CBSE Test paper 04

Chapter 13 Magnetic Effects of Electric Current

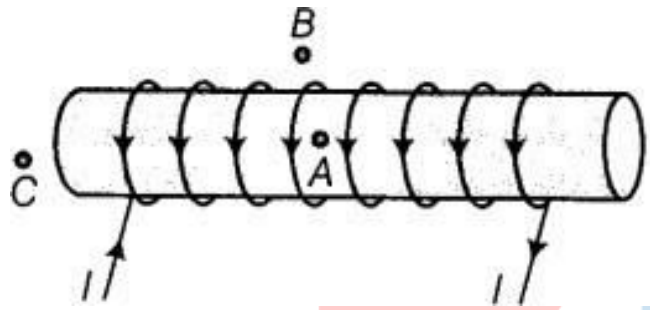
1. In the statement of Fleming's left hand rule. What does the fore finger represent? **(1)**
   a. electric field
   b. force
   c. current
   d. magnetic field
2. Which rule determines the direction of flow of current in the conductor? **(1)**
   a. Fleming's left hand rule
   b. Fleming's right hand rule
   c. Maxwell's right hand grip rule
   d. Left hand thumb rule
3. A commutator changes the direction of current in the coil of **(1)**
   a. a DC motor and an AC generator
   b. an AC generator
   c. a DC motor and a DC generator
   d. a DC motor
4. The device used for producing electric current is called **(1)**
   a. galvanometer
   b. generator
   c. ammeter
   d. motor
5. The rectangular coil of copper wires is rotated in a magnetic field. The direction of induced current change once in each **(1)**
   a. one fourth revolution
   b. half revolution
   c. one revolution
   d. two revolutions
6. What is the principle of an electric motor ? **(1)**
7. How can it be proved that a magnetic field exists around a current carrying metallic

wire? **(1)**

8. What is meant by overloading ? **(1)**

9. Mention the shape of the magnetic field lines around a current carrying straight conductor. **(1)**

10. For the current carrying solenoid, draw magnetic field lines and give reason to 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)**



11. When does an electric short circuit occurs? **(3)**

12. Consider a circular loop of wire lying in the plane of the table. Let the current pass through the loop in the clockwise direction. Apply right-hand rule to find out the direction of the magnetic field inside and outside the loop. **(3)**

13. Why do not two magnetic field lines intersect each othe? **(3)**

14. Draw a labelled diagram of an electric motor. Explain its principle and working. What is the function of split ring in an electric motor? **(5)**

15. Define electromagnetic induction? Two circular coils A and B are placed close to each other. If the current in the coil A is changed, will some current be induced in the coil B? Explain. **(5)**

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Answers

1. d. magnetic fieid

   Explanation: The direction of force which acts on the current-carrying conductor placed in a magnetic field is given by Fleming's left hand rule. It states that if the forefinger, thumb and middle finger of left hand are stretched mutually perpendicular and the forefinger points along the direction of external magnetic field, middle finger indicates the direction of current, then thumb points along the direction of force acting on the conductor.

2. b. Fleming's right hand rule

   Explanation: The direction of induced current in a straight conductor is given by Fleming's right hand rule.

   It states that if we stretch the thumb, forefinger and the middle finger of right hand at right angles to one another in such a way that the forefinger points in the direction of magnetic field.

   Then, thumb gives the direction of motion of conductor (force), forefinger indicates direction of magnetic field and the middle finger points the direction of induced current.

3. c. a DC motor and a DC generator

   Explanation: The commutation in DC machine or more specifically commutation in DC generator is the process in which generated alternating current in the armature winding of a dc machine is converted into direct current after going through the commutator and the stationary brushes. Again in DC Motor, the input DC is to be converted in alternating form in armature and that is also done through commutation. This transformation of current from the rotating armature of a DC machine to the stationary brushes needs to maintain continuously moving contact between the commutator segments and the brushes.

4. b. generator

Explanation: Electric current is produced by electric generator which converts mechanical energy into electricity.

5. b. half revolution

   Explanation: When a rectangular coil of copper is rotated in a magnetic field, the direction of the induced current in the coil changes once in each half revolution as a result of which the direction of the current in the coil remains same.

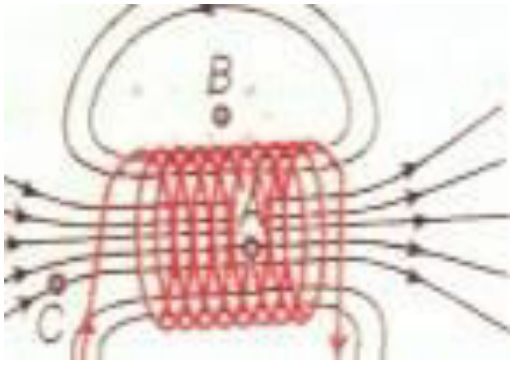
6. Electric motor is based upon Fleming's left hand rule.

7. When a magnetic compass needle is placed close to the current carrying wire, it will get deflected.

8. The supply wires as well the wires used in household wiring has a specific rating. The rating of 15A means that if a current upto 15A is passed through circuit, there is no likely damaged feared to the circuit. But if a current more than maximum allowed limit is passed, there may be excessive heating of the wires and it may damage the wiring due to excessive heating.

9. The shape of magnetic field lines around the straight current carrying conductor is in the form of concentric circles.

10. Magnetic field lines due to a solenoid

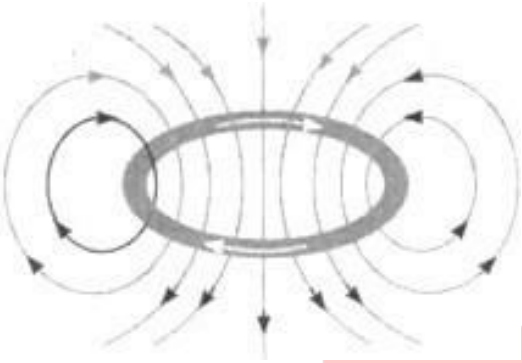


In case of an ideal solenoid, magnetic field strength is maximum at point A and is minimum or zero at point B. This is because the magnetic field is strong, where magnetic field lines are far apart. At the point, C, the density of the field lines is less than that of point A , but greater than that of point B. So, the order of the magnetic field at points A, B and C is $B_B < B_C < B_A$.

11. If either the insulation of wires used in an electric circuit is damaged or there is a

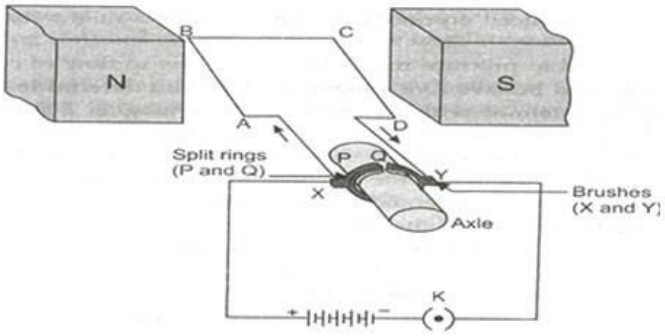
fault in the appliances, live wire and neutral wire may come in direct contact. As a result, the current in the circuit abruptly rises and short circuiting occurs.

12. Since the current passes through the loop in clockwise direction, therefore, the front face of the loop will be the south pole and the back face, i.e., the face touching the table will be north pole. According to right-hand rule, the direction of magnetic field inside the loop will be pointing downward. Outside the loop, the direction of the magnetic field will be upward.



13. The two magnetic field lines can never intersect each other because two tangents can be drawn from that point of intersection which will give two directions of the field from the same point, which is impossible.

14. Electric motor labelled diagram of an electric motor is as follows:

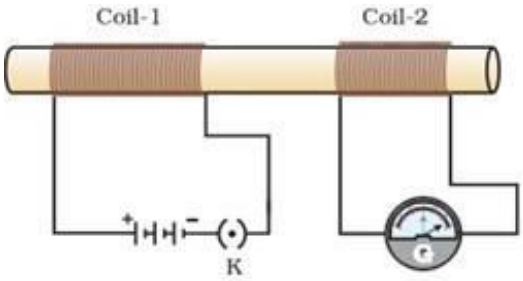


Principle: A current-carrying conductor, when placed in a magnetic field, experiences a force. If the direction of magnetic field and that of current are mutually perpendicular, then force acting on the conductor will be perpendicular to both and will be the given by Fleming's left-hand rule. Due to this force the conductor begins to move, if it is free to rotate.

Working: Let the current in the coil ABCD of motor enters from the source battery through the conducting brush X, flow along ABCD and finally flows back to the battery through brush Y. On applying Fleming's left-hand rule we find that force acting on

arm AB due to magnetic field pushes it downwards. But the force acting on arm CD pushes it upwards. Thus, the coil and the axle rotate anticlockwise. Due to action of split rings P and Q change their contacts with brushes. Now, P makes contact with Y and Q with X. As a result, Current begins to flow in coil along DCBA. The arms are pushed in opposite direction and coil continues to rotate in same direction.

15. Electromagnetic induction means the production of induced current in a closed coil due to the change in the magnetic field.



When current flows in coil-1, magnetic flux sets up around coil A due to which some magnetic field sets up around coil-2 and when current in coil-1changes, magnetic field around coil-2 also changes thus some induced current flow through coil B due to which galvanometer deflects.