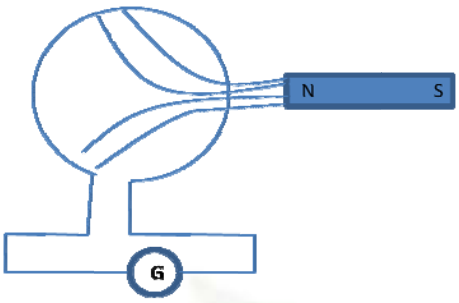
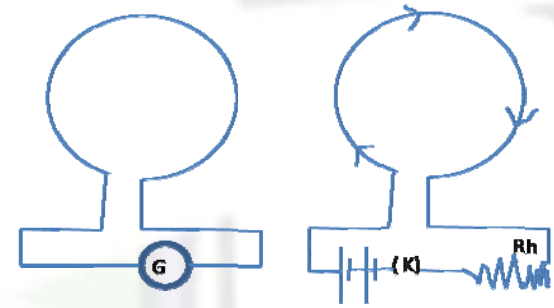
Electromagnetic Induction

Electromagnetic Induction: Just after the discovery of magnetic effect of current by Oersted, Faraday tried for a converse effect i.e. to produce current by using magnetic field.





Faraday's Experiment:

(1) Faraday kept a bar magnet in front of a closed coil containing a galvanometer. Although magnetic lines of force from the bar magnet cut the coil but no deflection in the galvanometer could be observed.

(2) Faraday then produced the magnetic field by passing current through another circular coil kept in front of the first coil but still no deflection could be observed.

However Faraday noticed that when the key was just closed or taken off, a jerk of the needle in the galvanometer could be observed at those very instants, guided by this observation he found the result.

(3) Faraday varied the current in the coil with the help of rheostat thereby varying the number of magnetic lines of force produced by the coil. When these lines of force cut the first coil a deflection in the galvanometer could be observed.

(4) Faraday using a bar magnet in front of the coil could also observe a deflection in the galvanometer by moving the magnet either towards the coil or away from the coil.

Conclusion: When magnetic lines of force cutting through the plane of the coil changes with time a current flows through the coil the current is known as induced current and emf responsible for this is induced emf and the phenomenon is known as electromagnetic induction.

Thus for electromagnetic induction following two conditions must be satisfied:

(1) The magnetic lines of force must cut through the plane of the coil.

(2) The number of magnetic lines of force cutting the plane of the coil must change with time (either there should be a relative motion between the coil and the magnet or the coil and the current through the current carrying coil should vary). Thus the magnetic flux through the coil must change time.