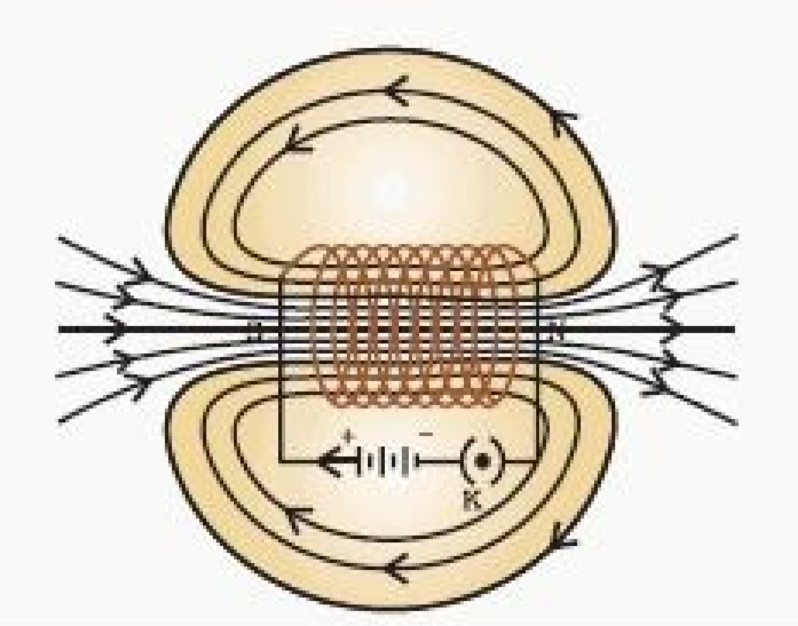
Question 25. The essential difference between an AC generator and a DC generator is that:
(a) AC generator has an electromagnet while a DC generator has permanent magnet.
(b) DC generator will generate a higher voltage.
(c) AC generator will generate a higher voltage.
(d) AC generator has slip rings while the DC generator has a commutator
Solution:
(d) AC generator has slip rings while the DC generator has a commutator.

Question 26. At the time of short circuit, the current in the circuit
(a) reduces substantially.
(b) does not change.
(c) increases heavily.
(d) vary continuously.
Solution:
(c) increases heavily.

Question 27. State whether the following statements are true or false.
Solution:
(a) An electric motor converts mechanical energy into electrical energy - false.
(b) An electric generator works on the principle of electromagnetic induction - true
(c) The field at the centre of a long circular coil carrying current will be parallel straight lines - true.
(d) A wire with a green insulation is usually the live wire of an electric supply - true.

Question 28. List three sources of magnetic fields
Solution:
(a) Magnetic field due to a current through a straight conductor.
(b) Magnetic field due to a current in a solenoid.
(c) Magnetic field due to a current through a circular loop.

Question 29. How does a solenoid behave like a magnet? Can you determine the north and the south poles of a current-carrying solenoid with the help of a bar magnet? Explain.
Solution:

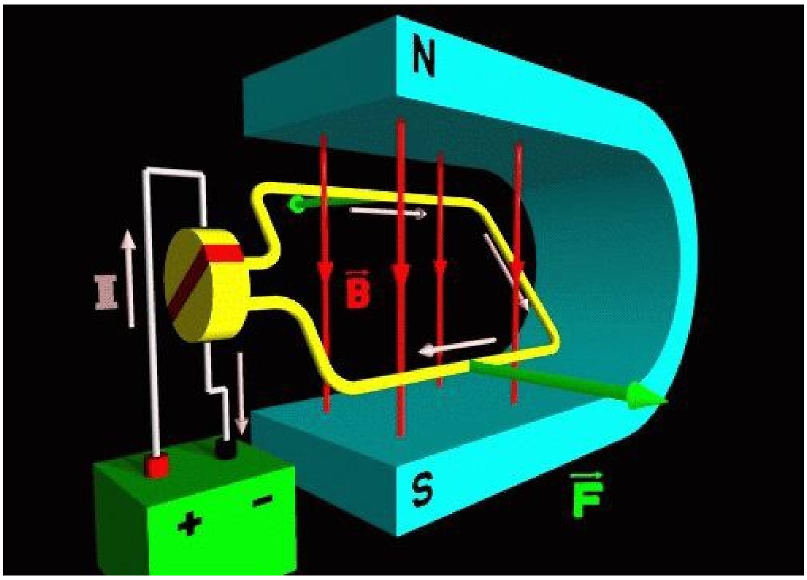


A coil of many circular turns of insulated copper wire wrapped closely in the shape of the cylinder is called a solenoid. The pattern of the magnetic field lines around a current- carrying solenoid is shown in this figure. In fact, one end of the solenoid behaves as a magnetic north pole, while the other behaves as the south pole. The field lines inside the solenoid are in the form of parallel straight lines. This indicates that the magnetic field is the same at all points inside the solenoid. That is, the field is uniform inside the solenoid.
A strong magnetic field produced inside a solenoid can be used to magnetise a piece of magnetic material, like soft iron, when placed inside the coil. The magnet so formed is called an electromagnet.

Question 30. When is the force experienced by a current-carrying conductor placed in a magnetic field the largest?
Solution:
The force experienced by a current-carrying conductor placed in a magnetic field is largest provided when the direction of current is at right angles to the direction of the magnetic field.

Question 31. 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?
Solution:
The direction of magnetic field is towards west.

Question 32. Draw a labelled diagram of an electric motor. Explain its principle and working.What is the function of a split ring in an electric motor?
Solution:



A motor is a device that converts the electrical energy into mechanical energy.
Principle
An electric motor is based on the fact that when a current carrying conductor is placed in a magnetic field the conductor experiences a force which is given by Fleming's Left Hand Rule. For example, when a rectangular coil is placed in the magnetic field and current is passed through it, a torque acts on the coil, which rotates it continuously. When the coil rotates, the shaft attached to it also rotates and therefore the electrical energy supplied to the motor is converted into the mechanical energy of rotation.

An electrical motor consists of a rectangular coil ABCD of insulated copper wire, wound on a soft iron core called armature. The coil is mounted between the poles of a magnet in such a way that it can rotate between the poles N and S. The two ends of the coil are soldered to the ends of a commutator whose main function is to reverse the direction of the current flowing through the coil every time the coil just passes the vertical position during its revolution.

Working
Suppose the coil ABCD is initially at a horizontal position. When the switch is in ON position the current enters the coil through the carbon brushes and the half ring 'A' of the commutator.

The current flows in the direction DCBA and leaves via the half ring 'B'. In the side PQ of the coil, the direction is from Q to P towards the south and the direction of the magnetic field is from the N to S pole towards the east. So, by applying Fleming's left hand rule, we find that it will experience a force in upward direction. Similarly, the side SR of the coil will experience a downward force. Thus we have two parallel wires experiencing forces in opposite directions. They form a couple tending to rotate the coil in the anticlockwise direction.

When the coil goes beyond the vertical position, the two commutator half rings automatically changes contact from one brush to the other. This reverses the direction of current through the coil which, in turn, reverses the direction of forces acting on the two sides of the coil. The sides of the coil are interchanged, but rotate in the same anticlockwise direction. This process is repeated again and again and the coil continues to rotate as long as the current is passing.

*********** END **********