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## NCERT Science Class 10 Chapter 13 Magnetic Effects of Electric Current CBSE Board Sample Problems Short Answer (For CBSE, ICSE, IAS, NET, NRA 2022)

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### Question

**A coil of insulated copper wire is connected to a galvanometer.**

What would happen if a bar magnet is

- (i) Pushed into the coil?
- (ii) Withdrawn from Side the coil?
- (iii) Held stationary inside the coil?

### Solution

- (i) Due to change in magnetic flux linked with coil, the galvanometer shows deflection (say towards right) .
- (ii) Due to change in magnetic flux linked with coil, the galvanometer shows deflection (say towards left opposite to that in case one) .
- (iii) As it is stationary no change in magnetic flux linked with coil, so galvanometer shows no deflection.

### Question

**(a) What is short circuiting?**

(b) What is overloading? How can you avoid overloading?

### Solution

- Short circuiting means when live wire and the neutral wires come in contact with each other. Due to this resistance of the circuit becomes very small and huge amount of current flows through the circuit which in turn produces more heat which can cause fire.
- Overloading means large amount of current flows in the circuit. It can happen when many electrical appliances of high power ratings are connected in a single socket. It can be avoided by the following methods:

- Not use too many appliance is a single socket
- To apply preventive methods of short circuiting.

## Question

**(a) What is the standard colour code followed for**

- (i) Live
- (ii) Neutral and
- (iii) Earth wires used in electric circuits?

**(b) Which part of an electric appliance is earthed and why?**

## Solution

- The standard colour code for
  - Live wire - Red
  - Neutral - Black
  - Earth - Green respectively.
- The metallic case of an electrical appliance is earthed because metals are good conductors of electricity and in case if current exceeds i.e.. live wire touches the metallic case of an appliance and then due to earthing all the excess amount of current flows down to the earth and we prevent ourselves from an electric shock.

## Question

**Distinguish between a direct current and an alternating current**

## Solution

- DC - Always flows in one direction; magnitude of current remain constant; ex. battery, DC generator
- AC - reverses its direction periodically; magnitude of current continuously changes with time; AC generator

## Question

**Why is alternating current preferred over direct current? List any three reasons**

## Solution

An alternating current is preferred over direct current due to the following reasons:

- (i) AC is easy to operate and maintain
- (ii) AC voltage can be stepped up or stepped down as per convenience

(iii) AC can be easily transmitted over long distances

## Question

**What precautions should be taken to avoid the overloading of domestic electric circuits?**

## Solution

- (i) Too many electrical appliances should not be operated using a single socket
- (ii) Too many large power rating appliances should not be switched on at a time.

## Question

**When is the force experienced by a current-carrying conductor placed in a magnetic field**

- (i) Maximum
- (ii) Minimum

## Solution

- (i) Maximum when direction of current is at right angles to the direction of magnetic field,
- (ii) Minimum (zero) when direction of current is parallel or anti-parallel to the direction of magnetic field

## Question

**Define a solenoid. With the help of a suitable diagram show the pattern of magnetic field lines around a current carrying solenoid. State the region where field is uniform.**

## Solution

- A solenoid is defined as a long coil of many circular turns of insulated metal wire wrapped closely in the shape of a cylinder.
- Magnetic field is uniform inside the solenoid

## Question

**What is meant by overloading of an electrical circuit? Explain two possible causes due to which overloading may occur in household circuits? State one preventive measure that should be taken to avoid overloading of domestic electric circuits.**

## Solution

Overloading of an electrical circuit happens when an excessive amount of electric current passes through the wire and excessive heating takes place.

**Two possible causes of overloading:**

- (a) Live and neutral wires come in contact with each other.
- (b) Connecting too many appliances in parallel to a single socket.

**Preventive measures:**

- (a) Proper insulation
- (b) Not connecting too many appliances in a single socket.

**Question**

**The following questions consists of two statements – Assertion (A) and Reason (R) . Answer these questions selecting the appropriate option given below:**

- (a) Both A and R are true and R is correct explanation of A.
- (b) Both A and R are true and R is not correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Assertion (A) : On freely suspending a current carrying solenoid, it comes to rest in N-S direction just like a bar magnet.

Reason (R) : One end of current carrying straight solenoid behaves as a North Pole and other end as a South Pole.

**Solution**

(b) , Because first statement is telling about relation between Earth's geographical N-S pole and Magnetic N-S pole whereas, Second statement is giving the property of a solenoid.

**Question**

**The following questions consists of two statements – Assertion (A) and Reason (R) . Answer these questions selecting the appropriate option given below:**

- (a) Both A and R are true and R is correct explanation of A.
- (b) Both A and R are true and R is not correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Assertion (A) : Safety fuses are made up of material having low melting point.

Reason (R) : Safety fuses should be resistant to electric current.

## Solution

(b) Both the statements are individually correct. Both the statement explains about the fuse and its properties but nowhere resistance property is linked to material property of fuse.

## Question

**With the help of an activity, explain the method of inducing electric current in a coil with the help of a magnet. State the rule used to find the direction of electric current thus generated in the coil.**

## Solution

A moving magnet induces a current in the coil.

- Take a coil wire AB having a large number of turns.
- Connect the two ends of the rod to the galvanometer. When a strong magnet is brought towards one of the ends of the rod, the needle in the galvanometer deflects in the left direction indicating the presence of current in the circuit.
- When the magnet is moved away from the coil, the needle again rests at zero showing that no current flows in the circuit when the magnet is taken away.
- The direction of the current can be easily be determined using Fleming's Right Hand Thumb rule which states that When we stretch the thumb, index finger and middle finger of right hand in mutually perpendicular direction, the thumb points in the direction of motion of conductor, the index finger points in the direction of the magnetic field and the middle finger points in the direction of induced current.

## Question

**A current through a horizontal power line flows in west to east direction.**

(i) What is the direction of magnetic field at a point directly above it and a point directly below it?

(ii) Name the rule used to determine

(a) The direction of force when a current carrying wire is placed in a strong magnetic field.

(b) Magnetic field in a current carrying conductor.

## Solution

(i) The current is in the east-west direction. Applying the right hand thumb rule, we get that the direction of magnetic field at a point above the wire is anticlockwise direction.

The direction of magnetic field at a point directly above the wire is clockwise direction when viewed from east side.

(ii) (a) Using Fleming's left hand rule

(b) Using Right hand thumb rule

## Question

**(i) What is the function of earth wire in electrical instruments?**

(ii) Explain what is short circuiting in an electric supply.

(iii) What is the usual current rating of the fuse wire in the line to feed?

Lights and fans?

(b) Appliances of 2 kW or more power?

## Solution

(i) Earth wire in electrical instruments saves us from all possible electric shocks.

(ii) Accidentally, when live and neutral wires of an electric circuit comes into direct contact, it is called short circuiting.

(iii) (a) 5A

(b) 15A

## Question

**(a) A student performs an experiment to study the magnetic effect of current around a current-carrying straight conductor.**

He reports that:

The direction of deflection of the north pole of a compass needle kept at a given point near the conductor remains unaffected even when the terminals of the battery sending the current in the wire are interchanged.

For a given battery current, the degree of deflection of a N-pole decrease when the compass is kept at a point farther away from the conductor.

Which of the above observations is correct and why? (1)

(b) State three factors on which the magnitude of the force on a current-carrying conductor placed in a magnetic field depends.

Can this force be zero for some position of the conductor?

(1 + 1)

## Solution

(a) (ii) observations is correct, magnetic field decreases with increase in the radius around the conductor. (1)

Decreases in magnetic field when going away from the conductor.

(b) FaL FaL FaB

(1 + 1)

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