{E}$ and r .

Ans. $\mathcal{E} = 2.0$ V, $r = 0.1$ Ω



$$\mathcal{E} = I_1(R_1 + r)$$



$$\mathcal{E} = I_2(R_2 + r)$$

$$\Rightarrow I_1(R_1 + r) = I_2(R_2 + r)$$

$$\Rightarrow 1(1.9 + r) = 0.5(3.9 + r)$$

$$3.8 + 2r = 3.9 + r$$

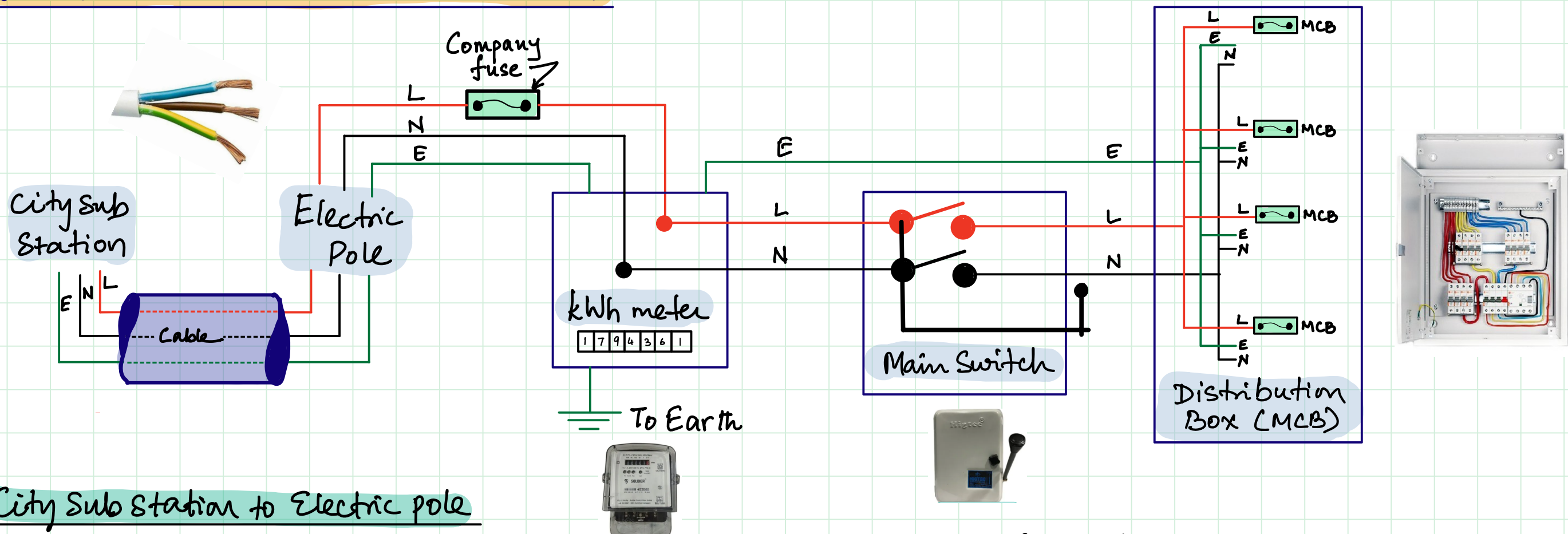
$$r = 0.1\Omega$$

$$\text{From } \mathcal{E} = I_1(R_1 + r)$$

$$= 1(1.9 + 0.1)$$

$$\mathcal{E} = 2V$$

Power distribution: Pole to Distribution box



City Sub Station to Electric pole

- Live or phase (L), Neutral (N) & Earth (E), are encased in a cable from city sub station to Electric pole.
- Live or phase wire (L) carries current from source to distribution board.
- Neutral (N) wire returns current back to source.
- Earth wire (E) is provided to discharge leakages if any to the earth.
- At sub station, the N and E wires are connected together so that both are at the same potential at zero volts.



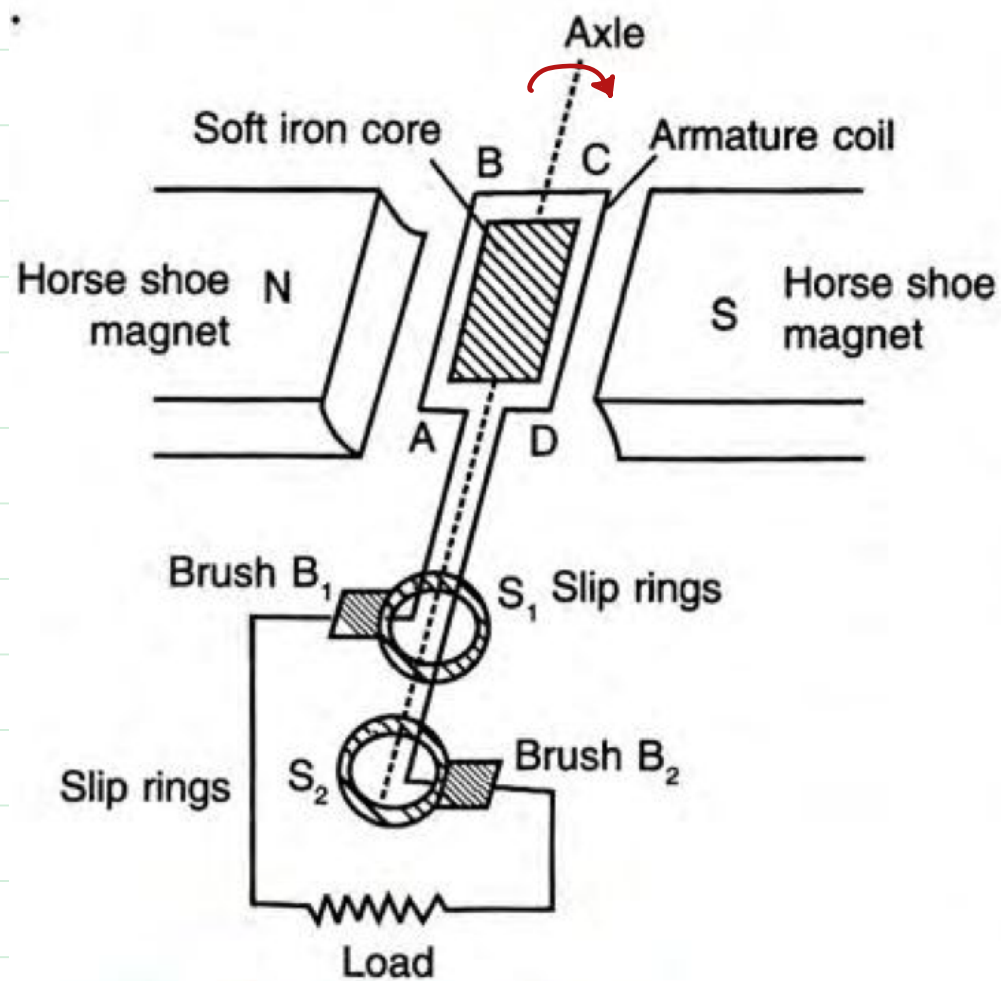
Electric pole to kWh meter

- The cable with L, N, E wires from pole connects the kWh meter.
- A company or pole fuse of 50A rating is connected to the live wire before the kWh meter.
- From the kWh meter, connections are made to the Main Switch or ELCB
Earth leakage circuit breaker



A.C. Generator or Dynamo

An a.c. generator is a device which converts the mechanical energy into the electrical energy using the principle of electromagnetic induction.



Principle of A.C. generator

When a coil is rotated in a magnetic field, e.m.f. is induced between the ends of coil causing flow of current.

Parts

1. Horseshoe magnet NS - Provides a strong magnetic field
2. Armature coil ABCD - Large number turns of insulated Cu wire on a soft iron core - ABCD in figure. The coil is rotated by an axle fixed to it.
3. Slip rings S_1 , S_2 - Two coaxial metal rings which rotate along with the coil.
One end of the coil (along AB) is attached to slip ring S_1 , while the other end of coil (along CD) is attached to slip rings S_2 .
4. Brushes B_1 , B_2 - Made of carbon, these brushes B_1 & B_2 press gently against slip rings S_1 & S_2 .