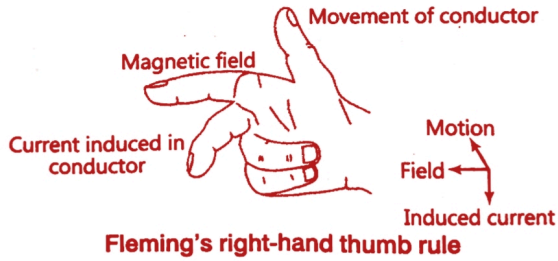
Q.1. State Right Hand Thumb Rule and also draw diagram. **[CBSE 2014]**

Ans. Hold the wire carrying current in your right hand, such that the thumb indicates the direction of current, then the folded fingers will indicate the presence of magnetic field (lines) surrounding the wire.



Fleming's right-hand thumb rule

Q.2.(i) A compass needle gets deflected when brought near a current carrying conductor. Why?

(ii) What happens to the deflection of needle when current in the conductor is increased? **[CBSE 2014]**

Ans. (i) Current carrying conductor produces a magnetic field around it.
(ii) Deflection increases with increases in current.

Q.3.(a) In a pattern of magnetic field lines due to a bar magnet, how can the regions of relative strength be identified?
(b) Compare the strength of field near the poles and middle of a bar magnet. **[CBSE 2014]**

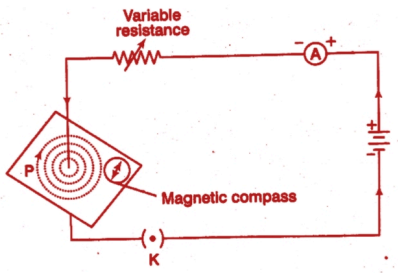
Ans.(a) The relative strength of the magnetic field is shown by the degree of closeness of the field lines.
(b) The strength of field near the poles is highest and in the middle of a bar magnet it is lowest.

Q.4. State two ways by which the strength of an electromagnet can be increased. **[CBSE 2014]**

Ans. The strength of an electromagnet can be increased by
(i) Increasing the number of turns in the solenoid.
(ii) Increasing the strength of current flowing through the solenoid.

Q.5. Draw magnetic field lines produced around a current carrying straight conductor passing through cardboard. How will the strength of the magnetic field change, when the point where magnetic field is to be determined, is moved away from the straight wire carrying constant current? Justify your answer. **[CBSE 2012]**

Ans. The diagram is as shown



Using compass needle, when we move away from the straight wire, the deflection of the needle decreases which implies the strength of the magnetic field decreases.

Q.6. A current carrying conductor produces a magnetic field around it. Is there a similar magnetic field produced around a thin beam of moving [CBSE 2012]

(i) electrons. (ii) neutrons

Justify your answer.

Ans. (i) Yes (ii) No

A beam of moving electrons constitutes electric current but neutrons are neutral, so no current and hence no magnetic field.

Q.7.Horizontal component of earth's magnetic field at a place is uniform and its direction is south to north. A high current through a horizontal power line flows at this place from west to east. Consider two points A and B at equal distances from the wire, respectively above and below it. Giving reason explain, where is the field more at A or at B. [CBSE 2014]

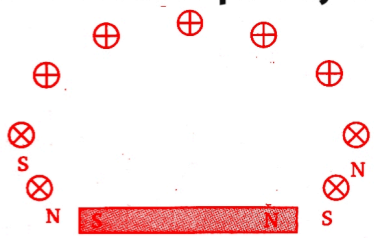
Ans. According to right hand thumb rule, the direction of magnetic field due to current at A is from north to south and at B from south to north. Therefore, at A earth's field and field due to current are in opposite directions whereas at B they are in the same direction. So field is more at B.

Q.8. A uniform magnetic field is directed vertically upwards. In which direction in this field should an alpha- particle (which are positively charged particles) be projected so that it is deflected south ward? Name and state the rule you have used to find the direction in this case. [CBSE 2015]

Ans. An alpha particle carries positive charge, applying Fleming's left hand rule, we find that the direction of motion of positively charged a particle is from west to east.
Fleming's Left Hand Rule **Stretch the first three fingers of the left hand mutually perpendicular to each other such that the forefinger points the direction of a magnetic field, the middle finger point the direction of current, then the thumb will indicate the direction of force experienced by the conductor. It is applied to the direction of the current and field perpendicular to each other.**

Q.9. Define magnetic field. Describe an activity to draw magnetic field lines around a bar magnet from one pole to another pole. [CBSE 2015]

Ans. It is region around a magnet where the magnetic force of the magnet can be felt. Take a small compass and a bar magnet. Place the magnet on sheet of white paper fixed on a drawing board, using some adhesive material. Mark the boundary of the magnet.Place the compass near the north pole of the magnet.



We find that the south pole the needle points towards the north is directed away from the north pole of the magnet. Mark the position of two ends of the needle. Now, move the needle to a new position such that its south pole occupies the position previously occupied by its north pole. In this way, proceed step by step till you reach the south pole of the magnet as shown in figure.

Q.10. What is meant by electromagnetic induction? State the rule which helps in determining direction of induced current. **[CBSE 2015]**

Ans. *Electromagnetic induction* It is the production of potential due to change in magnetic field around a coil.

Fleming right hand rule **Hold the thumb, the fore finger and the middle finger of your right hand at right angles to one another. Adjust your hand in such a way that fore finger points in the direction of magnetic field, thumb points in the direction of motion of conductor, then the direction in which middle finger points give the direction of induced current in the conductor.**

Q.11. What is an electromagnet? How can we determine north and south pole of an electromagnet with the help of magnetised iron bar. **[CBSE 2014]**

Ans. An *electromagnet* is a solenoid coil that attains, magnetism due to flow of current. It works on the principle of magnetic effect of current.
(i) To suspend magnetised bar and identify its north and south poles.
(ii) To find the polarity of electromagnet using the property-like poles repel.

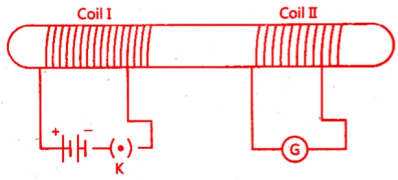
Q.12. Explain whether an alpha particle will xperience any force in a magnetic field if
(i) It is placed in the field at rest.
(ii) It moves in the magnetic field parallel to field lines.
(iii) It moves in the magnetic field perpendicular to field lines. **[CBSE 2014]**

Ans.(i) No, because, a charged particle at rest does not interact with magnetic field.
(ii) No, because, the force is zero if current and field are in the same direction.
(iii) Yes, because, the force is maximum when current and magnetic field are maximum.

Q.13. Under what condition does a current carrying conductor kept in a magnetic field experience maximum force? On what other factors does the magnitude of this force depend? Name and state the rule used for determination of direction of this force.
[CBSE 2011]

Ans. When the conductor is held perpendicular to the magnetic field.
The magnitude of the force depends upon
(i) Strength of magnetic field.
(ii) Orientation of the conductor.
(iii) Length of the conductor.
Fleming's left hand rule.

Q.1. Two coils of insulated copper wire are wound over a non conducting cylinder as shown. Coil I has larger number of turns.



(i) Write your observations when,

(a) Key K is closed.

(b) Key K is opened.

(ii) Give reason for your observations.

(iii) Mention the name of the phenomenon involved and define it

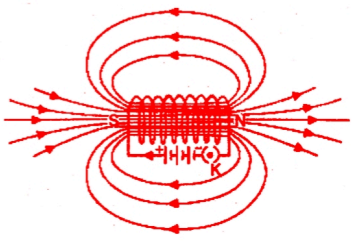
(iv) Name of two coils used in this experiment.

(v) State the rule which gives the direction of induced current. **[CBSE 2012,14,17]**

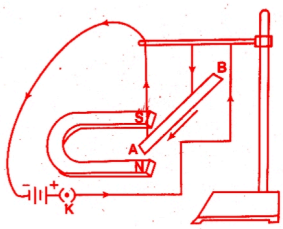
Ans. (i) (a) A momentary deflection is shown by the galvanometer.
(b) A momentary deflection is shown by the galvanometer but in the opposite direction.
(ii) When key is closed or opened, the current in the coil I changes, therefore the magnetic field linked with coil II changes and hence a current is induced in it.
(iii) Electromagnetic induction. The process by which a changing magnetic field in a conductor induced current in another conductor.
(iv) Primary coil - coil I
Secondary coil - coil II
(v) Fleming's Right Hand Rule Stretch the first three fingers of the right hand mutually perpendicular to each other such that the forefinger gives the direction of magnetic field and the thumb points in the direction of the motion of a conductor then, the middle finger will give the direction of the induced current.

Q.2.(a) What is a solenoid?
(b) Draw the pattern of magnetic field formed around a current carrying solenoid. Compare this field to that of a bar magnet.
(c) Explain an activity to show that a current carrying conductor experiences a force when placed in a magnetic field. **[CBSE 2011,12,15,17]**

Ans. (a) A coil of many circular turns of insulated copper wire wrapped closely in the of a cylinder is called solenoid.
(b) Magnetic fields of a solenoid and a bar magnet are similar.



(c) A small aluminium rod suspended horizontally from a stand using two connecting wires. Place a strong horse shoe magnet in such a way that the rod lies between the two poles with the magnetic field directed upwards. For this put the north pole of the magnet vertically below and south pole vertically above the aluminium rod. Connect the aluminium rod in series with a battery, a key and a rheostat. Pass a current through the aluminium rod from one end to other. The rod is displaced towards left. When the direction of current flowing through the rod is reversed, the displacement of rod will be towards right.



Q.3.(a) A stationary charge is placed in a magnetic field. Will it experience a force? Give reason to justify your answer.
(b) On what factors does the direction of force experienced by a conductor when placed in a magnetic field depend?
(c) Under what conditions is the force experienced by a current carrying conductor placed in a uniform magnetic field maximum?
(d) Name and state the rule which gives the direction of force experienced by a current carrying conductor placed in a magnetic field. [CBSE 2012]

Ans.(a) No, a magnetic field exerts a force only on moving charges.
(b) The direction of force depends on the direction of current and direction of magnetic field.
(c) The force is maximum when the direction of current is at right angles to the direction of magnetic field.
(d) Fleming's Left Hand Rule

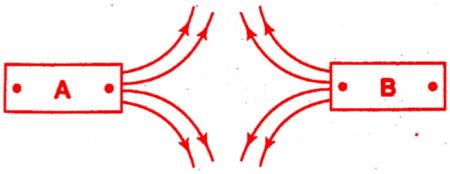
Q.4.Explain the meanings of the words electromagnetic" and "induction" in the term electromagnetic induction. List three factors on which the value of induced current produced in a circuit depends. Name and state the rule used to determine the direction of induced current. State one practical application of this phenomenon in everyday life. [CBSE 2014]

Ans. Electromagnetic means production of electric current in a coil under the influence of magnetic field and Induction means bringing about an electrical flow in the coil without coming in contact with a magnetised body.

Factors
(i) Number of turns in the coil.
(ii) Strength of the magnet
(iii) Speed of the magnet.
Fleming's right hand rule

Application **Generator.**

Q.5(a) Magnetic field lines of two bar magnets A and B are as shown below. Name the poles of the magnets facing each other.

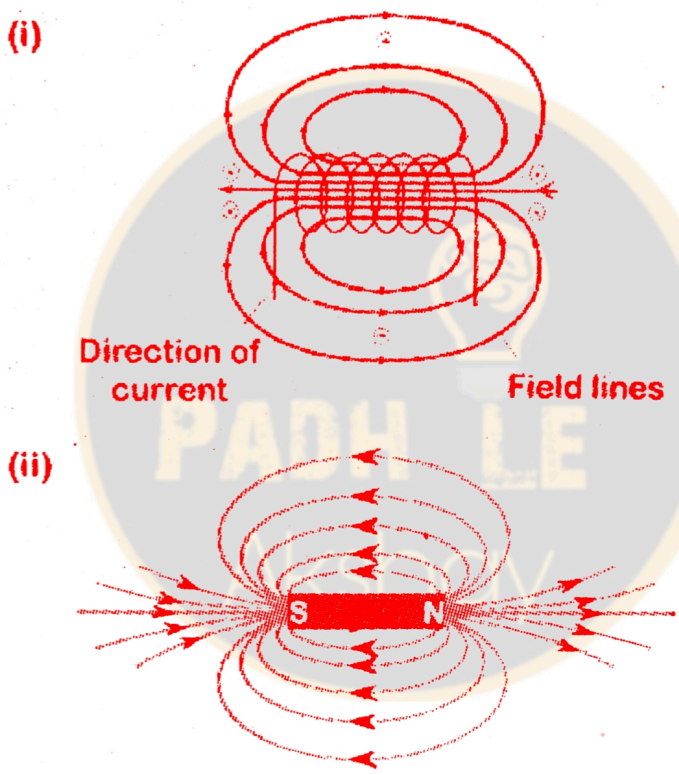


(b) Two magnetic field lines never intersect each other. Why?
(c) How does the strength of the magnetic field at the centre of a current carrying circular coil depend on the
(i) radius of the coil,
(ii) number of turns in the coil, and
(iii) strength of the current flowing in the coil? [CBSE 2015]

(b) Intersection of magnetic field lines at a point means that the compass needle would point towards two directions at the point, which is not possible.
(c) (i) Inversely proportional; more radius less strong magnetic field.
(ii) Directly proportional; more turns more strong magnetic field.
(iii) Directly proportional; more strength of current more strong magnetic field.

Q.6. What is a solenoid? Draw the pattern of magnetic field lines of (i) a current carrying solenoid and (ii) a bar magnet. List two distinguishing features between the two fields. **[CBSE 2013,15,19]**

Ans. A solenoid is a long cylindrical coil containing a large number of closely spaced turns of insulated copper wire.

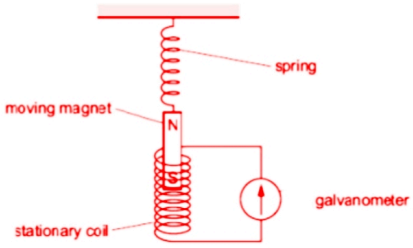


Distinguish between the two fields are

Distinguish between the two fields are :

(i) The strength of magnetic field due to solenoid can be changed while the magnetic field strength due to bar magnet cannot be changed.
(ii) Solenoid produces magnetic field so long as current flows in its coils while bar magnet produces a permanent magnetic field.

Ansari Sir was demonstrating an experiment in his class with the setup as shown in the figure below.



A magnet is attached to a spring. The magnet can go in and out of the stationary coil. He lifted the Magnet and released it to make it oscillate through the coil.
Based on your understanding of the phenomenon, answer the following questions.

a. What is the principle which Ansari Sir is trying to demonstrate?
b. What will be observed when the Magnet starts oscillating through the coil. Explain the reason behind this observation.
c. Consider the situation where the Magnet goes in and out of the coil. State two changes which could be made to increase the deflection in the galvanometer.
OR
Is there any difference in the observations in the galvanometer when the Magnet swings in and then out of the stationary coil? Justify your answer.

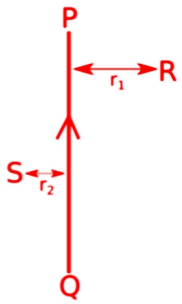
ANSWERS

(a). Sir is trying to demonstrate the principle of Electromagnetic induction.
(b). There will be induced current in the coil due to relative motion between the magnet and the coil. Changing the magnetic field around the coil generates induced current.
(c). Using a stronger magnet, using a coil with more number of turns.

OR

When the magnet moves into the coil, the ammeter shows a momentary deflection towards one side say left.
When the magnet moves out of the coil, the ammeter shows a momentary deflection now towards right.
This is due to changing magnetic field /flux associated with the coil as the magnet moves in and out.
Alternatively, the flux increases when the magnet goes in and it decreases when the magnet goes out.

PQ is a current carrying conductor in the plane of the paper as shown in the figure below.



(i) Find the directions of the magnetic fields produced by it at points R and S?
(ii) Given r_1 r2, where will the strength of the magnetic field be larger? Give reasons.
(iii) If the polarity of the battery connected to the wire is reversed, how would the direction of the magnetic field be changed?
(iv) Explain the rule that is used to find the direction of the magnetic field for a straight current carrying conductor.

ANSWERS

(i) The magnetic field lines produced is into the plane of the paper at R and out of it at S.

(ii) Field at S> Field at P Magnetic field strength for a straight current carrying conductor is inversely proportional to the distance from the wire.

(iii) The current will be going from top to bottom in the wire shown and the magnetic field lines are now in the clockwise direction on the plane which is perpendicular to the wire carrying current.

(iv) Right hand thumb rule. The thumb is aligned to the direction of the current and the direction in which the fingers are wrapped around the wire will give the direction of the magnetic field.