

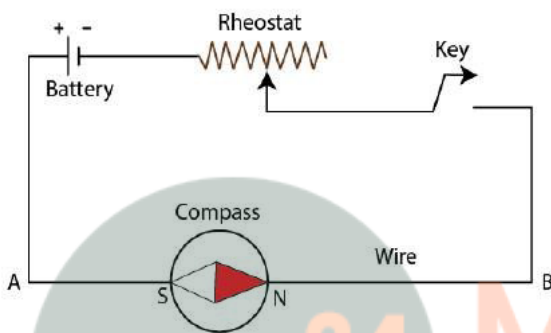
EXERCISE 10(A)

**Solution:**

Experiment: Figure shows a wire AB, lying in the north-south direction connected to a battery through a rheostat and a tapping key. Just below the wire, a compass needle is placed.

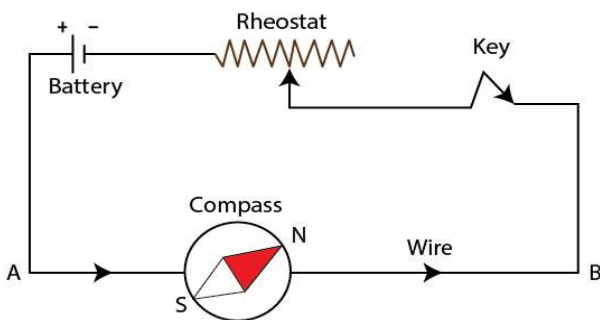
Observations:

(1) The needle shows no deflection, when the key is open i.e., no current passes through the wire and it points in the N-S direction (i.e., the earth's magnetic field). In this position, the needle is parallel to the wire as shown in figure (a).



(a) When a key is open, the needle shows no deflection and it point in the N-S direction

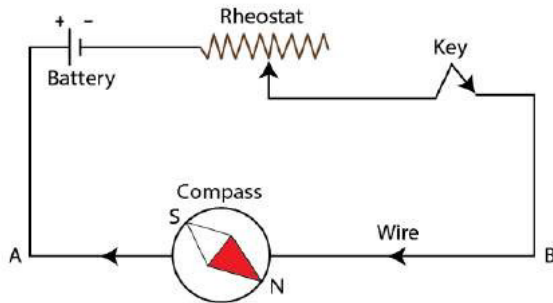
(2) A current passes in the wire in the direction from A to B when the key is pressed (i.e., from south to north) and the north pole (N) of the needle deflects towards the west as shown in figure (b).



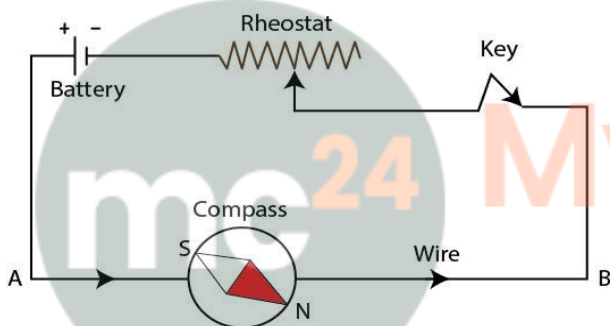
(b) When the key is pressed, the north pole (N) of the needle deflects towards the west.

(3) North pole (N) of the needle deflects towards the east, when the direction of current in the wire is reversed by reversing the connections at the terminals of the battery as shown

in figure (c).

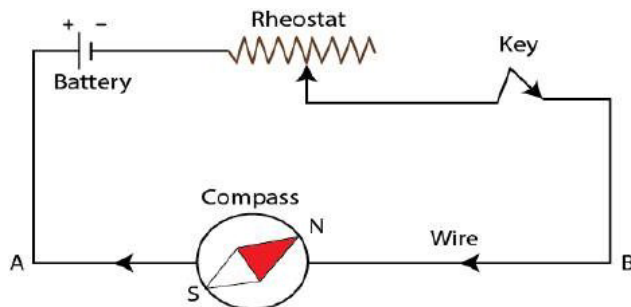


(c) When the direction of current in the wire is reversed, the north pole (N) of the needle deflects towards the east



(d) If the compass needle is placed just above the wire, the north pole (N) deflects towards east when the direction of current in wire is from A to B

(4) The north pole (N) deflects towards east when the direction of current in wire is from A to B if the compass needle is placed just above the wire. But the needle deflects towards west as shown in figure (e) if the direction of current in wire is from B to A.

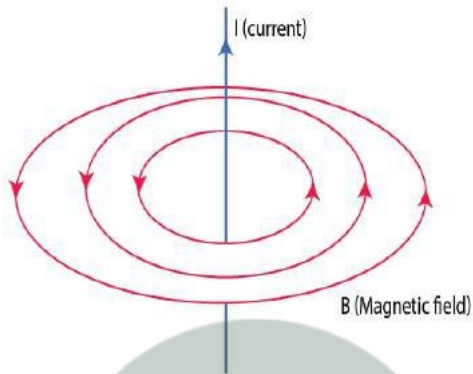


(a) If the compass needle is placed just above the wire, the needle deflects towards west if

the direction of current in wire is from B to A

The above observations of the experiment suggest that a current carrying wire produces a magnetic field around it.

**Solution:**



**Solution:**

- (a) The magnetic field lines become rarer on decreasing the current
- (b) If the direction of current is reversed, the direction of magnetic field is also reversed.

**Solution:**

The direction of magnetic field around a current carrying wire is determined by the right hand thumb rule. It states that if we hold the current carrying conductor in our right hand such that the thumb points in the direction of flow of current, then the fingers encircle the wire in the direction of the magnetic field lines.

**Question: 5**

**A straight wire lying in a horizontal plane carries a current from north to south.**

- (a) What will be the direction of magnetic field at a point just underneath it?**

(b) Name the law used to arrive at this answer in part (a).

**Solution:**

(a) The direction of magnetic field at a point just underneath is towards east.

(b) The name of the law is right hand thumb rule.

**Question: 6**

What will happen to a compass needle when the compass is placed below a wire with needle parallel to it and a current is made to flow through the wire? Give a reason to justify your answer.

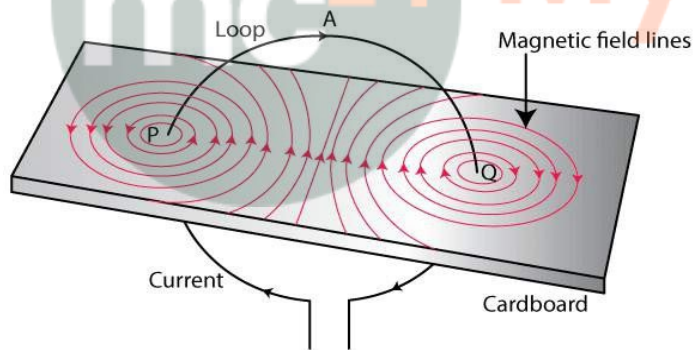
**Solution:**

When a current is passed through a conductor wire it produces a magnetic field around it and because of this, the compass needle gets deflected. Hence, the compass needle will show deflection.

**Question: 7**

Draw a labelled diagram showing the three magnetic field lines of a loop carrying current. Mark the direction of current and the direction of magnetic field by arrows in your diagram.

**Solution:**



**Question: 8**

A wire, bent into a circle, carries a current in an anticlockwise direction. What polarity does this face of the coil exhibit?

**Solution:**

The face of the coil exhibit north polarity

**Question: 9**

What is the direction of magnetic field at the centre of a coil carrying current in (i)

the clockwise, (ii) the anticlockwise, direction?

**Solution:**

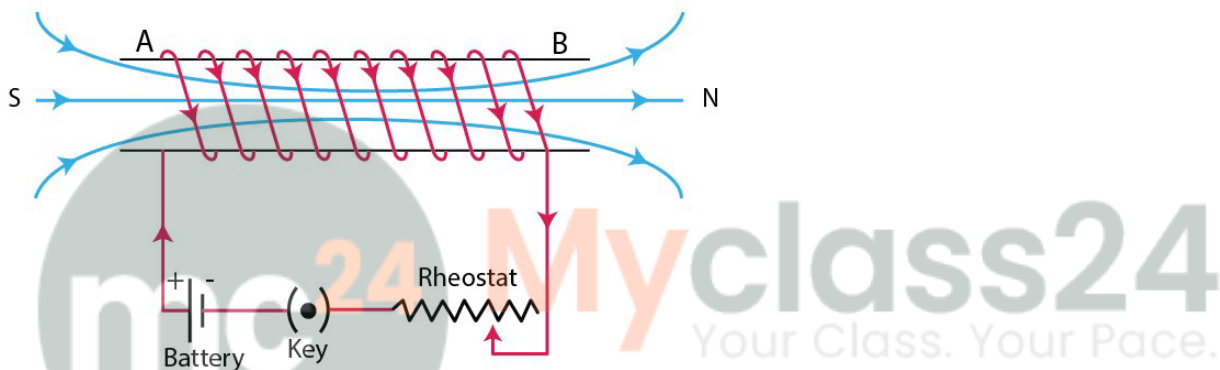
(i) The direction of magnetic field at the centre of a coil carrying current in the clockwise direction is along the axis of coil inwards.

(ii) The direction of magnetic field at the centre of a coil carrying current in the anticlockwise direction is along the axis of coil outwards.

**Question: 10**

**Draw a diagram to represent the magnetic field lines along the axis of a current carrying solenoid. Mark arrows to show the direction of current in the solenoid and the direction of magnetic field lines.**

**Solution:**



**Question: 11**

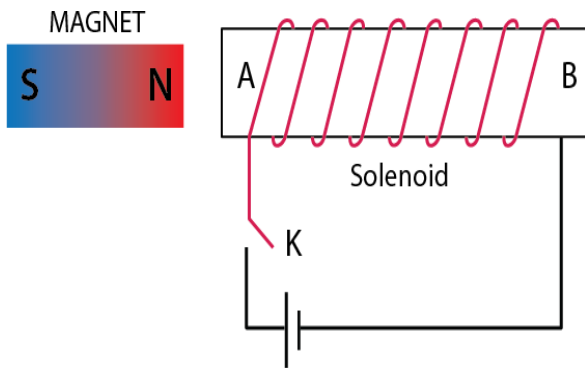
**Name and state the rule by which the polarity at the ends of a current carrying solenoid is determined.**

**Solution:**

The name of the rule is right hand thumb rule. It states that if we hold the current carrying conductor in right hand such that the thumb points in the direction of flow of current, then the fingers encircle the wire in the direction of the magnetic field lines.

**Question: 12**

**The diagram in figure shows a small magnet placed near a solenoid AB with its north pole N near the end A. Current is switched on in the solenoid by pressing the key K.**



- (a) State the polarity at the ends A and B.  
 (b) Will the magnet be attracted or repelled? Give a reason for your answer.

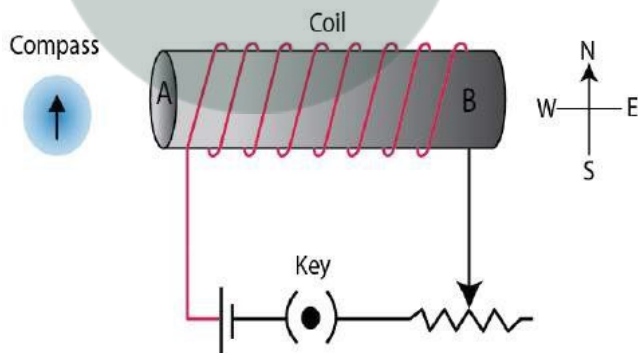
**Solution:**

- (a) The polarity at the end A is north pole and at the end B is south pole.  
 (b) The magnet is repelled because the end A of the solenoid becomes the north pole since the current at this face is anticlockwise and it repels the north pole of the magnet.

**Question: 13**

The diagram shows a spiral coil wound on a hollow cardboard tube AB. A magnetic compass is placed close to it. Current is switched on by closing the key.

- (a) What will be the polarity at the ends A and B?  
 (b) How will the compass needle be affected? Give reason.



**Solution:**

- (a) The polarity at the end A is north pole and at the end B is south pole.  
 (b) The north pole of compass needle will deflect towards west.  
 Reason: End A of the coil behaves like north pole which repels the north pole of the compass needle towards west

**Question: 14**

State two ways by which the magnetic field due to a current carrying solenoid can be made stronger.

**Solution:**

The magnetic field due to a current carrying solenoid can be made stronger by following ways

- (i) By increasing the number of turns of winding in the solenoid and
- (ii) By increasing the current through the solenoid

**Question: 15**

**Why does a current carrying freely suspended solenoid rest along a particular direction? State the direction in which it rests.**

**Solution:**

A current carrying freely suspended solenoid at rest behaves like a bar magnet. Hence, a current carrying solenoid when suspended freely sets itself in the north- south direction exactly in the same manner as a bar magnet does.

**Question: 16**

**What effect will there be on a magnetic compass when it is brought near a current carrying solenoid?**

**Solution:**

The needle of the compass will rest in the direction of magnetic field due to the solenoid at that point

**Question: 17**

**How is the magnetic field due to a solenoid carrying current affected if a soft iron bar is introduced inside the solenoid?**

**Solution:**

The strength of magnetic field increases if a soft iron bar is introduced inside the solenoid.

**Question: 18**

**Complete the following sentences:**

- (a) When current flows in a wire, it creates \_\_\_\_\_
- (b) On reversing the direction of current in a wire, the magnetic field produced by it gets \_\_\_\_\_.
- (c) A current carrying solenoid behaves like a \_\_\_\_\_.
- (d) A current carrying solenoid when freely suspended, it always rest in \_\_\_\_\_ direction.

**Solution:**

- (a) When current flows in a wire, it creates a magnetic field around it.
- (b) On reversing the direction of current in a wire, the magnetic field produced by it gets

reversed.

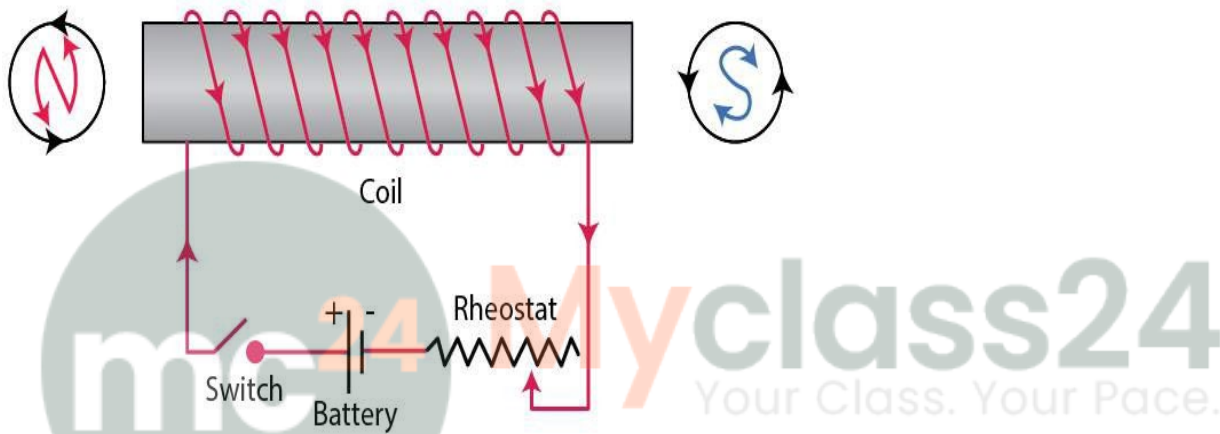
(c) A current carrying solenoid behaves like a bar magnet.

(d) A current carrying solenoid when freely suspended, it always rest in north-south direction.

**Question: 19**

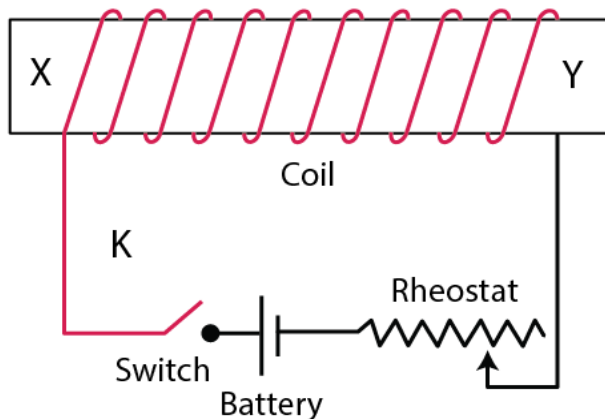
You are required to make an electromagnet from a soft iron bar by using a cell, an insulated coil of copper and a switch. (a) Draw a circuit diagram to represent the process. (b) Label the poles of the electromagnet.

**Solution:**



**Question: 20**

The diagram in figure shows a coil wound around a soft iron bar XY. (a) State the polarity at the end X and Y as the switch is pressed. (b) Suggest one way of increasing the strength of electromagnet so formed.



**Solution:**

- (a) The polarity at the end X - north pole and at Y - south pole
- (b) By reducing the resistance of circuit by means of rheostat to increase current in the coil.

**Question: 21**

- (a) What name is given to a cylindrical coil of diameter less than its length?
- (b) If a piece of soft iron is placed inside the coil mentioned in part (a) and current is passed in the coil from a battery, what name is then given to the device so obtained?
- (c) Give one use of the device mentioned in part (b).

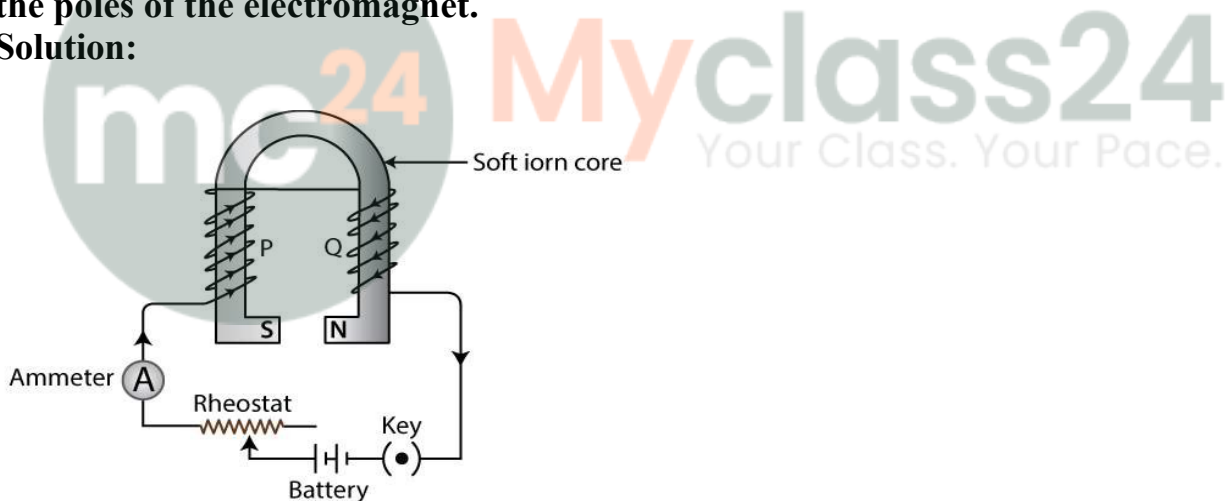
**Solution:**

- (a) A cylindrical coil of diameter less than its length is solenoid
- (b) Electromagnet is the name of the device obtained
- (c) Electromagnet is used in electric relay

**Question: 22**

Show with the aid of a diagram how a wire is wound on a U-shaped piece of soft iron in order to make it an electromagnet. Complete the circuit diagram and label the poles of the electromagnet.

**Solution:**



**Question: 23**

What is an electromagnet? Name two factors on which the strength of magnetic field of an electromagnet depends and state how does it depend on the factors stated by you.

**Solution:**

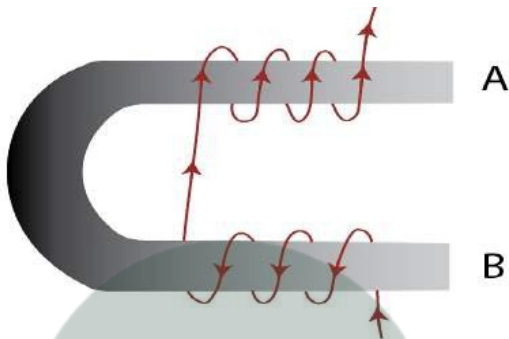
An electromagnet is a temporary strong magnet made by passing current in a coil wound around a piece of soft iron. It is an artificial magnet.

The strength of magnetic field of an electromagnet depends on:

- (i) By increasing the number of turns of winding in the solenoid and
- (ii) By increasing the current through the solenoid.

**Question: 24**

Figure shows the current flowing in the coil of wire wound around the soft iron horse shoe core. (a) State the polarities developed at the ends A and B. (b) How will the polarity at the ends A and B change on reversing the direction of current. (c) Suggest one way increase the strength of magnetic field produce.



**Solution:**

- (a) At the end A – south pole and at end B – north pole
- (b) Polarities get reversed. A will become north pole and B will become south pole
- (c) By increasing the current

**Question: 25**

State two ways through which the strength of an electromagnet can be increased.

**Solution:**

- The two ways through which the strength of an electromagnet can be increased are
- (i) By increasing the number of turns of winding in the solenoid and
  - (ii) By increasing the current through the solenoid

**Question: 26**

Name one device that uses an electromagnet.

**Solution:**

The device that uses an electromagnet is electric bell

**Question: 27**

State two advantages of an electromagnet over a permanent magnet.

**Solution:**

- (i) An electromagnet can produce a strong magnetic field

(ii) By changing the current in its solenoid, the strength of the magnetic field of an electromagnet can easily be changed

**Question: 28**

**State two differences between an electromagnet and a permanent magnet.**

**Solution:**

Electromagnet	Permanent magnet
It is made of soft iron	It is made of steel
The polarity of an electromagnet can be reversed	The polarity of a permanent magnet cannot be reversed

**Question: 29**

**Why is soft iron used as the core of the electromagnet in an electric bell?**

**Solution:**

The soft iron bar acquires the magnetic properties only when an electric current flows through the solenoid and as the current is switched off, it loses the magnetic properties. For this reason the soft iron is used as the core of the electromagnet in an electric bell.

**Question: 30**

**How is the working of an electric bell affected, if alternating current be used instead of direct current?**

**Solution:**

If an a.c. source is used in place of the battery, the core of electromagnet will get magnetised, but the polarity at its ends will change. Since attraction of armature does not depend on the polarity of the electromagnet, so the bell will still ring on pressing the switch.

**MULTIPLE CHOICE TYPE**

**Question: 1**

**The presence of magnetic field at a point can be detected by:**

- (a) A strong magnet
- (b) A solenoid
- (c) A compass needle
- (d) A current carrying wire

**Solution:**

The presence of magnetic field at a point can be detected by a compass needle

**Question: 2**

**On reversing the direction of current in a wire, the magnetic field produced by it:**

- (a) Gets reversed in direction
- (b) Increases in strength
- (c) Decreases in strength
- (d) Remains unchanged in strength and direction

**Solution:**

On reversing the direction of current in a wire, the magnetic field produced by it gets reversed in direction



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