

Question 1

Question: How can you find the direction of a magnetic field at a given point in the magnetic line of force?

Answer: By placing a magnetic compass at the given point. It will indicate the North-South direction.

Question 2

Question: If the current in a wire is flowing in the vertically downward direction and a magnetic field is applied from west to east, what is the direction of force on the wire?

Answer: Applying Fleming's left-hand rule, force acting on the wire is towards south.

Question 3

Question: A motor converts one form of energy to another. Name the two forms.

Answer: Electrical energy to mechanical energy

Question 4

Question: What is the nature of the pattern of lines of force around a straight conductor carrying current?

Answer: Concentric circles that grow larger away from the wire.

Question 5

Question: What would you conclude from the observation that a current carrying conductor deflects a magnetic needle placed near it?

Answer: The deflection of the magnetic needle indicates that the current carrying conductor behaves like a magnet.

Question 6

Question: What do you understand by the term 'magnetic field'?

Answer: Magnetic field is a region near a magnetised body where magnetic forces can be detected.

Question 7

Question: What would you infer from the observation that the field lines are closest near the poles.

Answer: The magnetic field is strongest at the poles

Question 8

Question: On what effect of electric current does an electromagnet work?

Answer: Magnetic effect of current

Question 9

Question: What is an electromagnet?

Answer: An electromagnet can be defined as a soft-iron core that is magnetised temporarily by passing a current through a coil of wire wound on the core.

Question 10

Question: What is a solenoid?

Answer: A solenoid is a long coil (shaped like a cylinder) containing a large number of close turns of insulated copper wire.

Question 11

Question: What happens if a current carrying conductor is placed in a magnetic field?

Answer: A current carrying conductor placed in a magnetic field experiences a force whose direction is given by Fleming's left hand rule.

Question 12

Question: What is electromagnetic induction?

Answer: The phenomenon by which an emf or current is induced in a conductor due to change in the magnetic field near the conductor is known as electromagnetic induction.

Question 13

Question: A positive charge moving towards west is deflected towards north. What is the direction of the magnetic field?

Answer: According to Fleming's left hand rule, the magnetic field is in the upward direction. It is perpendicular to both motion and force.

Question 14

Question: When does a current carrying conductor experience a maximum force in the magnetic field?

Answer: When it is placed perpendicular to the magnetic field.

Question 15

Question: What is the frequency of AC in India?

Answer: 50 Hz

Question 16

Question: What is the frequency of DC?

Answer: Zero

Question 17

Question: What do you understand by the term 'current rating' of an electric fuse?

Answer: The maximum amount of current that can be passed through the fuse wire without melting it.

Question 18

Question: Name the alloy used to make fuse wire.

Answer: Alloy of lead and tin.

Question 19

Question: What is the use of a commutator in an electric motor?

Answer: A commutator is used to reverse the direction of current after every half rotation of the coil.

Question 20

Question: How can you convert an AC generator to a DC generator?

Answer: An AC generator converted to a DC generator by replacing the slip rings with split ring commutator.

Question 21

Question: How is the fuse connected in an electric circuit?

Answer: A fuse is connected in series with the live wire.

Question 22

Question: Why are fuses usually made of tin alloy?

Answer: It has a low melting point.

Question 23

Question: Which two capacities of fuses are usually used in domestic supply?

Answer: Fuse capacity of 5 A and 15 A.

Question 24

Question: Give the colour convention of domestic wiring?

Answer: Live wire - red, neutral wire - black, earth wire - green.

Question 25

Question: What is the main purpose of earthing in an electrical appliance?

Answer: To prevent electric shock as the current is safely transferred through the earth wire into the earth.

Question 26

Question: Which effect of electric current is utilized in the safety fuse?

Answer: Heating effect of electric current.

Question 27

Question: Why is copper not used as a fuse wire?

Answer: It has high melting point due to which it will not melt easily and thus cannot break the circuit.

Question 28

Question: What is the function of the carbon brushes in an electric motor?

Answer: To make an electrical contact between the commutator rings and the external circuit.

Question 29

Question: What is the principle of an AC generator?

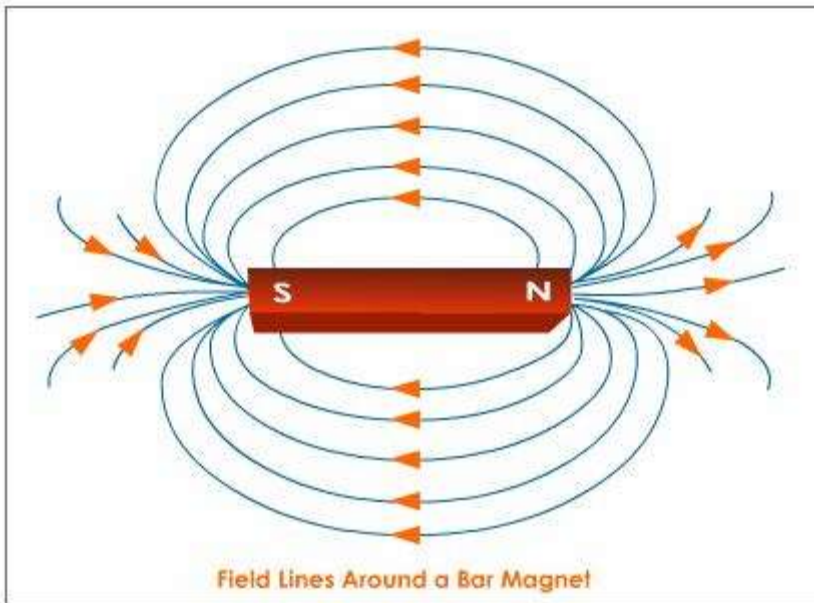
Answer: The working of an AC generator is based on the phenomenon of electromagnetic induction.

Question 30

Question: Draw a sketch to show the magnetic lines of force due to a bar magnet.

MAGNETIC EFFECTS OF ELECTRIC CURRENT

Answer:

**Question 41**

Question: When does the coil experience a maximum and minimum torque in an electric motor?

Answer: 1) When the coil is parallel to magnetic field torque is maximum
2) When the coil is in vertical position the torque is minimum

Question 42

Question: A coil of copper wire is connected to a galvanometer. What would happen if a bar magnet is:

- 1) pushed into the coil with its north pole entering first?
- 2) Held stationary inside the coil?
- 3) Pulled out again?

Answer: 1) Momentary deflection in the galvanometer is observed indicating production of current in the coil

2) No deflection in galvanometer - no current is produced

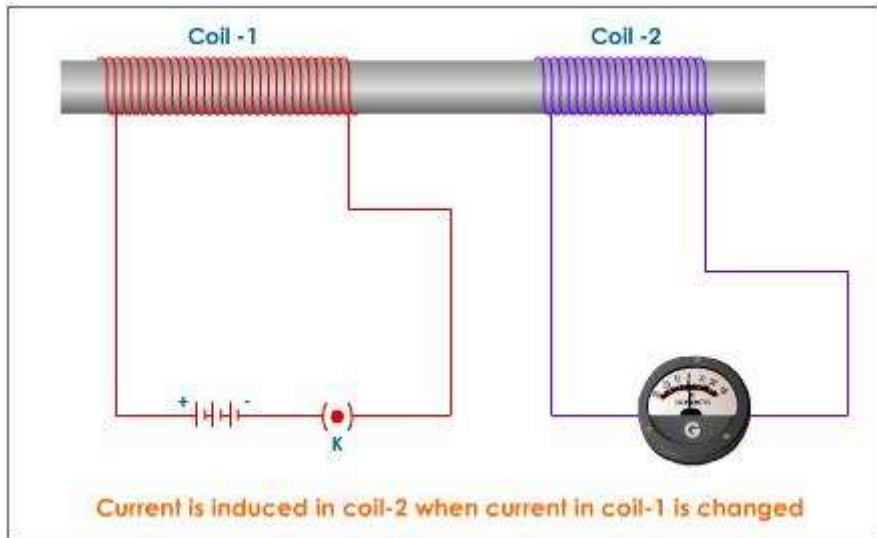
3) The pointer of the galvanometer deflects in the opposite direction indicating production of current in the coil

Question 43

Question: 1) What change would you observe in the coil -2 when we vary the current in the coil-1?

2) What do you infer?

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Answer: 1) The needle of the galvanometer shows a deflection
 2) A varying magnetic field in primary coil induces a small current in the secondary coil which is detected by the galvanometer

Question 44

Question: Name the main parts in an AC generator

Answer: 1) Armature
 2) Slip rings
 3) Carbon brushes and
 4) a permanent concave cylindrical magnet

Question 45

Question: What is the function of the earth wire in an electric circuit? Why is the metallic body of the electrical appliance connected to the earth wire?

Answer: One end of the earth wire is connected to a copper plate buried deep inside the earth so as to carry the current and discharge it. If by chance the live wire touches the metal case of the appliance or there is a leakage of current in it, the earth wire safely carries the current into the ground which is at zero potential. Thus it prevents electric shock.

Question 46

Question: What is short circuit? How does a fuse help in case of a short circuit?

Answer: 1) Accidentally or due to faulty wiring, sometimes the live wire comes in contact with the neutral wire. This is called a short circuit.

2) The fuse wire is an alloy of lead and tin having a low melting point. Due to heavy current, the wire gets heated and melts. Thus it breaks the circuit and prevents damage to the electrical circuit.

Question 47

Question: State any three properties of the magnetic lines of force.

Answer: 1) The magnetic lines of force originate from the north and terminate at the south-pole.

2) They do not intersect each other

3) They are concentrated more at the poles than at the centre of the magnet

Question 48

Question: Write the factors on which the magnitude of the magnetic field produced due to a circular coil carrying current depends on?

Answer: 1) Current - The magnitude of the magnetic field increases when the strength of the current is increased, as it is directly proportional to the current.

2) Number of turns in the coil - The field strength increases when we increase the number of turns in the coil as it is directly proportional to it.

3) Radius of the coil - The magnetic field strength is inversely proportional to the radius of the circular coil i.e. the field strength reduces as the radius of the coil increases

Question 49

Question: What factors affect the strength of the magnetic field produced by a current carrying solenoid?

Answer: 1) The number of turns in the solenoid - Larger the number of turns in the solenoid, greater will be the magnetism produced.

2) The strength of current in the solenoid - Larger the current passed through solenoid, stronger will be the magnetic field produced.

3) Nature of 'core-material' used in making the solenoid - if we use soft-iron as a core for the solenoid, then it produces the strongest magnetism.

Question 50

Question: What is an electromagnet? How does it differ from a permanent magnet?

Answer: An electromagnet can be defined as a soft-iron core that is magnetised temporarily by passing a current through a coil of wire wound on the core. Electric bell and microphone use electromagnets.

1) It behaves like a magnet only when the current is switched on

2) The strength of an electromagnet can be changed by changing the number of turns in the coil or by changing the current passing through it whereas the strength of a permanent magnet cannot be changed

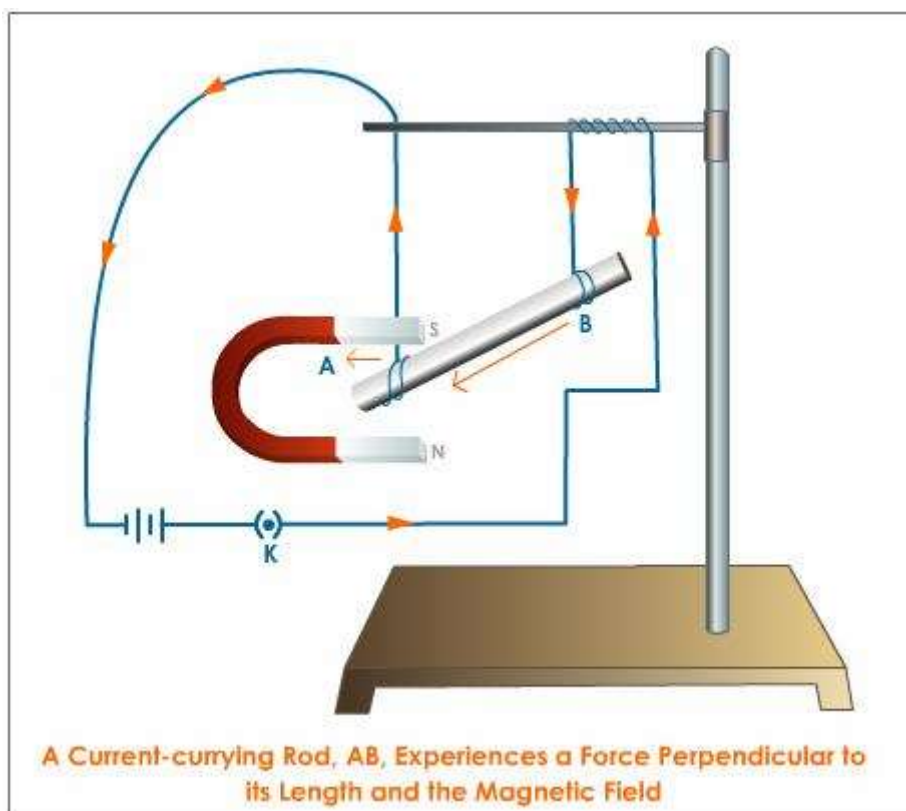
3) The polarity of an electromagnet can be changed by changing the direction of the current flowing through the coil. The polarity of a permanent magnet is fixed and cannot be changed.

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4) An electromagnet can produce a very strong magnetic force unlike a permanent magnet.

Question 51

Question: Describe an experiment to show that a current carrying wire experiences a force when placed in a magnetic field.



Answer:

A small aluminium rod AB is suspended horizontally by using connecting wires as shown in the figure. A horse shoe magnet is placed vertically such that the magnetic field is directly upwards. When the key is inserted, the rod is deflected towards the left. The displacement is reversed when the direction of current in the rod is reversed. This shows that there is a force exerted on the current carrying conductor when it is placed in a magnetic field

Question 52

Question: What principle is illustrated in the working of an electric motor? What is the function of the commutator and the carbon brushes in an electric motor?

Answer: Principle

When a rectangular coil carrying current is placed in a magnetic field, a torque acts on the coil and this torque rotates the coil continuously.

When the coil rotates, the shaft attached to it also rotates and thus it is able to do mechanical work.

Commutator

The function of the commutator rings is to reverse the direction of current flowing through the coil every time the coil just passes the vertical position during a revolution.

Carbon Brushes

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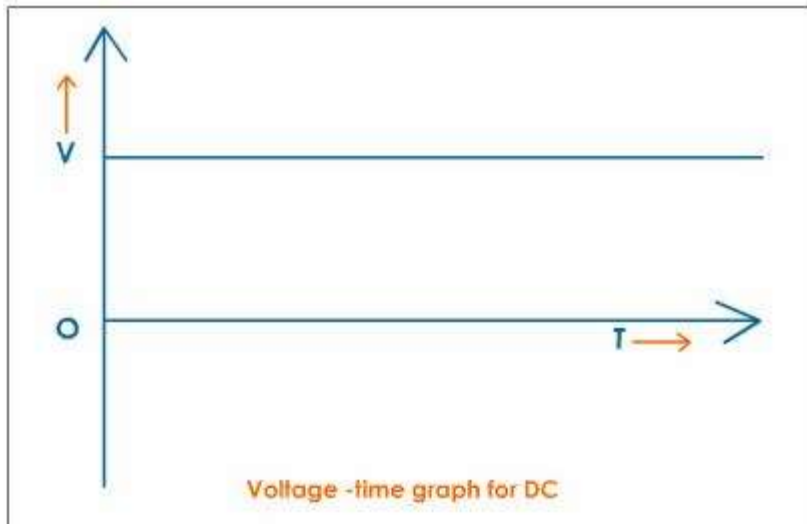
Two small strips of carbon, known as brushes press slightly against the two split rings, and the split rings rotate between the brushes. The carbon brushes are connected to a D.C. source.

Question 53

Question: Give any three points of difference between direct current and alternating current.

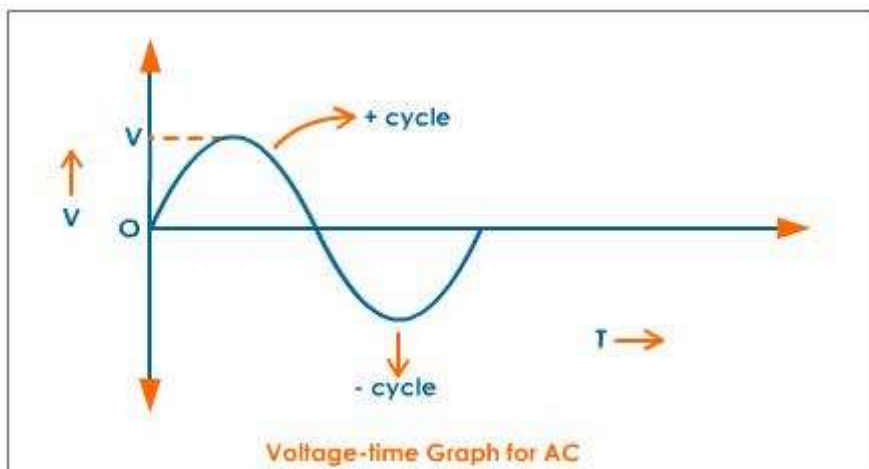
Answer: Direct Current

- 1) It is derived from a cell or a battery and is uni-directional.
- 2) The positive and negative terminals are fixed
- 3) The voltage v/s time graph is represented as follows:



Alternating Current

- 1) The current changes its direction after equal intervals of time
 - 2) It has no fixed terminals as the current changes its direction after every half cycle.
- The voltage vs time graph is represented as follows:



MAGNETIC EFFECTS OF ELECTRIC CURRENT

Question 54

Question: Explain what is short circuiting and over-loading in an electric supply

Answer: Short-circuiting

Whenever the live wire and the neutral wire come in contact with each other a spark is caused which causes fire in the house or building. This condition is called short-circuiting. The wires touch may each other due to faulty connections or sometimes due to the wearing off the insulation. The over heating of the wires causes fire and this condition can be prevented by using good quality wires with proper thickness and insulation. The wire joints should be covered with insulated adhesive tape.

Over Loading

If too many electrical appliances of high power rating (like electric iron or geyser) are switched on at the same time they draw an extremely large current from the circuit. The condition is called overloading and it can cause overheating of the wiring which finally results in a fire. It can also happen due to an accidental hike in a supply voltage. Thus we must take care to see that the electrical appliances having high power ratings are not switched on at the same time.

Question 55

Question: State the principle of an electric generator. How does an AC generator differ from a DC generator? What is the frequency of the alternating current produced in India?

Answer: Principle

When a straight conductor is moved rapidly in a magnetic field, then a current is induced in the conductor. It is based on the phenomenon of electromagnetic induction.

An AC generator can be converted to a DC generator by replacing the slip rings with the commutator rings (split rings).

The frequency of the alternating current produced in India is 50 Hertz.

Question 56

Question: Describe an experiment to show the magnetic field lines produced by:

- 1) A straight conductor carrying current
- 2) A circular loop carrying current

Answer: 1)

Arrange a copper wire, key, battery and a thick sheet of cardboard with a hole at its centre as shown here. Sprinkle some iron filings on the cardboard.

Gently tap the cardboard.

The iron filings do not show any change in their arrangement because no current is flowing through the conductor.

Switch on the current and observe the magnetic field lines.

The iron filings arrange themselves in concentric circles around the conductor.

This is because the electric current produces a magnetic field around the conductor and the iron filings being magnetic in nature align themselves in concentric circles.

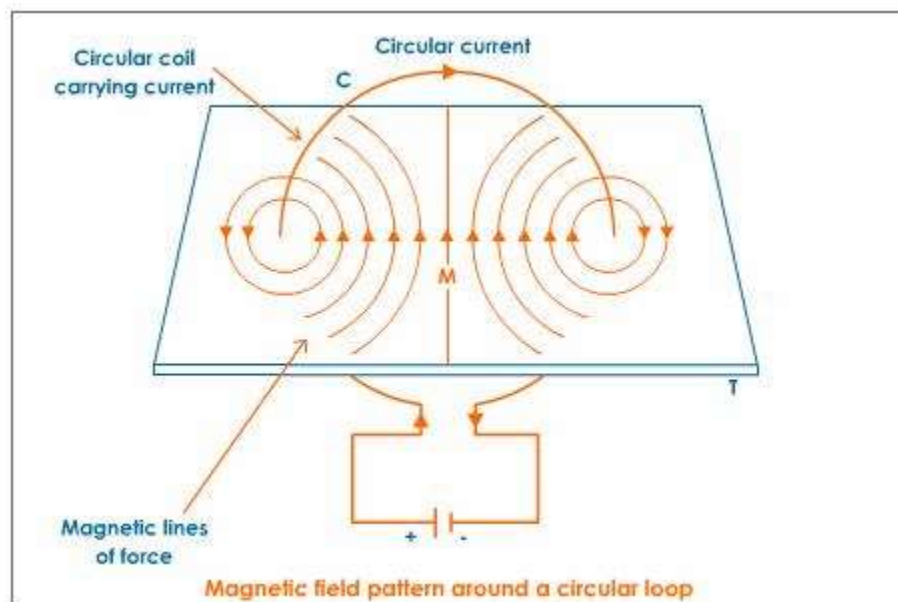
The direction of magnetic field lines can be found out using a compass needle.

Repeat the experiment by reversing the direction of flow of current.

The iron filings arrange themselves in concentric circles around the conductor but in the opposite direction.

This is because the direction of magnetic field changes when the direction of flow of current is reversed.

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2)

Take a long wire and bend it to form a circle.

Pass the wire through the cardboard such that half the wire is above it and the remaining part of the wire below the cardboard.

Join the free ends of the wire to a battery through a plug key.

Insert the key and pass the current. Sprinkle iron filings on the cardboard and tap gently.

Note the pattern of the iron filings that emerge on the cardboard.

Concentric circles are formed, which are centred at the point where the wire passes through the cardboard

The lines near the centre of the loop are almost straight. The magnetic field at the centre of the loop is perpendicular to the plane of the loop.

The concentric circles become larger as we move away from the wire.

Question 57

Question: Explain the construction and working of an electric motor with the help of a neat diagram

Answer: Electric Motor

An electric motor is a device which converts electrical energy into mechanical energy. A common motor works on direct current. So, it is also called DC motor.

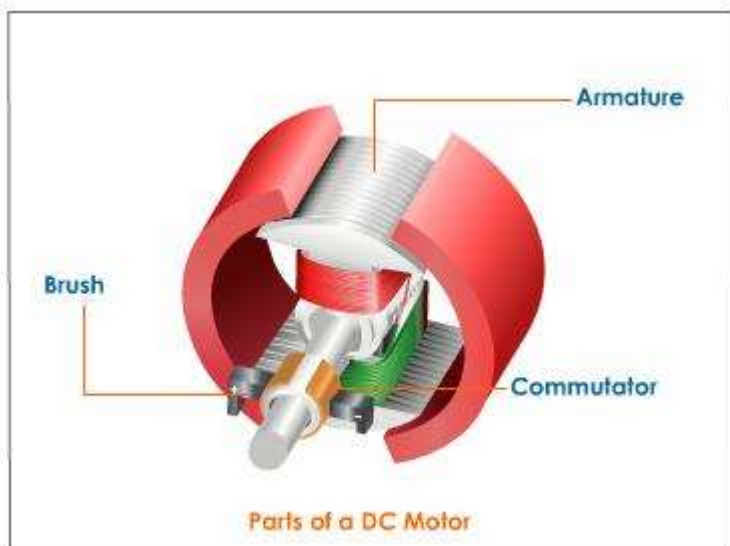
Principle When a rectangular coil carrying current is placed in a magnetic field, a torque acts on the coil which rotates it continuously.

When the coil rotates, the shaft attached to it also rotates and thus it is able to do mechanical work.

Construction and Working

Parts of a D.C. Motor

MAGNETIC EFFECTS OF ELECTRIC CURRENT

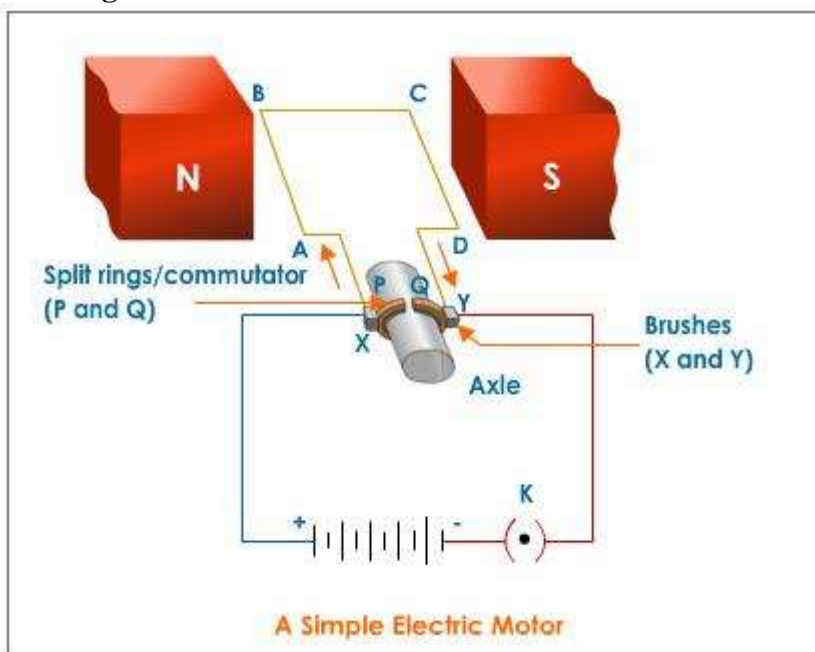


Armature A D.C. motor consists of a rectangular coil made of insulated copper wire wound on a soft iron core. This coil wound on the soft iron core forms the armature. The coil is mounted on an axle and is placed between the cylindrical concave poles of a magnet.

Commutator A commutator is used to reverse the direction of flow of current. Commutator is a copper ring split into two parts C_1 and C_2 . The split rings are insulated from each other and mounted on the axle of the motor. The two ends of the coil are soldered to these rings. They rotate along with the coil. Commutator rings are connected to a battery. The wires from the battery are not connected to the rings but to the brushes which are in contact with the rings.

Brushes Two small strips of carbon, known as brushes press slightly against the two split rings, and the split rings rotate between the brushes. The carbon brushes are connected to a D.C. source.

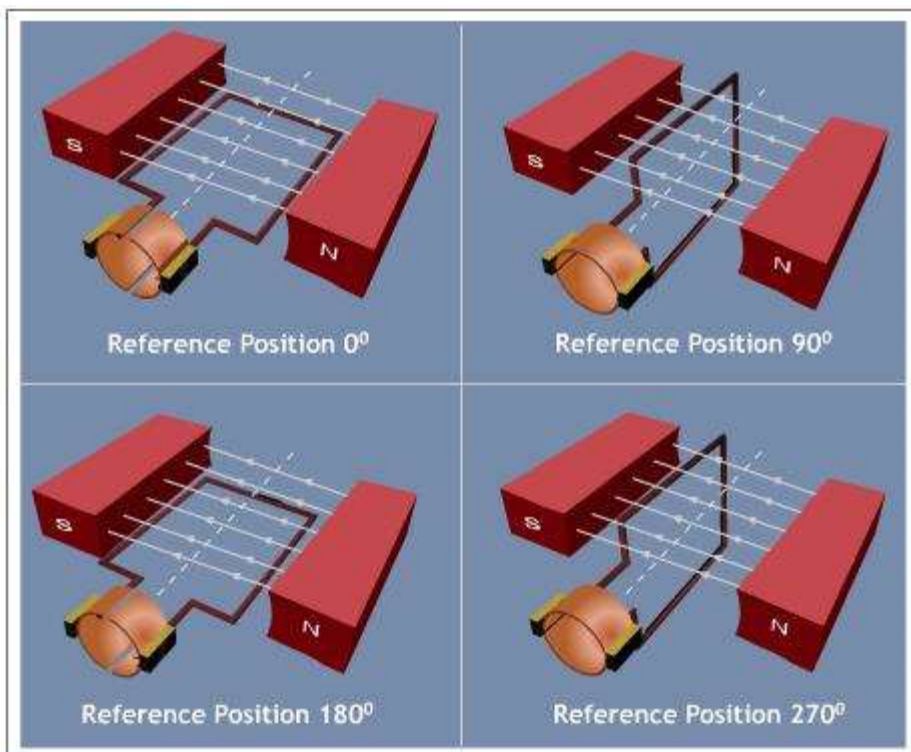
Working of a DC Motor



When the coil is powered, a magnetic field is generated around the armature. The left side of the armature is pushed away from the left magnet and drawn towards the right, causing rotation.

When the coil turns through 90° , the brushes lose contact with the commutator and the current stops flowing through the coil.

MAGNETIC EFFECTS OF ELECTRIC CURRENT



However the coil keeps turning because of its own momentum.

Now when the coil turns through 180° , the sides get interchanged. As a result the commutator ring C_1 is now in contact with brush B_2 and commutator ring C_2 is in contact with brush B_1 . Therefore, the current continues to flow in the same direction.

Question 58

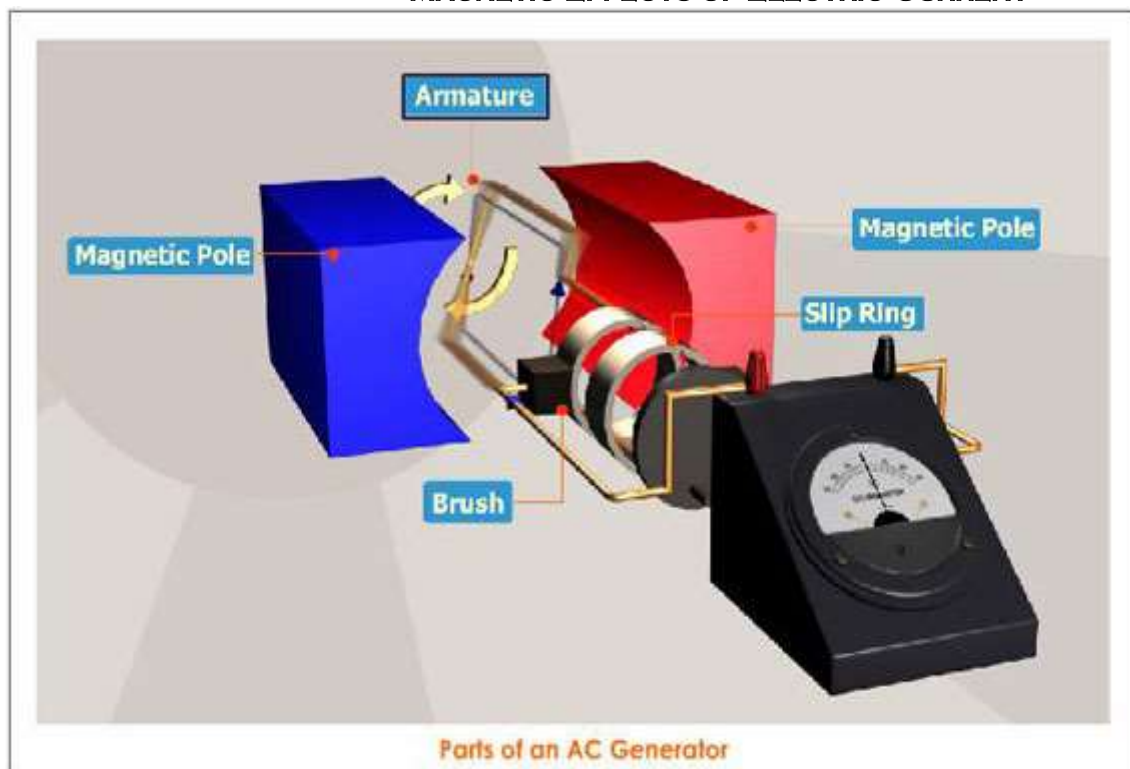
Question: Explain the construction and working of an AC generator with the help of a neat diagram.

Answer: Principle

When a straight conductor is moved rapidly in a magnetic field, then a current is induced in the conductor. It is based on the phenomenon of electromagnetic induction.

Construction

MAGNETIC EFFECTS OF ELECTRIC CURRENT

**Main parts of the AC Generator**

An AC generator consists of a magnet with concave cylindrical poles, an armature, and a current collecting arrangement.

The current collecting arrangement consists of slip rings and brushes.

Armature is a soft iron core on which a coil having a large number of turns of insulated copper wire is wound

Magnetic poles are concave and cylindrical. The concave poles produce a radial magnetic field.

The ends of the armature are connected to two slip rings. They rotate along with the coil. The slip rings are made of metal and are insulated from each other.

There are two brushes B_1 and B_2 made of carbon. One end of each brush is in contact with the rotating slip rings and the other end is connected to an external circuit. Here the brushes are connected to a galvanometer and brushes do not rotate with the coil.

The axle is rotated mechanically from outside by a diesel engine, flowing water, steam or high-speed wind.

Working

As the armature rotates about an axis perpendicular to the magnetic field, it keeps on changing its relative orientation with respect to the field.

Thus the flux keeps on changing continuously with time

This change in magnetic flux induces an emf.

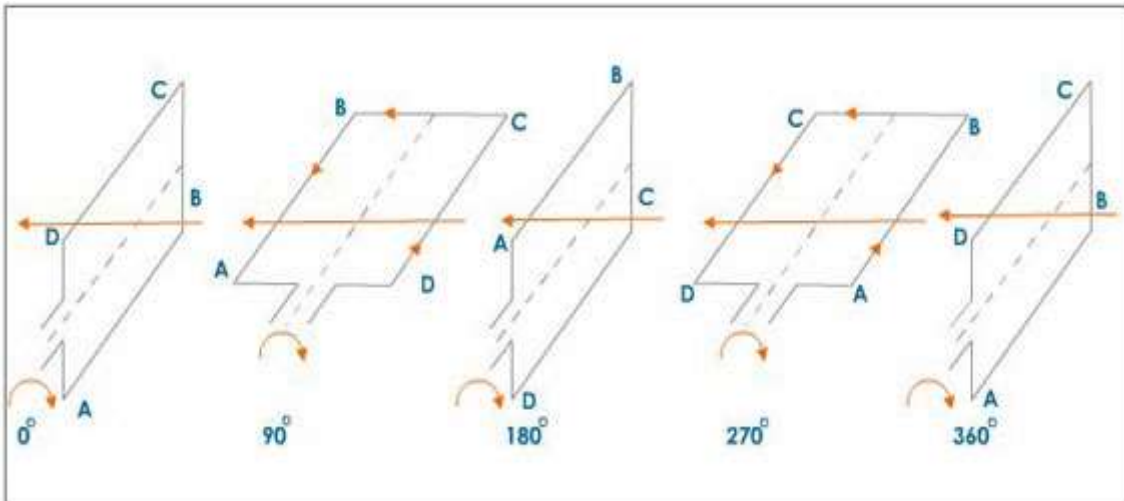
If the outer terminals of the armature are connected to an external circuit, an electric current flows through it.

The deflection of the galvanometer needle indicates that an emf is induced.

The direction of the induced emf is reversed after every half rotation of the coil.

Thus in one rotation of the coil, the current changes its direction twice in the coil. To understand how the direction of current changes go through the diagram given below.

MAGNETIC EFFECTS OF ELECTRIC CURRENT



Such a current which changes its direction after equal intervals of time is called alternating current (AC). This device is called an AC generator.

To get a direct current (DC) generator a split-ring type commutator must be used. In this arrangement, one brush is at all times in contact with the arm moving up in the field while the other is in contact with the arm moving down. Thus a unidirectional current is produced in such a generator

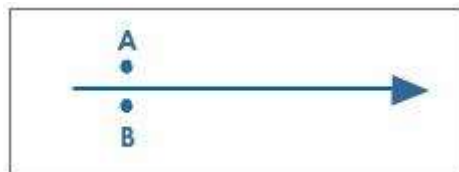
MAGNETIC EFFECTS OF ELECTRIC CURRENT

Question 1: A magnetic field line is used to find the direction of

1. south-north
2. a bar magnet
3. a compass needle
4. magnetic field

Answer: 4

Question 2: An electric current passes through a straight wire in the direction of south to north. Magnetic compasses are placed at points A and B as shown in the figure.



What is your observation?

1. The needle will not deflect
2. Only one of the needles will deflect
3. Both the needles will deflect in the same direction
4. The needles will deflect in the opposite directions

Answer: 4

Question 3: The magnetic field lines due to a straight wire carrying a current are

1. straight
2. circular
3. parabolic
4. elliptical

Answer: 2

Question 4: Magnetic field produced at the centre of a current carrying circular wire is

1. directly proportional to the square of the radius of the circular wire
2. directly proportional to the radius of the circular wire
3. inversely proportional to the square of the radius of the circular wire
4. inversely proportional to the radius of the circular wire

Answer: 4

MAGNETIC EFFECTS OF ELECTRIC CURRENT

Question 5: The magnetic field lines inside a long, current carrying solenoid are nearly

1. straight
2. circular
3. parabolic
4. elliptical

Answer: 1

Question 6: A soft iron bar is introduced inside a current carrying solenoid. The magnetic field inside the solenoid

1. will become zero
2. will decrease
3. will increase
4. will remain unaffected

Answer: 3

Question 7: The direction of the force on a current-carrying wire placed in a magnetic field depends on

1. the direction of the current
2. the direction of the field
3. the direction of current as well as field
4. neither the direction of current nor the direction of field

Answer: 3

Question 8: The direction of induced current is obtained by

1. Fleming's left-hand rule
2. Maxwell's right-hand thumb rule
3. Ampere's rule
4. Fleming's right-hand rule

Answer: 4

Question 9: Who first discovered the relationship between electricity and magnetism?

1. Faraday
2. Newton
3. Maxwell
4. Oersted

Answer: 4

MAGNETIC EFFECTS OF ELECTRIC CURRENT

Question 10: In an electric motor, the energy transformation is from

1. electrical to chemical
2. chemical to light
3. mechanical to electrical
4. electrical to mechanical

Answer: 4

Question 11: A commutator changes the direction of current in the coil of

1. a DC motor
2. a DC motor and an AC generator
3. a DC motor and a DC generator
4. an AC generator

Answer: 3

Question 12: Which of the following devices works on the principle of electromagnetic induction?

1. Ammeter
2. Voltmeter
3. Generator
4. Galvanometer

Answer: 3

Question 13: A device used for measuring small currents due to changing magnetic field is known as

1. galvanometer
2. ammeter
3. voltmeter
4. potentiometer

Answer: 1

Question 14: An electric generator actually acts as

1. source of electric charge
2. source of heat energy
3. an electromagnet
4. a converter of energy

Answer: 4

MAGNETIC EFFECTS OF ELECTRIC CURRENT

Question 15: Electromagnetic induction is the

1. charging of a body with a positive charge
2. production of current by relative motion between a magnet and a coil
3. rotation of the coil of an electric motor
4. generation of magnetic field due to a current carrying solenoid

Answer: 2

Question 16: For making a strong electromagnet, the material of the core should be

1. soft iron
2. steel
3. brass
4. copper

Answer: 1

Question 17: Magnetic field inside a long solenoid carrying current is

1. same at all points (uniform)
2. different at poles and at the centre
3. zero
4. different at all points

Answer: 1

Question 18: You have a coil and a bar magnet. You can produce an electric current by

1. moving the magnet but not the coil
2. moving the coil but not the magnet
3. moving either the magnet or the coil
4. using another DC source

Answer: 3

Question 19: Which of the following describes the common domestic power supplied in India?

1. 220 V, 100 Hz
2. 220 V, 50 Hz
3. 110 V, 100 Hz
4. 100 V, 50 Hz

Answer: 2

MAGNETIC EFFECTS OF ELECTRIC CURRENT

Question 20: A fuse in an electric circuit acts as a

1. current multiplication
2. voltage multiplication
3. power multiplier
4. safety device

Answer: 4

Question 21: The magnetic lines of force inside a current carrying solenoid are

1. along the axis and parallel to each other
2. perpendicular to the axis and parallel to each other
3. circular and do not intersect each other
4. circular and intersect each other

Answer: 1

Question 22: When the main switch of the house is put off, it disconnects

1. live wire
2. neutral wire
3. earth wire
4. live and neutral wires

Answer: 4

Question 23: Kilowatt-hour is the unit of

1. potential difference
2. electric power
3. electrical energy
4. charge

Answer: 3

Question 24: When a fuse is rated 8A, it means

1. it will not work if current is less than 8A
2. it has a resistance of 8
3. it will work only if current is 8A
4. it will burn if current exceeds 8A

Answer: 4