CBSE Test Paper 05

Chapter 13 Magnetic Effects of Electric Current

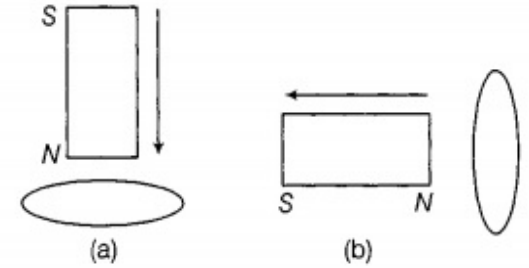
1. What are the factors affecting the strength of magnetic field at a point due to a straight conductor carrying current? **(1)**
   a. Current only
   b. Distance of the point from the wire only
   c. Current, length and distance of the wire
   d. Length of the wire only
2. A current carrying conductor placed in magnetic field experiences a force. The displacement of the conductor in magnetic field can be increased by **(1)**
   a. Decreasing the current in the conductor.
   b. Increasing the magnetic field.
   c. Increasing the current in the conductor.
   d. Decreasing the magnetic field.
3. A positively charged particle say an alpha particle projected towards west is deflected toward north by a magnetic field. The direction of the magnetic field is **(1)**
   a. Downward
   b. Upward
   c. Towards south
   d. Towards east
4. Which of the following describes the common domestic power supplied in India? **(1)**
   a. 110 v, 100 Hz
   b. 220 v, 100 Hz
   c. 110 v, 50 Hz
   d. 220 v, 50 Hz
5. What type of currents is produced by most of the power stations in India? **(1)**
   a. AC current having frequency of 50 Hz
   b. AC current having frequency of 100 Hz
   c. DC current having frequency of 50 Hz
   d. DC current having frequency of 100 Hz

6. On what principle is an a.c. generator based ? **(1)**

7. Does a stationary charge has magnetic field around it ? **(1)**

8. How is the the type of current that we receive in domestic circuit different from one that runs a clock? **(1)**

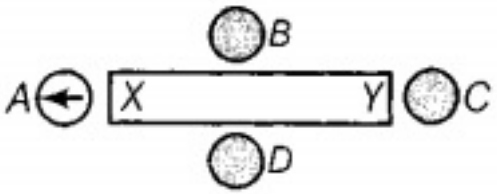
9. Give the direction of induced current in the following figure. **(1)**



10. Magnetic field in a given region is uniform. Draw a diagram to represent it. **(3)**

11. A magnetic compass shows a deflection when placed near a current carrying wire. How will the deflection of the compass get affected if the current in the wire is increased? Support your answer with a reason. **(3)**

12. i. The diagram shows a bar magnet surrounded by four plotting compasses. Copy the diagram and mark the direction of the compass needle for each of the cases B, C and D. **(3)**



ii. Which is the North pole, X or Y?

13. State and define S.I unit of magnetic field? **(3)**

14. Explain the principle, construction and working of an electric motor with a help of labelled diagram? **(5)**

15. Describe an experiment of illustrate the action of an electric fuse. **(5)**

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Answers

1. c. Current, length and distance of the wir

   Explanation: The strength of magnetic field depends upon :

   Amount of current flowing in the wire, more current will produce stronger field.

   Length of wire , longer wire will produce stronger field.

   Distance of point from the wire, more the distance of point from the wire weaker the field.

2. b. Increasing the magnetic field.

   Explanation: trength of magnetic field is directly proportional to current.

   Strength of magnetic field is inversely proportional to radius of circular wire.

   The amount of force experienced by a current carrying conductor placed in a magnetic field depends on the direction of the current with respect to the magnetic field and its displacement can be increased by increasing the magnetic field.

3. b. Upward

   Explanation: The direction of the magnetic field can be determined by the Fleming's left hand rule. According to Fleming's left hand rule if we stretch the thumb, the centre finger and the middle finger of our left hand such that they are mutually perpendicular to each other. If the centre finger gives the direction of current and middle finger points in the direction of magnetic field then the thumb points towards the direction of the force or motion of the conductor.

   Here the direction of positively charged alpha particle is towards west this implies the direction of current is also towards west and the direction of magnetic force is towards north. Hence, according to Fleming's left hand rule, the direction of magnetic field will be upwards.

4. d. 220 v, 50 Hz

Explanation: The voltage in India is 220 volts, alternating at 50 cycles (Hertz) per second. The advantage of 220 is lower current and thus less power loss. And the ability to use thinner wires - less copper.

5. a. AC current having frequency of 50

   Explanation: Most of the power stations in India produce alternating current. The alternating current produced in India changes its direction after every $\frac{1}{100}$ th of a second. India got 50Hz, because it was colonized by England, which when they developed their electrical systems, choose 50 Hz.

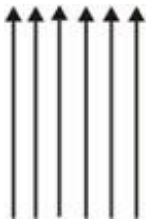
6. AC generator is based upon Fleming's right hand rule.

7. No, there is no magnetic field around a stationary charged particle.

8. The current that we receive in domestic circuit is AC of 50 Hertz frequency while that which runs a clock is DC of frequency 0 Hertz.

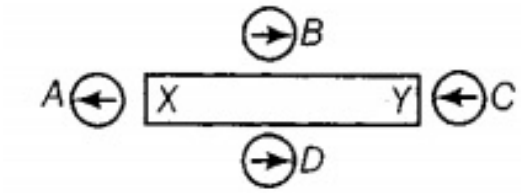
9. Using Fleming's right-hand rule,
   a. The direction of the induced current is anti-clockwise.
   b. The direction of the induced current is clockwise.

10. Uniform magnetic field is shown by equidistant and parallel lines as shown. The parallel lines are close to each other, if the field is strong. Stronger the field, closer are the lines.



11. The increase in deflection is seen as the strength of magnetic field is directly proportional to the current flowing in the conductor.

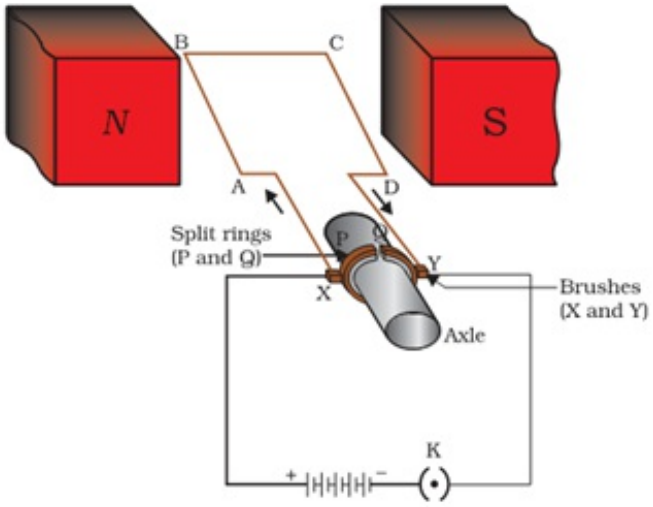
12. i.



   ii. The North Pole is **X.**

13. The S.I unit of magnetic field is Tesla (T). The magnetic field strength is said to be one Tesla if one meter long conductor placed perpendicular to the direction of magnetic field, carrying one ampere current experiences one newton of force.

14. Principle: It is based on the principle that a current carrying conductor placed perpendicular to the magnetic field experiences a force.



Construction-

i. Armature or coil- It consist of an insulated copper wire wound on a soft iron core.
ii. Strong field magnet- two pole pieces of a strong magnet provides a strong magnetic field.
iii. Split ring- it consist of two halves (P and Q) of a metallic ring which reverses the direction of the current in a coil.
iv. Brushes- two carbon brushes touch the commutator (split ring).
v. Battery – a battery is connected across the carbon brushes.

Working: When current flow through coil,arm AB and CD experience magnetic force.According to Fleming's Left hand rule,arm AB of coil experiences force in downward direction and arm CD experiences force in upward direction.Both these forces are equal and opposite.Two equal and opposite forces acting at different position of armature constitute a couple.The couple rotate the coil in clockwise direction until the coil is in vertical position.At this position,the contact of commutator and brushes break.Supply of current to coil is cut off.Hence no force acts on arms of coil.But coil goes on rotating due to inertia of motion of coil until commutator again comes in contact with brushe . When commutators comes in contact with brushes after rotation,direction of current in arm AB and CD is

reversed.The force acting on arm AB is in downward direction and force acting on arm CD is in upward direction.These 2 equal and opposite forces constitute a couple.this couple rotate coil again in clockwise direction.The coil of d.c. motor continues to rotate in same direction.Hence electrical energy is converted into mechanical energy.

15. **Safety Fuse or fuse :** Usually the wire chosen for electric circuit are such that these allow a certain maximum current to pass through them without excessive heating of the circuits. However, incidentally there is a short-circuiting or over-loading, the current exceeds this maximum permissible value. The wires may get over-heated and catch a fire. Sparking at the points of short-circuit may also cause fire. Many precautions and safety measures are taken to protect the circuits against damage due to over-heating. All wirers used in electric circuits are coated with layer of insulating materials. In addition these are coated with rubber or plastic layer.
    The most important safety device used these days is safety fuse or fuse. Fuse is a piece of wire of a material with a low melting point. Good fuse wire is always made of pure tin but cheaper variety is made of alloy of tin and copper or tin and lead (63% tin and 37% lead)
    Fuse is always connected to the live wire. When current of value more than maximum permissible is passed through the circuit, the fuse wire melts due to excessive heating. This way the circuit is broken to ensure safety of the circuit. It is due to this fact that the fuse is usually called safety fuse. The thickness, length and material of the fuse wire depends upon the maximum current permitted through the circuit. For proper protection, a fuse of proper value is must. Fuse of improper rating is a curse instead of being a safety device.