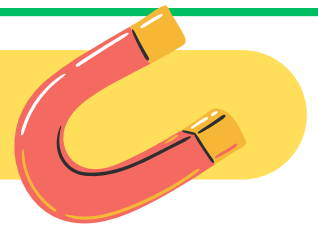


• Magnetic effects of current



1. State whether an alpha particle will experience any force in a magnetic field if (alpha particles are positively charged particles) (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. Justify your your answer in each case.

(CBSE 2016, 2022, 2023)

2. Mention and explain the function of an earth wire. Why it is necessary to earth metallic appliances? (CBSE 2014, 2016, 2020)

3. Name and state the rule which is used to determine the direction of force on a current carrying conductor placed in a magnetic field. (CBSE 2020, 2022, 2023)

4. What are magnetic field lines? Justify the following statements:

(a) Two magnetic field lines never intersect each other.

(b) Magnetic field are closed curves. (CBSE 2013, 2015, 2016)

5. What is 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.

(Delhi 2019, 2020)

Solutions

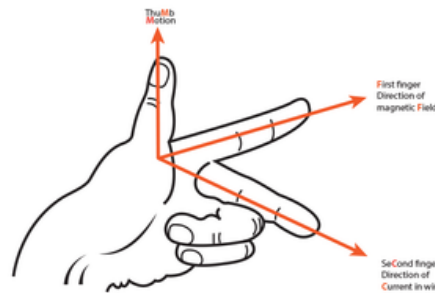
1. (i) No, alpha particle will not experience any force if it is at rest, because only moving charge particle can experience force when placed in a magnetic field.

(ii) No, alpha particle will not experience any force if it moves in the magnetic field parallel to field lines because charge particle experiences force only when it moves at an angle other than 0° with magnetic field.

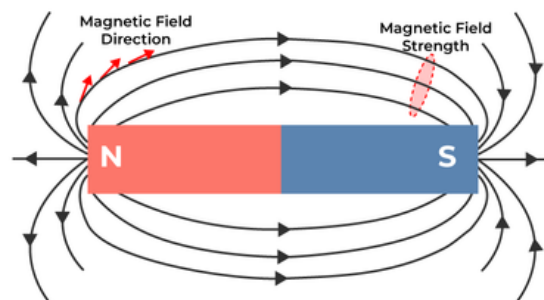
(iii) Alpha particle will experience a force in the direction perpendicular to the direction of magnetic field and direction of motion of alpha particle.

2. Many electric appliances of daily use like electric press, heater, toaster, refrigerator, table fan etc. have a metallic body. If the insulation of any of these appliances melts and makes contact with the metallic casing, the person touching it is likely to receive a severe electric shock. This is due to the reason that the metallic casing will be at the same potential as the applied one. Obviously, the electric current will flow through the body of the person who touches the appliance. To avoid such serious accidents, the metal casing of the electric appliance is earthed. Since the earth does not offer any resistance, the current flows to the earth through the earth wire instead of flowing through the body of the person.

3. Fleming's left hand rule: Stretch the forefinger, middle finger and the thumb of your left hand mutually perpendicular to each other. If the forefinger indicates the direction of magnetic field and the middle finger indicates the direction of current, then the thumb will indicate the direction of motion of conductor



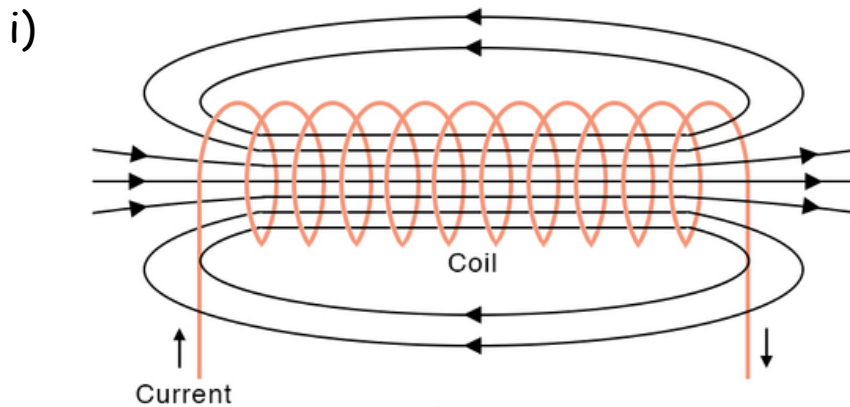
4. Imaginary continuous closed curves used to represent the magnetic field in a region is known as magnetic field lines. It is directed from north pole to south pole outside the magnet and south pole to north pole inside the magnet.



(a) The direction of magnetic field (B) at any point is obtained by drawing a tangent to the magnetic field line at that point. In case, two magnetic field lines intersect each other at the point P as shown in figure, magnetic field at P will have two directions, shown by two arrows, one drawn to each magnetic field line at P , which is not possible.

(b) It is taken by convention that the field lines emerges from north pole and merge at the south pole. Inside the magnet, the direction of field lines is from its south pole to its north pole. Thus, the magnetic field lines are closed curves.

5. Solenoid: A coil of many circular turns of insulated copper wire wrapped in the shape of cylinder is called solenoid.



(ii) Magnetic field lines around a bar magnet.

Following are the distinguishing features between the two fields.

(a) A bar magnet is a permanent magnet whereas solenoid is an electromagnet, therefore field produced by solenoid is temporary and stay till current flows through it.

(b) Magnetic field produced by solenoid is more stronger than magnetic field of a bar magnet.

