O P JINDAL SCHOOL, SAVITRINAGAR

CLASS TEST & PRACTICE

CLASS X PHYSICS

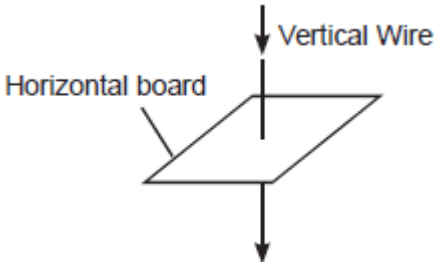
TOPIC : MAGNETIC EFFECT OF CURRENT AND MAGNATISM

---

1 What are magnetic field lines? Justify the following statements
(a) Two magnetic field lines never intersect each other. 3
(b) Magnetic field lines are closed curves.

ANS: Magnetic field lines: It is defined as the path along which the unit North pole (imaginary) tends to move in a magnetic field if free to do so.
(a) The magnetic lines of force do not intersect (or cross) one another. If they do so then at the point of intersection, two drawn tangents at that point indicate that there will be two different directions of the same magnetic field, i.e. the compass needle points in two different directions which is not possible.
(b) Magnetic field lines are closed continuous curves. They emerge out from the north pole of a bar magnet and go into its south pole. Inside the magnet they move from south pole to north pole.

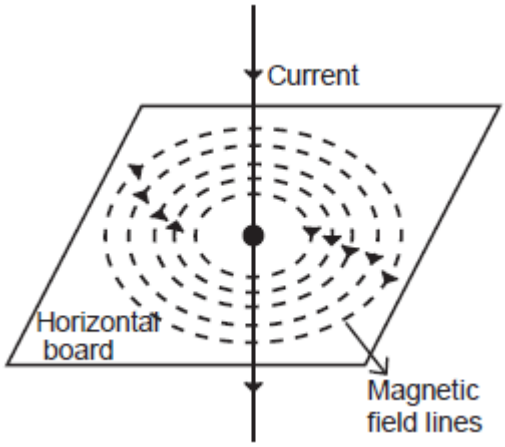
2 The direction of electric current passed through a vertical wire and through a horizontal card is shown below:



3

Sketch the pattern of the magnetic field on the card around the wire. Indicate the direction of the magnetic field at any one point. How would you check this direction experimentally?

ANS: The pattern of magnetic field lines on the card around the current carrying conductor for the downward direction of current is shown. They are concentric in circle with their centre ties on the axis of wire.



Direction of magnetic field lines can be checked experimentally by placing a magnetic compass needle any where on the card board. Direction of its North pole indicating the direction of magnetic field.

3 How will the magnetic field produced at a point due to a current carrying circular coil change if we:
(a) increase the current flowing through the coil?
(b) reverse direction of current through the coil?
(c) increase the number of turns in the coil? 3

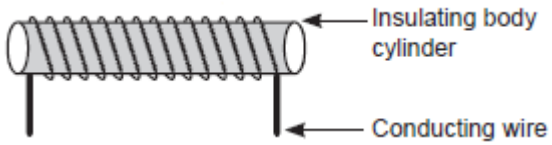
ANS: Magnetic field (B) at the centre of the circular coil
(a) increases if the current is increased as $B \propto I$
(b) reverses on reversing the current.
(c) increases if the number of turns in the coil increases as field is directly proportional to the number of turns.

4 Two circular coils A and B of insulated wires are kept close to each other. Coil A is connected to a galvanometer while coil B is connected to a battery through a key. What will you observe in coil A, if
(a) current is passed through coil B by plugging the key,
(b) the current is stopped by removing the plug from the key?
(c) both the coils are moved in the same direction with the same speed?
Explain your answer mentioning the name of the phenomena involved. 3

ANS: (a), (b) In both the given cases, galvanometer shows momentary deflection but in opposite direction. Magnetic field lines [increase in case (a) and decrease in case [(b)] linked with coil 'A' induces a potential difference across the end of the coil which set up induced electric current in that coil due to its closed circuit. This is shown by the deflection in galvanometer.
This phenomenon is known as electromagnetic induction.
(c) If both the coils are moved in the same direction with the same speed, there will be no change in magnetic field lines of force associated with the secondary coil. Hence, no induced current will be set up in the coil.

5 What is meant by solenoid? How does a current carrying solenoid behave? Give its main use. 3

ANS: Solenoid: A coil of many circular turns of insulated copper wire wound on a cylindrical insulating body (i.e. cardboard etc.) such that its length is greater than its diameter is called solenoid.

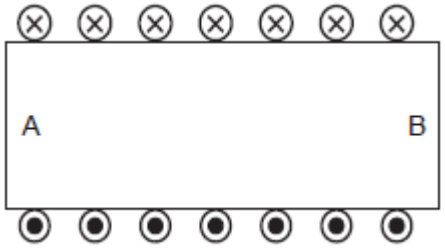


When current is flowing through the solenoid, the magnetic field line pattern resemble exactly with those of a bar magnet with the fixed polarity North and South pole at its ends and it acquires the
directive and attractive properties similar to bar magnet. Hence the current carrying solenoid behaves a bar magnet.
Use of current carrying solenoid: It is used to form a temporary magnet called electromagnet as well as permanent magnet.

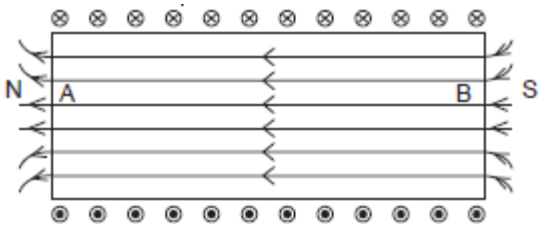
6 How does the strength of the magnetic field produced by a current carrying solenoid increased? 3

ANS: Strength of the magnetic field can be increased by:
(i) increasing the current in the coil
(ii) increasing the number of coils in the solenoid; and
(iii) using a soft iron core within the solenoid.

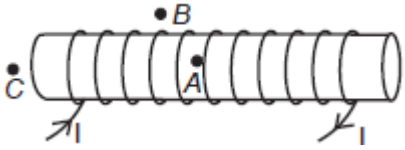
7 Diagram shows the lengthwise section of a current carrying solenoid. ⊗ indicates current entering into the page, ⊙ indicates current emerging out of the page. Decide which end of the solenoid A or B, will behave as north pole. Give reason for your answer. Also draw field lines inside the solenoid. 3



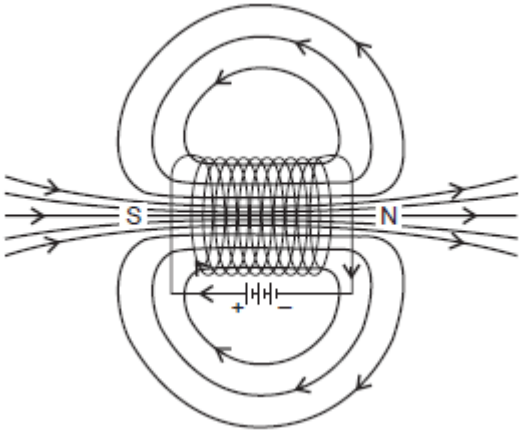
ANS: 'A' end of the given solenoid will behave as north pole because at this end direction of current appears anticlockwise (By using clock face rule)



8 For the current carrying solenoid as shown below, draw magnetic field lines and giving reason explain that out of the three points A, B and C at which point the field strength is maximum and at which point it is minimum. 3



ANS: Outside the solenoid magnetic field is minimum. At the ends of solenoid, magnetic field strength is half that of inside it. So



Minimum – at point B; Maximum – at point A