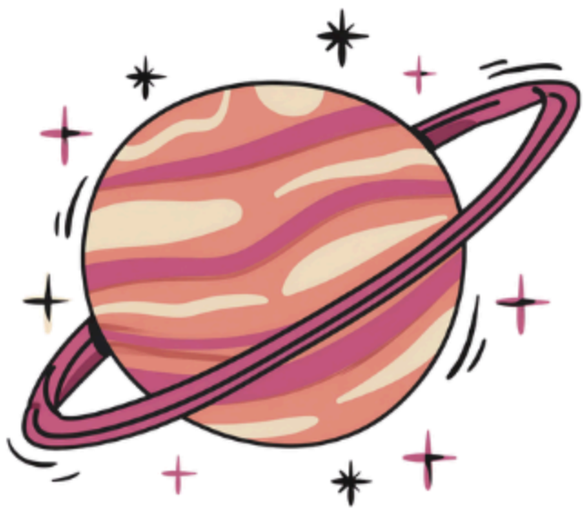

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Class - 10th

NCERT Solution

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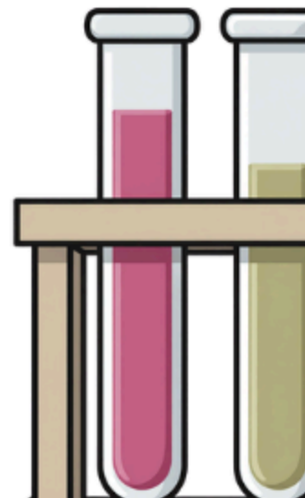
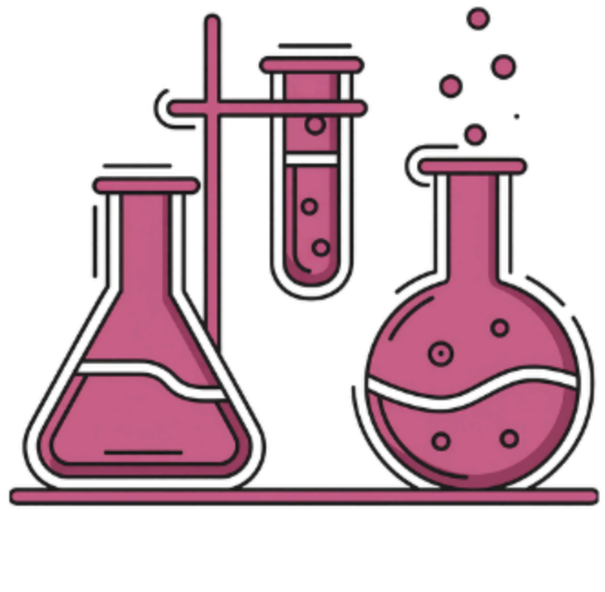
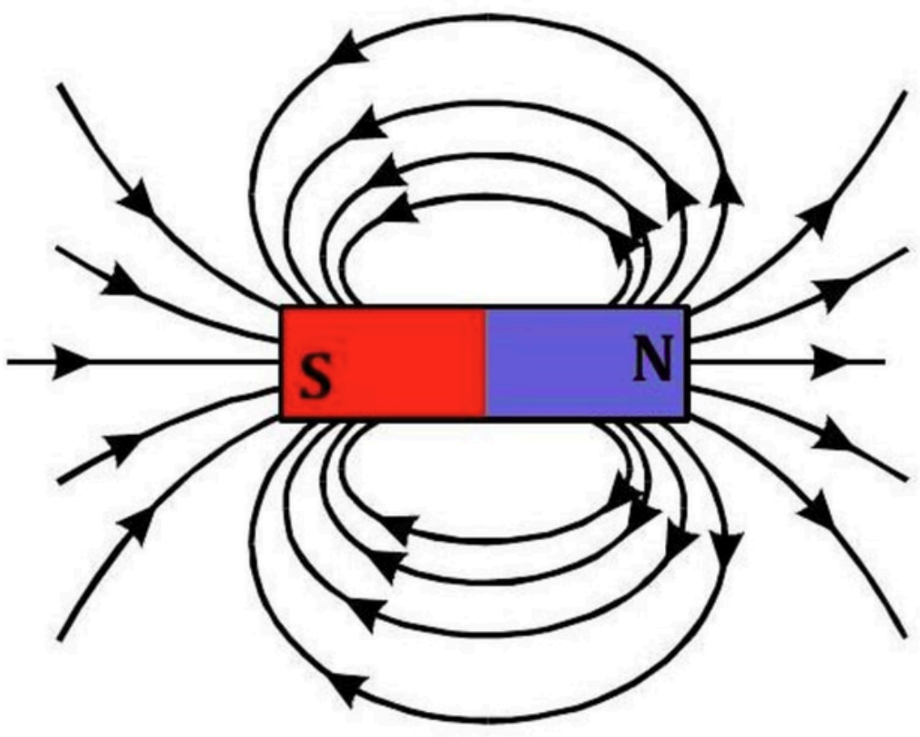




NCERT Class 10 Science Chapter 12 Magnetic Effects of Electric Current : Detailed Solutions

1. **Why does a compass needle get deflected when brought near a bar magnet?**
Solution: A compass needle is a small magnet which experiences a force in the magnetic field of a bar magnet. Due to this force, it gets deflected.

2. **Draw magnetic field lines around a bar magnet.**
Solution:



3. **List the properties of magnetic lines of force.**
Solution:
(i) Magnetic lines of force are closed continuous curves.
(ii) The tangent at any point on the magnetic line of force gives the direction of the magnetic field at that point.
(iii) Two magnetic lines of force never cross each other.

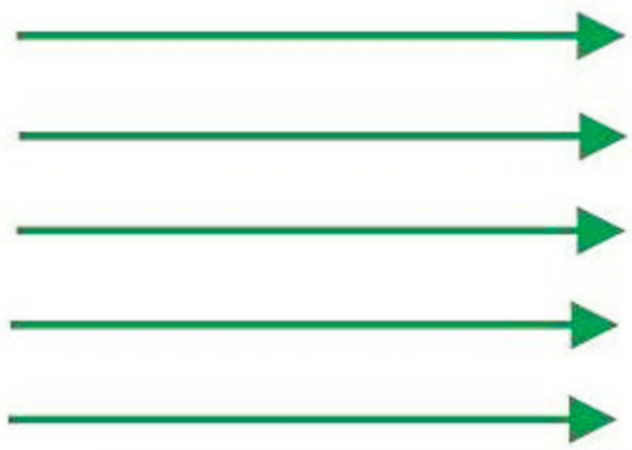
4. **Why don't two magnetic lines of force intersect each other?**
Solution: The tangent at any point on a magnetic field line gives the direction of magnetic field at that point. If two magnetic field lines cross each other, then at the point of intersection, there will be two tangents. Hence, there will be two directions of the magnetic field at the point of intersection. This is not possible. Hence, no two magnetic field lines can cross each other.

5. **Consider a circular loop of wire lying in the plane of the table. Let the current pass through the loop clockwise. Apply the right-hand rule to find out the direction of the magnetic field inside and outside the loop.**

Solution: The magnetic field inside the loop is perpendicular to the plane of the table and in the downward direction. Outside the loop, the magnetic field is perpendicular to the plane of the table and in the upward direction.

6. **The magnetic field in a given region is uniform. Draw a diagram to represent it.**

Solution:



7. **Choose the correct option. The magnetic field inside a long straight solenoid carrying current**

(1) is zero
(2) decreases as we move towards its ends
(3) increases as we move towards its ends
(4) is the same at all points

Solution:

The magnetic field inside a long straight solenoid carrying current decreases as we move towards its ends.

At the ends of the solenoid, the strength of the magnetic field is almost half that in the middle of the solenoid. Thus, the correct option is (2).

8. **Which of the following properties of a proton can change while it moves freely in a magnetic field? (There may be more than one correct answer)**

(1) mass
(2) speed
(3) velocity
(4) momentum

Solution: Motion of a charged particle like a proton in a magnetic field is a circular path. Hence, its velocity and momentum can change. Thus, option (3) and (4) are correct.

9. **In active physics 6 , how do we think the displacement of rod PQ will be affected if (i) current in rod PQ is increased (ii) a stronger horseshoe magnet is inserted (iii) length of the rod PQ is increased.**

Solution:

(i) When the current in the rod increases, force on the rod also increases. Hence, the displacement of the rod increases.

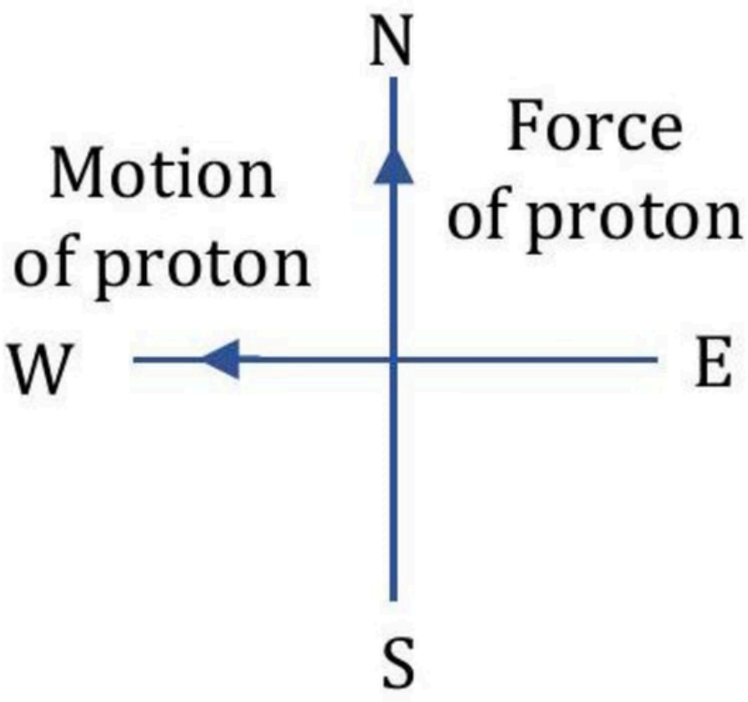
(ii) When a stronger horseshoe magnet is inserted, the magnetic field increases. Thus, force on the rod also increases. Hence, displacement of the rod increases.

(iii) When length of the rod increases, force on the rod also increases and hence, displacement increases.

10. **A positively charged particle (alpha particle), projected towards west, is deflected towards north by a magnetic field. The direction of magnetic field is**
(1) towards south
(2) towards east
(3) downward
(4) upward

Solution:

A positively charged particle (alpha particle), projected towards west, is deflected towards north by a magnetic field. The direction of magnetic field is (1) towards south (2) towards east (3) downward (4) upward



By applying Fleming's left-hand rule, we find that the magnetic field is in upward direction.
Thus, option (4) is correct.

11. Name two safety measures commonly used in electric circuits and appliance.

Solution: The two safety measures commonly used in electric circuits and appliances are fuse and earthing.

12. An electric oven of 2 kW power rating is operated in a domestic electric circuit (220 V) that has a current rating of 5 A . What result do you expect? explain.

Solution:

Given,

P=2kw=2000 W,I=5 A, V=220 V

P=V×I⇒I=VP=2202000=9 A

If there is no fuse, overloading will result in wire melting, which will cause a short circuit, which will start a fire. As a result, the current will exceed and the fuse will burn out.

13. What precaution should be taken to avoid the overloading of domestic electric circuits?

Solution:

For the purpose of preventing overloading and short circuits, the fuse in the circuit should always be connected. Avoid plugging in too many appliances at once since this could start a fire. Always operate equipment within an electric circuit's safe limit. Use only one appliance at a time, always.

14. Which of the following correctly describes the magnetic field near a long straight wire?

(1) The field consists of a straight line perpendicular to the wire.

(2) The field consists of straight lines parallel to the wire.

(3) The field consists of radial lines originating from the wire.

(4) The field consists of concentric circles centred on the wire.

Solution:

The magnetic field near a long straight

on the wire.

Hence, option (4) is correct.

15. At the time of short circuit. the current the circuit

(1) reduces substantially.

(2) does not change.

(3) increases heavily.

(4) vary continuously.

Solution:

Short circuit means there is no voltage difference between the two points in the circuit. Hence by ohms law large current flows through it. So, at the time of the short circuit, the current in the circuit increases heavily.

Hence, option (3) is correct.

16. State whether the following statements are true or false.
(i) The field at the centre of a long circular coil carrying current will be parallel straight lines.
(ii) A wire with a green insulation of usually the live wire of an electric supply.

Solution:

(i) True
The field at the centre of a long circular coil carrying current will be parallel straight lines.
(ii) False

17. A wire with a green insulation of usually the earth wire of an electric supply. List two methods of producing magnetic fields.

Solution:

(i) A permanent magnet.
(ii) A current-carrying solenoid.

18. When is the force experienced by a current-carrying conductor placed in a magnetic field the largest?

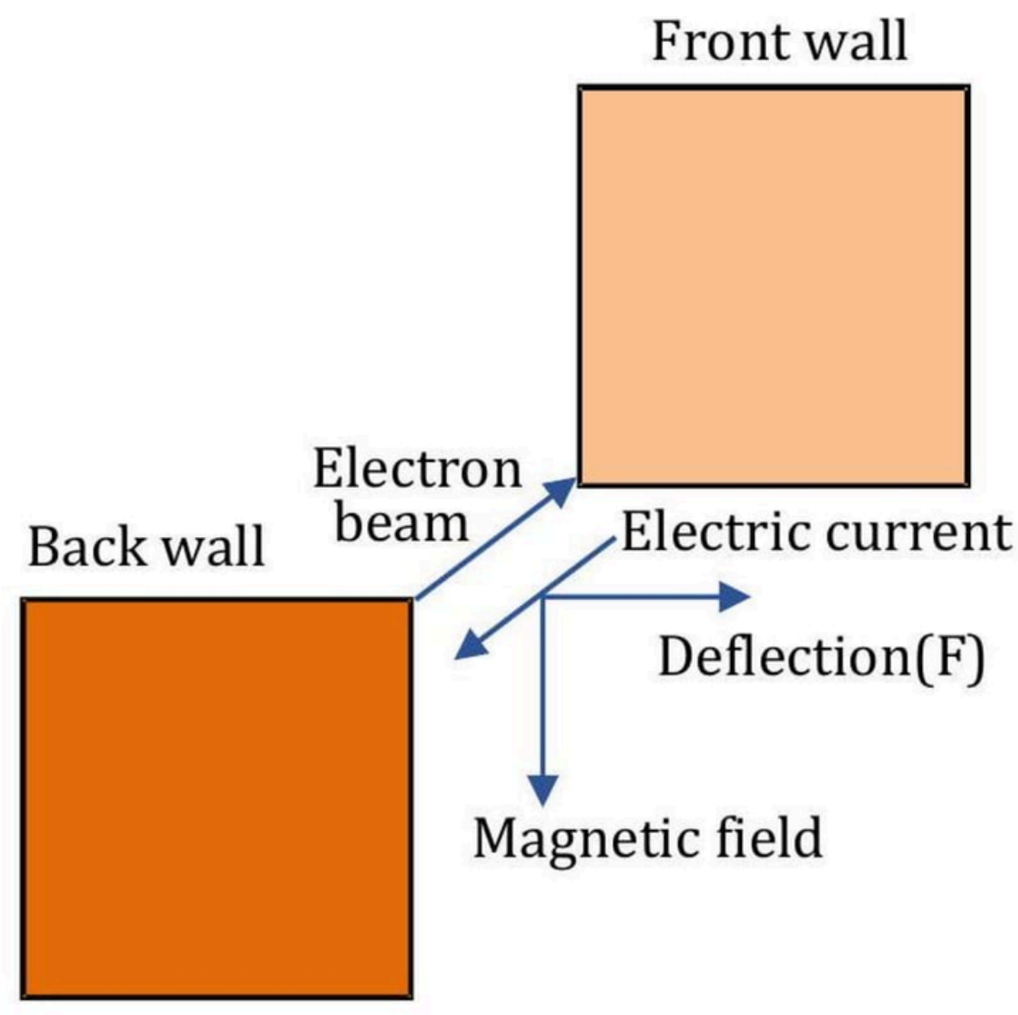
Solution:

When the current-carrying conductor is placed perpendicular to the magnetic field.

19. Imagine that you are sitting in a chamber with your back to one wall. An electron beam moving horizontally from the back wall towards the front wall, is deflected by a strong magnetic field, to your right side. What is the direction of the magnetic field?

Solution:

The movement of an electron beam from the back wall to the front wall is equivalent to the flow of electric current from the front wall to the back wall. The deflection of the beam means the force is acting towards our right side. According to Fleming's LeftHand Rule, the direction of the magnetic field is vertically downward.



20. **State the rule to determine the direction of a**
(i) magnetic field produced around a straight conductor carrying current,
(ii) force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it.

Solution:

(i) Right hand thumb rule.
(ii) Fleming's left-hand rule.

21. **When does an electric short-circuit occur?**

Solution:

When live wire and neutral wire touch each other (i.e. come in direct contact).

22. **What is the function of an earth wire? Why is it necessary to earth metallic casings of electric appliances?**

Solution:

Earth wire acts as a safety measure. When the live wire touches the metallic casing of an electric appliance, the electric current flows from the casing of the appliance to the earth through the copper wire. An electric current flows along the path of low resistance thus, current passes through the copper wire instead of the human body. Thus, the human body is saved from electric shock.

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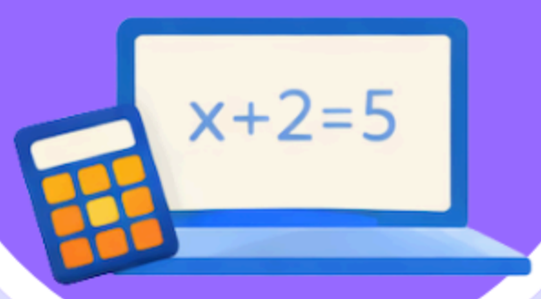

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