RAVI TEST PAPERS & NOTES, WHATSAPP 8056206308

Magnetic Effects of Electric Current

10th Standard

Science

1) Why don't two magnetic field lines intersect each other?

Answer : If two magnetic lines of force intersect each other, it would mean that there are two directions of the magnetic field at the point of intersection, which is not possible.

2) Why does a compass needle get deflected when brought near a bar magnet?

Answer : The compass needle gets deflected due to the magnetic field around a bar magnet.

3) The magnetic field in a given region is uniform. Draw a diagram to represent it.

Answer : In a uniform magnetic field, the magnetic field lines of force are parallel and equidistant from each other as shown in the diagram.

4) Name two safety measures commonly used in electric circuits and appliances.

Answer : Electric fuse and earth wire are two safety measures commonly used in electric circuits.

5) When is the force experienced by a current carrying conductor placed in a magnetic field largest ?

Answer : The force experienced by a current carrying conductor placed in a magnetic field is the largest when conductor is kept perpendicular to the direction of the magnetic field.

6) When does an electric short circuit occur?

Answer : An electric short circuit occurs when the insulation of wires is damaged or there is a fault in the appliance. Due to this, the live wire and neutral wire come in direct contact and the current in the circuit increases abruptly.

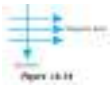
7) What is the function of an earth wire ? Why is its necessary to earth metallic appliances?

Answer : The earth wire is connected to a metallic plate buried deep inside the earth. In this way, the metallic body of appliance is connected to the earth, which provides a low resistance conducting path for electric current. Hence, any leakage of current to the metallic body of appliance flows to the earth through the earth wire. The user might not get a severe electric shock on touching such an appliance in case of a fault.

8) List two methods of producing magnetic fields.

Answer : Three methods of producing magnetic field are as given below:
(i) Passing electric current through a straight conductor / circuit.
(ii) Passing electric current through a circular loop.

9) An electron enters a magnetic field at right angles to it, as shown in Fig. The direction of force acting on the electron will be



(a) to the right.
(b) to the left.
(c) out of the page.
(d) into the page.

Answer : Answer is option (d). The direction of force is perpendicular to the direction of magnetic field and current as given by Fleming's left hand rule. Recall that the direction of current is taken opposite to the direction of motion of electrons. The force is therefore directed into the page.

10) A current through a horizontal power line flows in east to west direction. What is the direction of magnetic field at a point directly below it and at a point directly above it?

Answer : The current is in the east-west direction. Applying the right-hand thumb rule, we get that the magnetic field (at any point below or above the wire) turns clockwise in a plane perpendicular to the wire, when viewed from the east end, and anti-clockwise, when viewed from the west end

11) State Fleming's Left hand Rule.

Answer : According to this rule, stretch the thumb, forefinger and middle finger of your left hand such that they are mutually perpendicular. If the first finger points in the direction of magnetic field and the second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.

12) Name some sources of direct current.

Answer : Electrochemical cell, DC generator, photovoltaic cell, etc.

13) List three methods of producing magnetic field.

Answer : (a) By permanent magnet
(b) By electromagnet
(c) By current carrying conductors

14) (a) What is the different between a direct current and an alternating current?
(b) How many times does AC used in India change direction in one second?

Answer : (a) In case of AC, the direction of current keeps on changing at frequent intervals, while the direction of current always remains the same in case of DC.
(b) The AC in India changes its direction at the rate of 100 times in a second.

15) What is galvanometer?

A galvanometer is an instrument that can detect the presence of a current in a circuit.

16) Name the rule used to determine the direction of induced current.

Direction of induced current is given by Fleming's right hand rule according to this rule, stretch the thumb, fore-finger and the middle finger of the right hand such that they are mutually perpendicular.
If the fore-finger points in the direction of magnetic field the thumb shows the direction of motion and middle finger points in the direction of induced current.

17) What are the two most commonly used domestic circuit?

5 A for low power rating appliances .
15 A for high power rating appliances.

18) What is the use of electric fuse?

Electric fuse is used for protecting the circuits due to short circuiting or overloading of the circuits.

19) How can the magnitude of the induced current by increased?

Answer : Magnitude of the induced current can be increased by
(i) increasing the number of coils of the wire.
(ii) by increasing the power of magnet.

20) Explain briefly the term overloading

When the total current drawn by all the appliances at a particular time exceeds the bearing capacity of that wire, the wires of the domestic wiring gets heated this is called overloading.

21) Name the type of current:
(a) used in household supply. (b) given by a cell.

(a) Alternating current
(b) Direct current.

22) Name the physical quantities which are indicated by the direction of thumb and forefinger in the Fleming's right hand rule?

In Fleming's right hand rule, thumb indicates - direction of motion of the conductor; forefinger indicates - direction of magnetic field.

23) What is a solenoid?

Solenoid is a-long coil of many turns of insulated copper wire wrapped in the shape of a cylinder.

24) How is an electromagnet different from a permanent magnet?

Answer : Electromagnet retains magnetism as long as the current flows in the enveloping coil, while a permanent magnet retains its magnetism all the time.

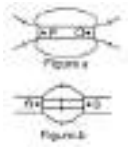
25) What is an electric fuse?

Electric fuse is a safety device made of thin wire of tin or lead- tin alloy havinglow melting point which breaks the circuit when current exceeds safety limit.

26) Which is the most important safety method used for protecting home appliances from short circuiting or overloading?

Answer : The use of fuse is the most important safety method used for protecting home appliances from short circuiting or overloading.

27) (i) Name the poles P, Q, R and S of the magnets in the following figures a and b



(ii) State the inference drawn about the direction of the magnetic field lines on the basis of the diagrams.

Answer : (i) In figure a P-North pole Q-South pole
In figure b R-North pole S- South pole
(ii) In the given diagram, the direction of the magnetic field shows that the magnetic field lines emerge from North pole of the magnet and merge at the South pole of the magnet

28) List the properties of magnetic lines of force.

Answer : **Properties of magnetic field lines:**
The magnetic field lines have the following properties:
(i) They originate from North pole of a magnet and end at its South pole, by convention.
(ii) These lines are closed and continuous curves.
(iii) They are crowded near the poles, where the magnetic field is strong and separated far from the poles, where the magnetic field is weak.
(iv) Field lines never intersect with each other. If they do, that would mean that there are two directions of the magnetic field at the point of intersection, which is impossible.

29) 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.

Answer : Applying the right hand thumb rule, the magnetic field inside the loop is in vertically downward direction and outside the loop, it is in vertically upward direction.

30) An electric oven of 2kW 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.

Answer : $\therefore$ Current, $I = \frac{P}{V} = \frac{2000 \quad W}{220 \quad V} > 5A$
Since, current drawn by oven is greater than the rated value of current, which may cause overloading and excessive heating of the circuit.

31) What precaution should be taken to avoid the overloading of domestic electric circuits?

Answer : The following precautions should be taken to avoid the overloading of domestic electric circuits as given below:
(i) The circuits should be of proper current rating and appliances should be connected accordingly.
(ii) Wires should be checked from time-to-time and those wires whose insulation is worn, should be immediately replaced.
(ii) Connection of too many appliances in a single socket must be avoided.

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

Answer : (i) True
(ii) False, the wire with green insulation is the earth wire not the live wire.

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

Answer : According to Fleming's left hand rule, the direction of magnetic field is vertically downward.

34) 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.
(iii) current induced in a coil due to its rotation in a magnetic field.

Answer : (i) Maxwell's right hand thumb rule:
It's a convenient way of finding the direction of magnetic field associated with a current carrying conductor. It states that, if you hold the current carrying straight wire in the grip of your right hand in such a way that the stretched thumb points in the direction of current, then the direction of the curl of the fingers will give the direction of the magnetic field. This rule is also called Maxwell's corkscrew rule.
(ii) Fleming's left hand rule:
The direction of force which acts on a 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 to each other, such that the forefinger points along the direction of external magnetic field, middle finger indicates the direction of current, then the thumb points towards the direction of force acting on the conductor.
(iii) Fleming's right hand rule gives the direction of induced current in a coil due to it's rotation in a magnetic field. If the forefinger points in the directions of magnetic field, thumb in the direction of motion of the conductor, then the central finger points in the direction of current induced in the conductor.

35) How do we think the displacement of rod AB will be affected, if
(i) current in rod AB is increased,
(ii) a stronger horse-shoe magnet is used and
(iii) length of the rod AB is increased?

Answer : The force acting on a current carrying conductor when placed in a magnetic field is illustrated.
(i) When current in rod AB is increased, the displacement of rod is increased, as force acting on rod is directly proportional to the current flowing through it. On increasing the current, force on the conductor increases.
(ii) If a stronger horse-shoe magnet is used, then the strength of magnetic field will increase leading to greater force on the rod. Due to this, the displacement of rod will increase.
(iii) Displacement of conductor is increased with an increase in length of the conductor. On increasing the length, more force will act on the conductor.

36) Distinguish between an electric motor and generator?

Answer : The major differences between an electric motor and generator are stated below:

Electric Motor:

1. It converts electrical energy into mechanical energy.
2. It needs electrical energy for its works.
3. They are used as water pumps, marble grinders etc.

Generator:

1. It converts mechanical energy into electrical energy
2. It needs mechanical energy for its working.
3. They are used as water pumps, marble grinders etc.
4. diesel generator, hydro-electric generator are the examples of it.

37) Write one application of each of the following:
(a) Right-hand thumb rule
(b) Fleming's left hand rule
(c) Fleming's right hand rule

Answer : (a) Right-hand thumb rule is used to find the direction of magnetic field in a coil of wire and the electric current in a straight conductor.
(b) Fleming's left hand rule is used to find the direction of force exerted on a current carrying conductor placed in a magnetic field as in electric motor.
(c) Fleming's right hand rule is used to find the direction of induced current in a closed circuit placed in changing magnetic field as in electric generator.

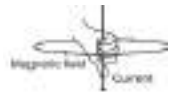
38) A compass needle is placed near a current-carrying wire. State your observation for the following cases, and give reason for the same in each case.
(i) Magnitude of electric current in the wire is increased.
(ii) The compass needle is displaced away from the wire

Answer : **(i)** We observe that the deflection of the needle increases.
Reason The magnetíc field due to the current carrying conductor is directly proportional to the current flowing through it.
(ii) We observed that the deflection in the compass needle decreases as we move away from the wire.
Reason The magnetic field is inversely proportional to the perpendicular distance from the wíre.

39) PQ Is a current carrying conductor in the plane of the paper as shown in the figure.

(i) Find the directions of the magnetic fields produced by it at points R and S.
(ii) Given $r_1 > r_2$, where will the strength of the magnetic field be larger? Give reasons.
(iii) If the polarity of the battery connected to the wire Is reversed, how would the direction of the magnetic field be changed?
(iv) Explain the rule that is used to find the direction of the magnetic field for a straight current carrying conductor.

Answer : (i) According to right hand thumb rule, the magnetic field produced by PQ at point Ris into the plane of the paper and at point S is out of the plane of the paper.
(ii) Here, $r_1 > r_2$ The magnetic field will be larger at point 5 as compared to that at point R. This is because the magnetic field produced by a straight current-carrying conductor is inversely proportional to the distance from the wire. So, the magnetic field will be larger at the point which is nearer to the conductor. As, point S is nearer to the conductor as compared to point R. So, field at S > field at R
(iii) If the polarity of the battery is reversed, the current will be going from top to bottom in the wire and the magnetic field lines will now be in the clockwise direction on the plane which is perpendicular to the wire carrying current.
(iv) Maxwell's right hand thumb rule is used to find the direction of the magnetic field for a straight current carrying conductor.



This law states that, if you hold the current carrying straight wire in the grip of your right hand in such a way that the stretched thumb points in the direction of current, then the direction of the curl of the fingers will give the direction of the magnetic field.

40) Draw magnetic field lines around a bar magnet.

Answer :