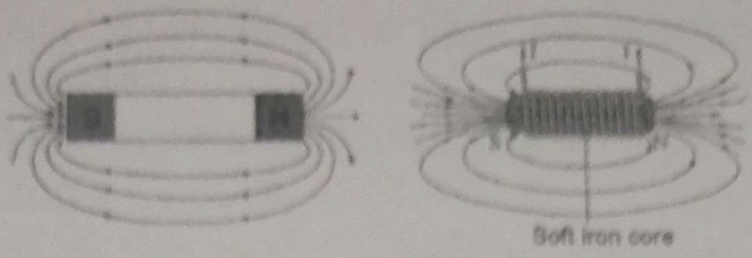
MAGNETIC FIELDS OF TWO TYPES OF MAGNETS



Qn. 1

The magnetic field of which magnets are depicted?

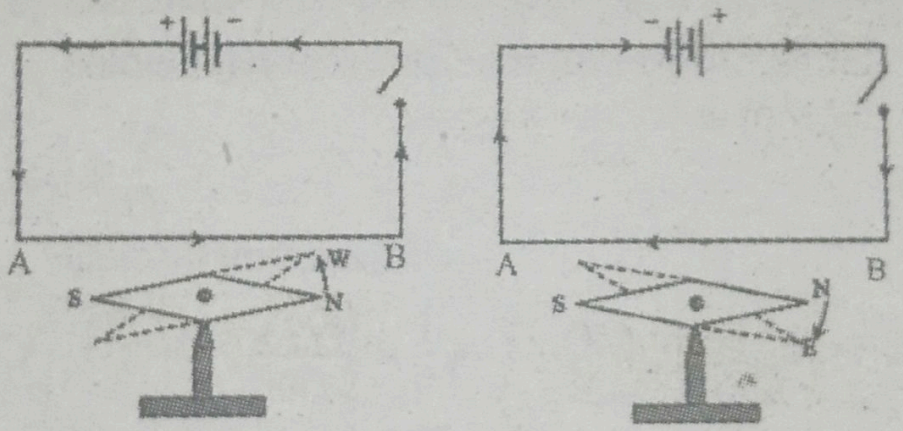
Ans Bar magnet, Electromagnet

The magnetic field lines of the bar magnet and that of the electromagnet are similar. The magnetic strength / magnetism of an electromagnet is temporary and that of bar magnet is permanent.

Magnetic field around a current carrying straight conductor.

Experiment

Arrange a circuit above a pivoted magnetic needle in such a way that the part AB of the conductor is parallel and close to the magnetic needle, as shown in Figure.



Switch on the circuit.

Observe the direction in which the North Pole (N) of the magnetic needle deflects and complete the first table.

Qn. 2

When the direction of electric current is from A to B, what will be the direction of the electron flow through it ?

Qn. 3

Repeat the experiment after reversing the current and record your observations in the table.

Ans

No.	Conductor above the magnetic needle	Direction of motion of North Pole (N) of the magnetic needle clockwise/anticlockwise
1	Direction of current from A to B	Anticlockwise
2	Direction of current from B to A	Clockwise

Qn. 4

Repeat the experiment keeping the conductor below the magnetic needle and record the observations in the table.

Ans

No.	Conductor above the magnetic needle	Direction of motion of North Pole (N) of the magnetic needle clockwise/anticlockwise
1	Direction of current from A to B	Clockwise
2	Direction of current from B to A	Anticlockwise

Find out the answer for the following based on the experiment.

Qn. 5

What might be the reason for the deflection of the magnetic needle?

Ans A magnetic field is developed around a current carrying conductor. The magnetic needle is deflected as a result of the mutual action of this magnetic field and that around the magnetic needle.

Qn. 6

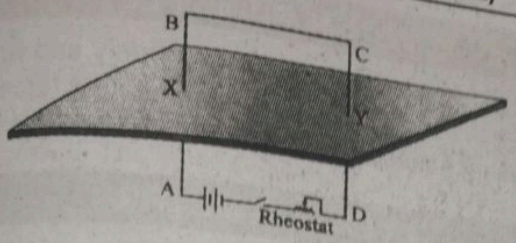
Does the deflection depend on the direction of current?

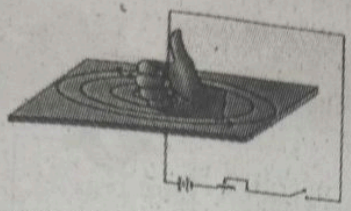
Ans Yes

A magnetic field is developed around a current carrying conductor.

Let's examine the speciality of the magnetic field around a current carrying conductor.

- Insert a conductor through a carboard and keep it in a vertical position as shown in the figure. The portions passing through the cardboard are marked as X and Y.



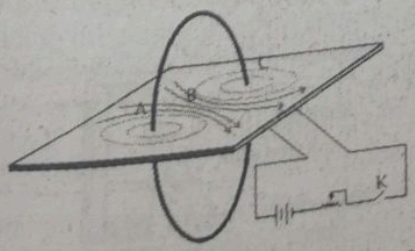


- Using a magnetic compass, draw the direction of the magnetic field around the point X when current passes through the conductor.
- The direction of current in the circuit between A and B is from A to B.
- The direction of magnetic field lines around X are in the anticlockwise direction by observing the North Pole of the magnetic compass.
- The direction of the fingers of the right hand encircling the conductor and the magnetic field lines are in the same direction.

The Right Hand Thumb Rule *of James Clark Maxwell. Imagine you are holding a current carrying conductor with the right hand in such a way, that the thumb points in the direction of the current. The direction in which the other fingers encircle the conductor gives the direction of the magnetic field.*

The same rule is also known as Right Hand Screw Rule. If a right hand screw is rotated in such a way that its tip advances along the direction of the current in the conductor, then the direction of rotation of the screw gives the direction of the magnetic field around the conductor.

Magnetic Field around a current carrying conductor in the shape of a coil.



After passing electricity the direction of magnetic field at C using a magnetic compass and is marked it on the cardboard.

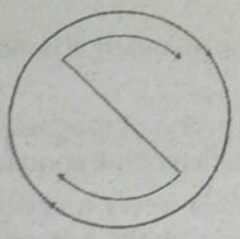
The magnetic field lines inside the coil are seen in the same direction.

When the electric current passes in the clockwise direction, the magnetic field lines appear to move away from us into the coil through the central part of the coil. But if the electric current passes in the anti clockwise direction, the magnetic field lines appear to move out towards us from the coil through its centre.

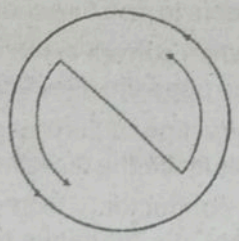
The strength of the magnetic field increases when the number of turns of the coil or current is increased.

SOLENOID

A solenoid is an insulated wire wound in the shape of a helix. Such coiled conductors are used to make use of the magnetic effect of electricity.



Current in the clockwise direction



Current in the Aniclockwise direction

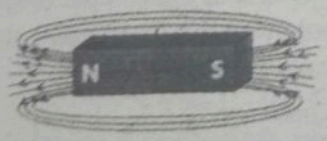
The end of the solenoid at which current flows in the clockwise direction will be the South Pole and the end at which current flows in the anticlockwise direction will be the North Pole.

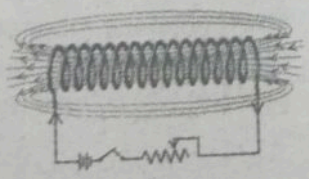
Qn. 7

What are the factors affecting the strength of the magnetic field of a solenoid carrying current.

- Intensity of electric current
- Number of turns
- Area of cross section of soft iron core.

Lines of force formed around a solenoid carrying current and a bar magnet.





Bar magnet	Solenoid
The magnetism is permanent	The magnetism is temporary
Polarity is unchanged	Polarity is changing
We can not change the magnetic strength	We can change the magnetic strength