



CLASS –X

CHAPTER – MAGNETIC EFFECTS OF ELECTRIC CURRENT

TOPIC : ELECTRIC MOTOR

ELECTRIC MOTOR



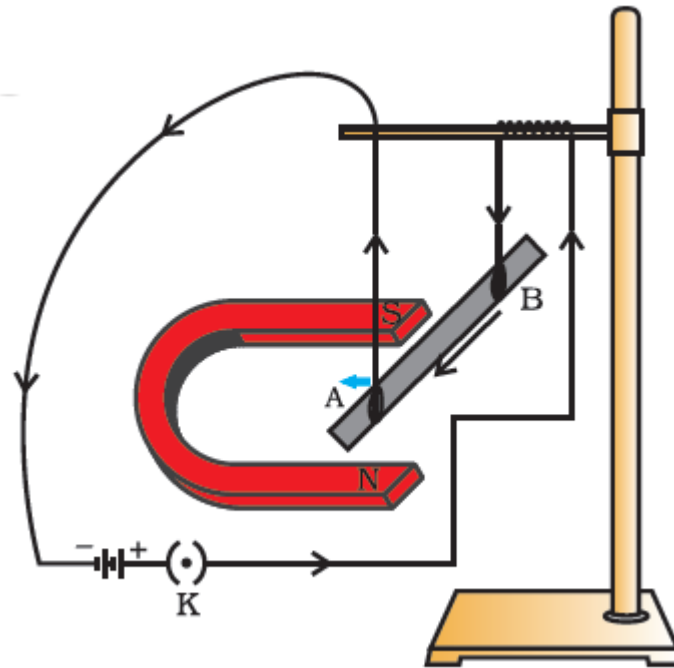


DEFINITION

An electric motor is an electric device that converts electrical energy to mechanical energy.

PRINCIPLE

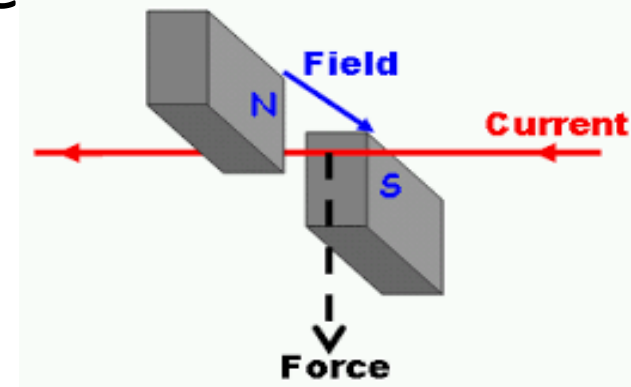
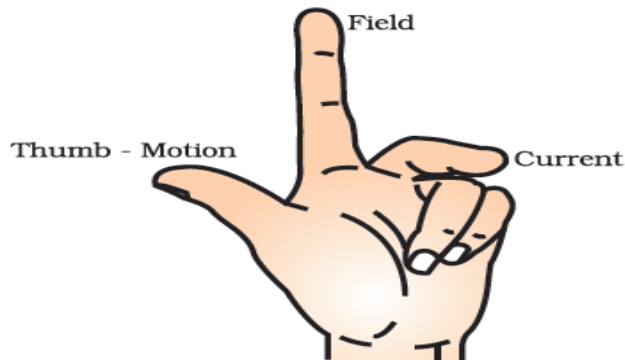
Force acts on a current carrying conductor placed in external magnetic field.



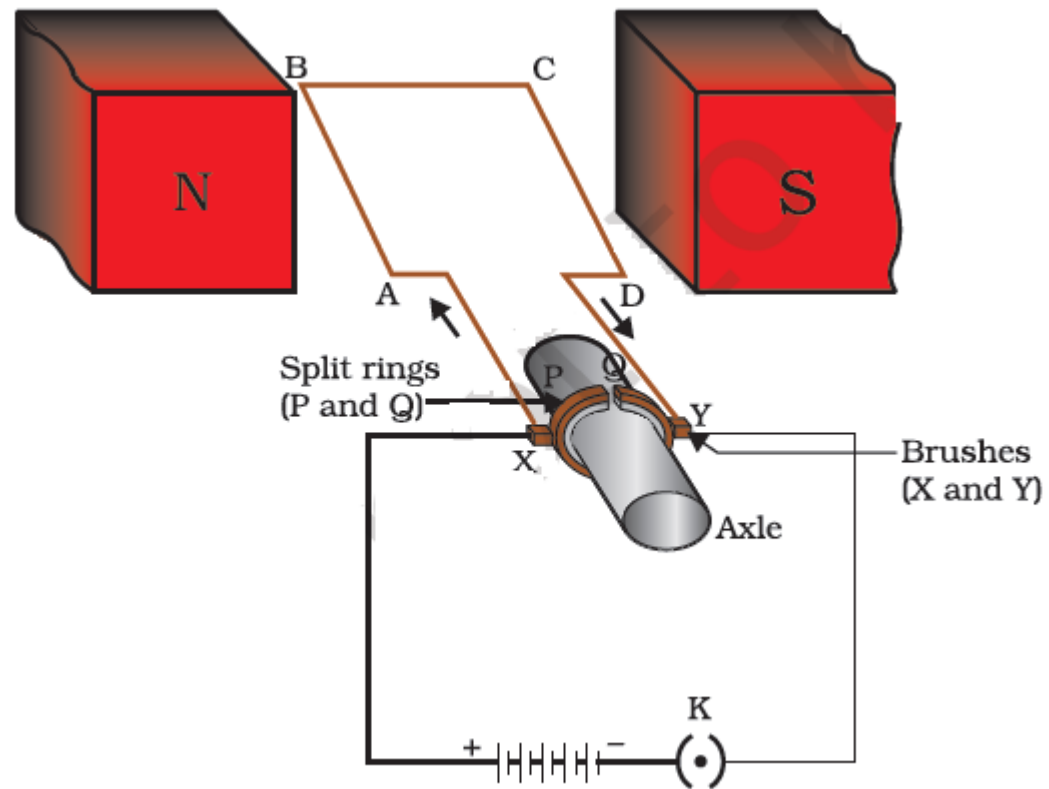
TO DETERMINE THE DIRECTION OF FORCE ON THE CURRENT CARRYING CONDUCTOR PLACED IN EXTERNAL MAGNETIC FIELD

FLEMING'S LEFT HAND RULE

- Fore Finger – Direction of Magnetic field
- Middle Finger – Direction of Current
- Thumb – Direction of Force



DIAGRAM



CONSTRUCTION

- **Insulated wire:** Rectangular coil of copper wire
- **Strong Magnet:** Armature coil is placed between the poles of strong magnet (North Pole and South Pole).
- **Split Rings:** C-shaped rings P and Q. They work as a commutator (It can reverse the direction of current)
- **Axle:** The split rings are placed on the axle which can rotate freely.
- **Carbon Brushes:** The outside of the split rings are in contact of conducting carbon brushes X and Y.
- **Battery:** Source of current.

WORKING

- Current in the coil ABCD enters from the source battery through conducting brush X and flows back to the battery through brush Y.
- Current in arm AB of the coil flows from A to B, while, in arm CD it flows from C to D, that is, opposite to the direction of current through arm AB.
- On applying Fleming's left hand rule the direction of force on AB is downwards while the force acting on arm CD is upwards.
- Therefore the coil ABCD and the axle O, mounted free to turn about an axis, rotate anti-clockwise.
- After half rotation, split ring Q makes contact with the brush X and split ring P with brush Y.
- Hence the current in the coil gets reversed and flows along the path DCBA. This reverses the direction of force acting on the two arms AB and CD.
- Thus the arm AB of the coil that was earlier pushed down is now pushed up and the arm CD previously pushed up is now pushed down.
- The reversing of the current is repeated at each half rotation, giving rise to a continuous rotation of the coil and to the axle.

APPLICATIONS

- Electric fans
- Refrigerators
- Electric vehicles,
- Amusement machines
- Aerospace
- Medical and healthcare equipment
- Pumping system.
- Mixers
- Washing machines
- Computers
- MP3 players



ENHANCEMENTS

- Motors with brushes and sliding contacts are gradually replaced by brushless motors.
- More integration of electric machines with mechanical components
- Electrical motors operating at high temperatures between 500 to 600°C





THANK YOU