Chapter 10

Magnetism

Class 9 - Concise Physics Selina Solutions

Exercise 10(A) — Multiple Choice Type

Question 1

The .... magnetism acquired by a magnetic material when it is kept near a magnet is called .... magnetism.

1. temporary, induced
2. permanent, induced
3. temporary, permanent
4. None of the above

Answer

temporary, induced

Reason — Due to magnetic induction, a piece of magnetic material acquires the magnetic properties temporarily in presence of another magnet near it.

Question 2

A magnetic pole induces .... polarity on the near end and a .... polarity on the farther end of the iron bar.

1. opposite, opposite
2. similar, similar
3. opposite, similar
4. similar, opposite

Answer

opposite, similar

Reason — A magnetic pole induces ***opposite*** polarity on the near end and a ***similar*** polarity on the farther end of the iron bar.

Question 3

Out of the following, the incorrect statement(s) is/are :

(i) Magnetic field lines are open and continuous curves.

(ii) Outside the magnet, magnetic field lines are directed from the south pole to the north pole of the magnet.

1. (i)
2. (ii)
3. both (i) and (ii)
4. none of the above

Answer

both (i) and (ii)

Reason — The correct statements are :

1. They are closed and continuous curves.
2. Outside the magnet, they are directed from the north pole towards the south pole of the magnet.

Question 4

An iron rod buried inside the earth along .... direction becomes a magnet.

1. east-west
2. equatorial
3. north-south
4. any direction

Answer

north-south

Reason — The Earth itself acts as a giant magnet. When the iron rod is aligned in the same direction as the Earth's magnetic field lines (i.e., north-south direction), it gets magnetised due to magnetic induction.

Question 5

The sum of all magnetic fields adds up to zero at the :

1. north pole
2. south pole
3. equator

4. neutral points

Answer

neutral points

Reason — At each neutral points, the resultant magnetic field is zero.

Question 6

The magnetic field lines in a non-uniform magnetic field are :

1. either converging or diverging
2. parallel and equispaced
3. only converging
4. only diverging

Answer

either converging or diverging

Reason — The magnetic field around a bar magnet (or horse shoe magnet) is non-uniform. The magnetic field lines in a non-uniform magnetic field are not equispaced and parallel, but they are curved (either converging or diverging).

Question 7

The magnetic field lines of the earth are .... to the earth's surface near the magnetic poles and .... to the earth's surface near the magnetic equator.

1. parallel, normal
2. normal, parallel
3. normal, normal
4. parallel, parallel

Answer

normal, parallel

Reason — The magnetic field lines of the earth are ***normal*** to the earth's surface near the magnetic poles and ***parallel*** to the earth's surface near the magnetic equator.

Question 8

The direction of a magnetic field at a point on a magnetic field line is given by :

1. a tangent at that point
2. a normal bisector at that point
3. both tangent and normal bisector at that point
4. none of the above

Answer

a tangent at that point

Reason — A magnetic field line is a continuous curve in magnetic field such that tangent at any point of the curve gives the direction of the magnetic field at that point.

Question 9

A soft iron bar is tied by a thread in the middle and is suspended from a rigid support such that it is free to rotate in a horizontal plane. It shall come to rest :

1. along north-south direction
2. along east-west direction
3. equally inclined to N-S and E-W direction
4. in any direction

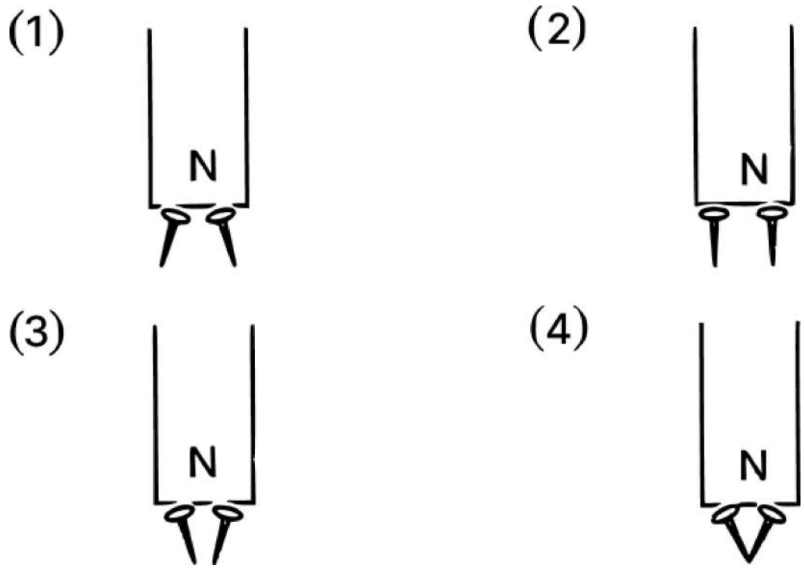
Answer

in any direction

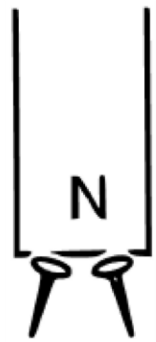
Reason — As the soft iron bar is not magnetised, hence it will not align itself with the Earth's magnetic field and will come to rest in any direction.

Question 10

The figure given below shows two iron nails attached to the end of a magnet. Choose the correct figure:



Answer



Reason — The lower ends of both the iron nails will repel each other since they have same polarities (north pole in this case).

Question 11

A freely suspended bar magnet is taken to the north pole of the earth. It comes to rest :

1. in any direction
2. parallel to the earth's surface
3. nearly vertical with the south pole in a downward direction

4. nearly vertical with the north pole in a downward direction.

Answer

nearly vertical with the south pole in a downward direction

Reason — A freely suspended bar magnet is taken to the north pole of the earth. It comes to rest nearly vertical with the south pole in a downward direction.

Question 12

Which of the following is not a correct statement for a magnet placed in the earth's magnetic field ?

1. Neutral points are always at an equal distance from the magnet.
2. The position of neutral points depends on the direction of the magnet in the earth’s magnetic field.
3. The position of neutral points does not depend on the direction of the magnet.
4. The magnetic field strength is zero at the neutral points.

Answer

The position of neutral points does not depend on the direction of the magnet.

Reason — As neutral points are the points at which two magnetic fields are equal in magnitude but opposite in direction, hence, the position of neutral points depends on the direction of the magnet. Therefore, the statement "The position of neutral points does not depend on the direction of the magnet" is incorrect.

Exercise 10(A) — Very Short Answer Type

Question 1

Fill in the blanks to complete the sentences:

(a) Two ends of a magnet are called ....

(b) Unlike poles of a magnet .... each other.

(c) Like poles of a magnet .... each other.

(d) A freely suspended magnet rests in the geographic .... direction.

Answer

(a) Two ends of a magnet are called ***poles***.

(b) Unlike poles of a magnet ***attract*** each other.

(c) Like poles of a magnet ***repel*** each other.

(d) A freely suspended magnet rests in the geographic ***north-south*** direction.

Question 2

Complete the following sentences:

(a) If the field lines in a magnetic field are parallel and equidistant, the magnetic field is ....

(b) At a neutral point, the resultant magnetic field is ....

(c) The neutral points of a bar magnet kept with it's north pole pointing towards geographic north are located ....

Answer

(a) If the field lines in a magnetic field are parallel and equidistant, the magnetic field is ***uniform***.

(b) At a neutral point, the resultant magnetic field is ***zero***.

(c) The neutral points of a bar magnet kept with it's north pole pointing towards geographic north are located ***on either side of the magnet in east and west directions***.

Question 3

Where is the magnetic south pole of the earth located?

Answer

The magnetic south pole of the earth is in Canada at a distance nearly 2240 km from the geographic north pole at 70.75° north latitude and 96° west longitude.

Question 4

What kind of magnetic field is represented by parallel and equidistant lines ?

Answer

Uniform Magnetic Field.

Question 5

What is the angle between the magnetic axis of the earth and the axis of rotation of the earth ?

Answer

The magnetic axis of the earth makes an angle of **17°** with the axis of rotation of the earth.

Exercise 10(A) — Short Answer Type

Question 1

What is a lodestone?

Answer

Lodestone is the first known pieces of magnets, an ore of iron oxide (Fe_3O_4) found in large quantities in Magnesia, in Asia Minor.

Question 2

What is a natural magnet? State two limitations of a natural magnet?

Answer

The pieces of lodestone found in nature were called natural magnets.

The limitations of a natural magnet are —

1. They are found in quite irregular and odd shapes.
2. They are not magnetically strong enough for use.

Question 3

What is an artificial magnet? State two reasons why do we need artificial magnets?

Answer

Artificial magnets are prepared from iron in different convenient shapes and sizes.

Examples of artificial magnets are bar magnet, horse shoe magnet, magnetic needle and magnetic compass.

We need artificial magnets because —

1. Natural magnets are of irregular and odd shapes.
2. Natural magnets are not magnetically strong enough for use.

Question 4

How will you test whether a given rod is made of iron or copper?

[Hint: Iron rod gets magnetized when placed near a bar magnet by magnetic induction, while copper rod does not get magnetized]

Answer

To test whether a given rod is made of iron or copper, we should bring it near (or in contact with) a magnet, if the rod is of iron, then it will become a magnet i.e., it will acquire the property of attracting iron fillings when they are brought near it's ends.

This happens because iron rod gets magnetized when placed near a bar magnet by magnetic induction, while copper rod does not get magnetized. This way, we can detect which rod is iron and which is copper.

Question 5

Explain the term induced magnetism.

Answer

The temporary magnetism acquired by a magnetic material when it is placed near (or in contact with) a magnet, is called induced magnetism.

Question 6(a)

Explain the following:

When two pins are hung by their heads from the same pole of a magnet, their pointed ends move apart.

Answer

When two pins are hung by their heads from the same pole of a magnet, their pointed ends move apart because the iron nails by magnetic induction gets magnetized and develop same poles. As we know that like poles repel each other hence, the two pointed ends of the nails repel each other.

Question 6(b)

Explain the following:

Several soft iron pins can cling, one below the other, from the pole of a magnet.

Answer

Several soft iron pins can cling, one below the other, from the pole of a magnet because the bar magnet by induction magnetizes an iron nail which gets attracted to the magnet and clings to it. This magnetized nail magnetizes the other nail near it by magnetic induction and attracts it.

This process continues till force of attraction of magnet on first nail is sufficient to balance the total weight of all the nails in the chain below it.

Now holding the uppermost nail in position by fingers, and if the magnet is removed, we find that all nails fall down. The reason is that on removing the magnet, the uppermost nail loses it's magnetism, so all other nails also lose their magnetism, they get separated from each other and they all fall down due to the force of gravity.

This shows that the magnetism acquired by induction is purely temporary. It lasts so long as the magnet causing induction remains in it's vicinity.

Question 6(c)

Explain the following:

The north end of a freely suspended magnetic needle gets attracted towards a piece of soft iron placed a little distance away from the needle.

Answer

When the north end of a freely suspended magnetic needle is placed near a piece of soft iron, the nearer end of the piece acquires an opposite polarity by magnetic induction.

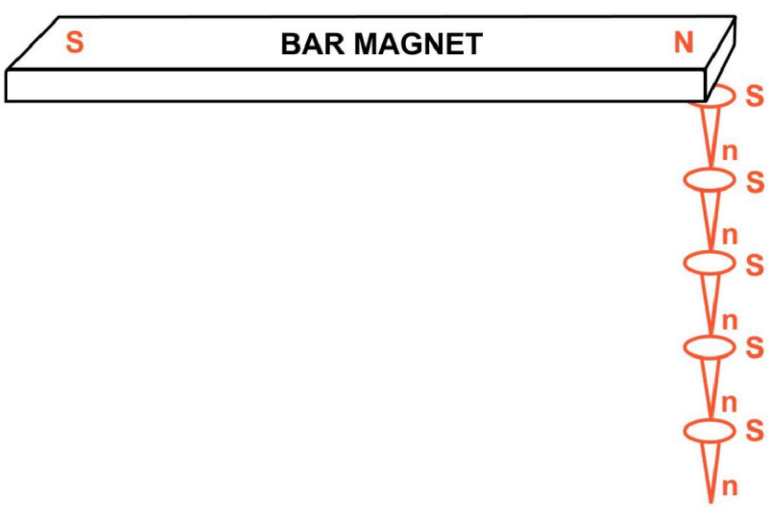
Since unlike poles attract each other, therefore the iron piece is attracted towards the end of the magnet. Thus, the piece of iron first becomes a magnet by induction and then it is attracted.

Question 7

'Induced magnetism is temporary'. Comment on this statement.

Answer

If one pole of a bar magnet is brought near small iron nails, they form a chain as shown in the figure below.



The magnetised nail is attracted to the magnet and clings to it. This magnetised nail, in turn, magnetises the neighbouring nail through induction and attracts it. This process continues until the force of attraction on the first nail balances the weight of all the nails in the chain below it. If the uppermost nail is held in position by fingers and the magnet is removed, all the nails fall down. This is because, without the magnet, the uppermost nail loses its magnetism. The nails no longer attract each other and separate, falling down due to gravity. This demonstrates that induced magnetism is temporary and lasts only as long as the magnet causing the induction is nearby.

Question 8

'Induction precedes attraction'. Explain the statement.

Answer

When a piece of iron is brought near one end of a magnet (or one end of a magnet is brought near the piece of iron), the nearer end of the piece acquires an opposite polarity by magnetic induction.

Since unlike poles attract each other, therefore the iron piece is attracted towards the end of the magnet. Thus, the piece of iron first becomes a magnet by induction and then it is attracted. In other words, **induction precedes attraction**.

Question 9

What do you understand by the term magnetic field lines?

Answer

A magnetic field line is a continuous curve in magnetic field such that tangent at any point of the curve gives the direction of the magnetic field at that point.

Question 10

State four properties of magnetic field lines.

Answer

The magnetic field lines have the following properties —

1. They are closed and continuous curves.
2. Outside the magnet, they are directed from the north pole towards the south pole of the magnet.
3. The tangent at any point on a field line gives the direction of magnetic field at that point.
4. They are crowded near the poles of the magnet where the magnetic field is strong and far away near the middle of

the magnet and far from the magnet where the magnetic field is weak.

Question 11

Explain why iron fillings which are sprinkled on a sheet of cardboard placed over a bar magnet, take up a definite pattern when cardboard is slightly tapped.

Answer

The iron fillings which are sprinkled on a sheet of cardboard placed over a bar magnet, take up a definite pattern when cardboard is slightly tapped because each piece of iron fillings gets magnetized by magnetic induction and experiences a force due to the magnet. Therefore, they arrange themselves along curved lines and these curved lines are called **magnetic field lines**.

Question 12

Can two magnetic field lines intersect each other? Give reason to your answer.

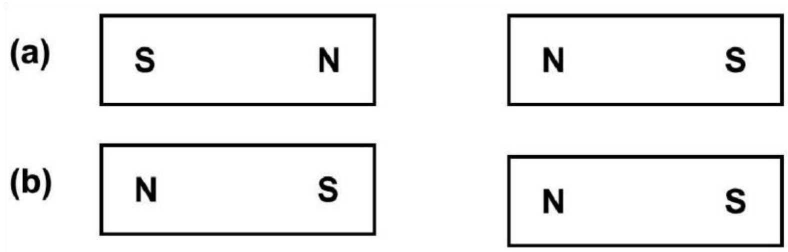
Answer

Two magnetic field lines **never intersect each other**.

If they would intersect, this would mean that there are two directions of the field at the specific point which is not possible.

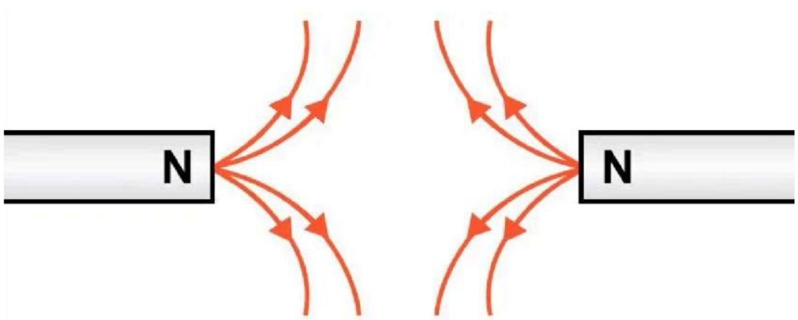
Question 13

In figure below, draw at least two magnetic field lines between the two magnets.

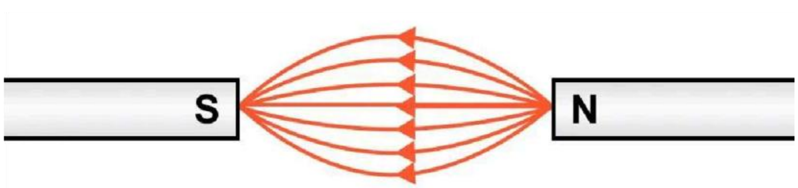


Answer

(a) As the north pole of both the magnets are facing each other so they will repel. The magnetic field lines between the two magnets are shown below:



(b) As opposite poles of both the magnets are facing each other so they will attract. The magnetic field lines between the two magnets are shown below:



Question 14

State two evidences of the existence of earth's magnetic field.

Answer

The evidences of the existence of earth's magnetic field are —

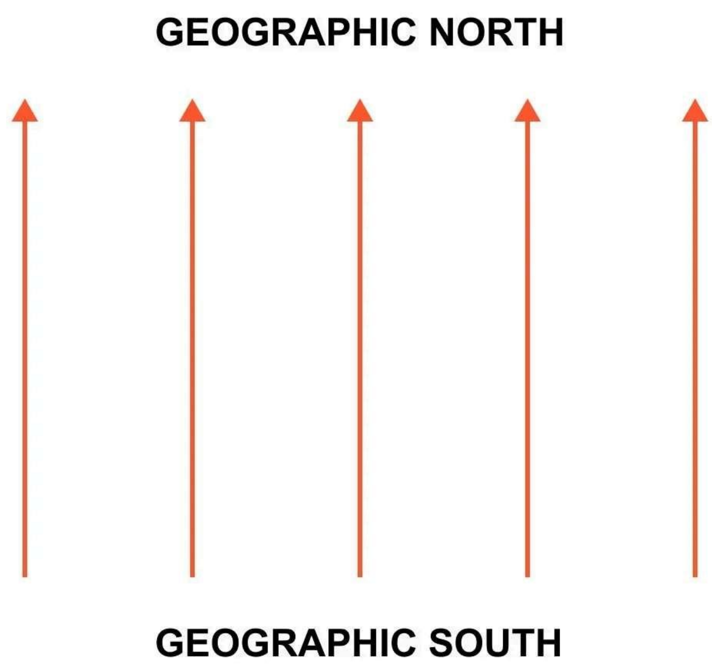
1. A freely suspended magnetic needle always rests in geographic north-south direction.
2. An iron rod buried inside the earth along north-south direction becomes a magnet.

Question 15

Sketch four magnetic field lines as obtained in a limited space on a horizontal plane in the earth's magnetic field alone.

Answer

Magnetic field lines as obtained in a limited space on a horizontal plane in the earth's magnetic field alone are shown below:


GEOGRAPHIC NORTH
GEOGRAPHIC SOUTH

Question 16

What conclusion is drawn regarding the magnetic field at a point if a compass needle at that point rests in any direction? Give reason for your answer.

Answer

If a compass needle at a point rests in any direction then we can say that the magnitude of the magnetic field at that particular point is zero.

The reason for this is that the earth's magnetic field at that point is neutralized by the magnetic field of some other magnetized material.

Question 17

What is a neutral point? How is the position of a neutral point located with the use of a compass needle?

Answer

Neutral points are the points at which two magnetic fields are equal in magnitude, but opposite in direction. The net magnetic field at a neutral point is zero.

A compass needle if placed at the neutral point, will rest in any direction. Hence, we can find the position of neutral points with the help of compass needle.

Question 18

State the positions of neutral points when a magnet is placed with it's axis in the magnetic meridian and with it's north pole (i) pointing towards the geographic north, (ii) pointing towards the geographic south.

Answer

(i) When a magnet is placed with it's axis in the magnetic meridian and with it's north pole pointing towards the geographic north then the neutral point will be in **east-west direction.**

(ii) When a magnet is placed with it's axis in the magnetic meridian and with it's north pole pointing towards the geographic south then the neutral point will be in **north-south direction.**

Exercise 10(A) — Long Answer Type

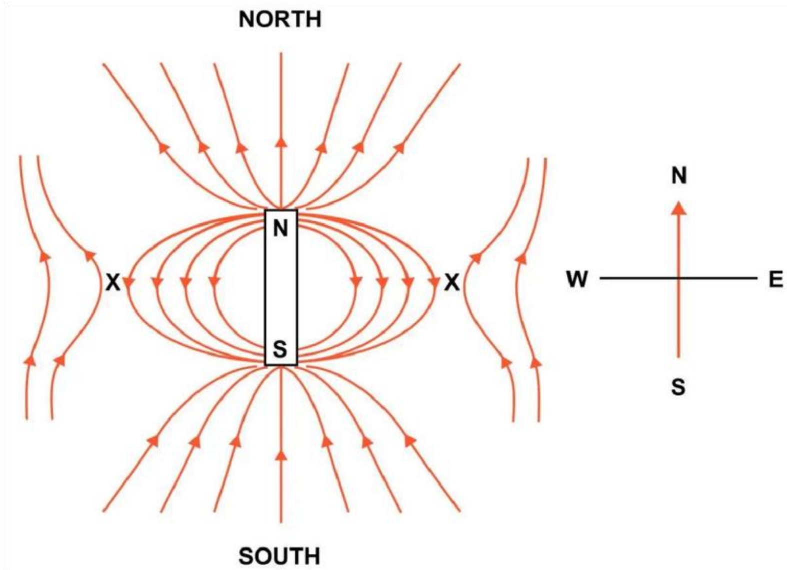
Question 1

(a) Draw the pattern of magnetic field lines near a bar magnet placed with it's north pole pointing towards the geographic north. Indicate the position of neutral points by marking x.

(b) State whether the magnetic field lines in part (a) represent a uniform magnetic field or non-uniform magnetic field?

Answer

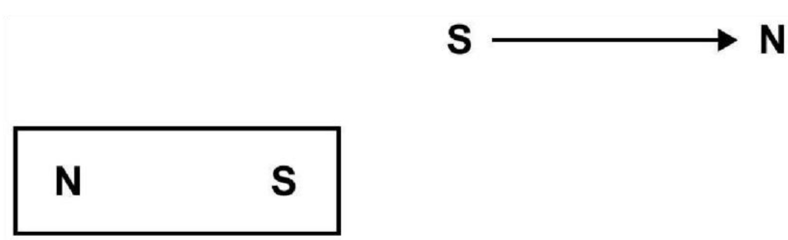
(a) Below diagram shows the magnetic field lines near a bar magnet placed with it's north pole pointing towards the geographic north. The position of neutral points is marked with x:



(b) The magnetic field lines as shown in part (a) are **non-uniform**.

Question 2

Figure given below shows a bar magnet placed on the table top with it's north pole pointing towards south. The arrow shows the north-south direction. There are no other magnets or magnetic material nearby.



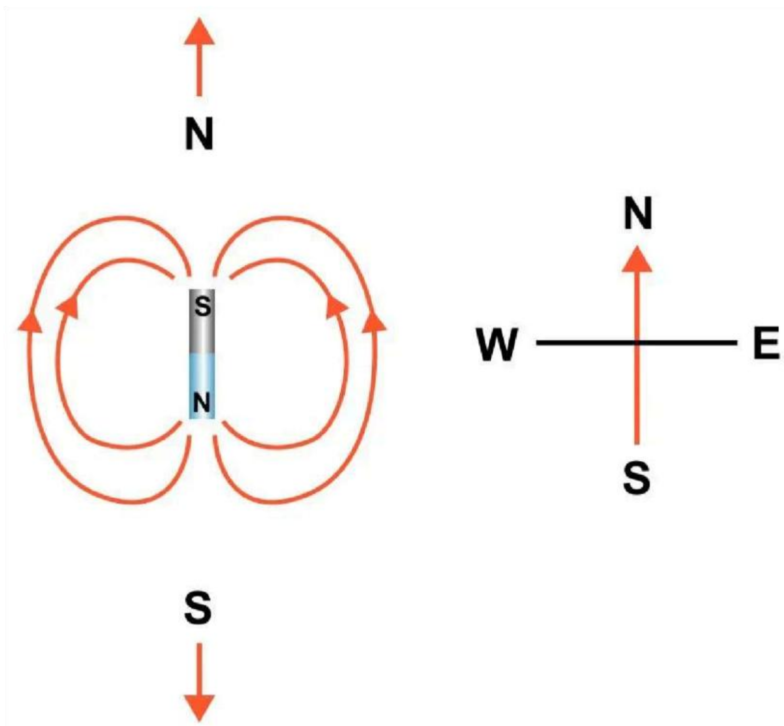
(a) Insert two magnetic field lines on either side of the magnet using arrow head to show the direction of each field line.

(b) Indicate by crosses, the likely positions of the neutral points.

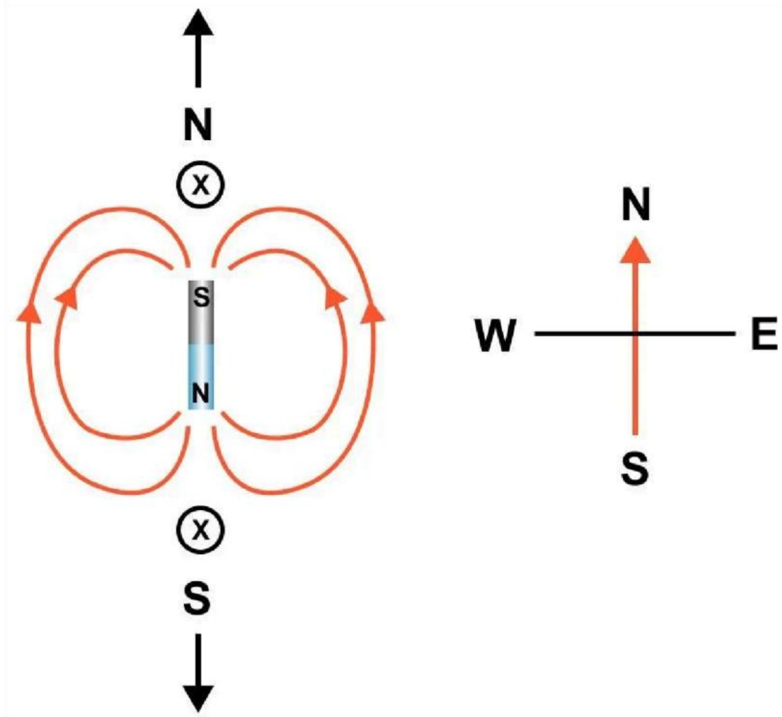
(c) What is the magnitude of the magnetic field at each neutral point? Give a reason for your answer.

Answer

(a) The magnetic field lines for the magnet are as shown below:



(b) The likely position of the neutral points is indicated by crosses in the diagram below:



(c) The magnitude of magnetic field at each neutral point is zero because at these points the magnetic field of the magnet and the magnitude of the earth's horizontal magnetic field are equal in magnitude but in opposite directions such that the two fields neutralize each other.

Question 3

You are provided with two similar bars, one is a magnet and the other is a soft iron bar. How will you distinguish between them without the use of any other magnet or bar?

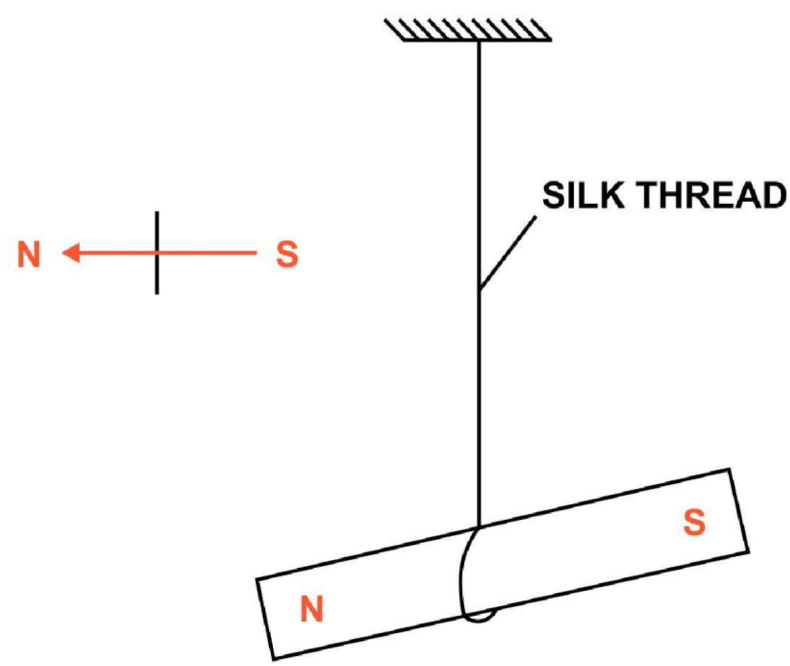
[Hint: A magnet when suspended freely will rest only in north-south direction, but soft iron bar will rest in any direction]

Answer

i

If we suspend the g ven bars with a silk thread such that it is free to rotate in a horizontal plane, then we will observe that one bar always sets itself in geographical north south direction as shown in the picture given below, while the other bar sets itself in any direction.

This happens because a magnet when suspended freely will rest only in north-south direction, but soft iron bar will rest in any direction. Hence, by suspending the two given bars freely and observing the position in which they rest we can distinguish between a magnet and a soft iron bar.



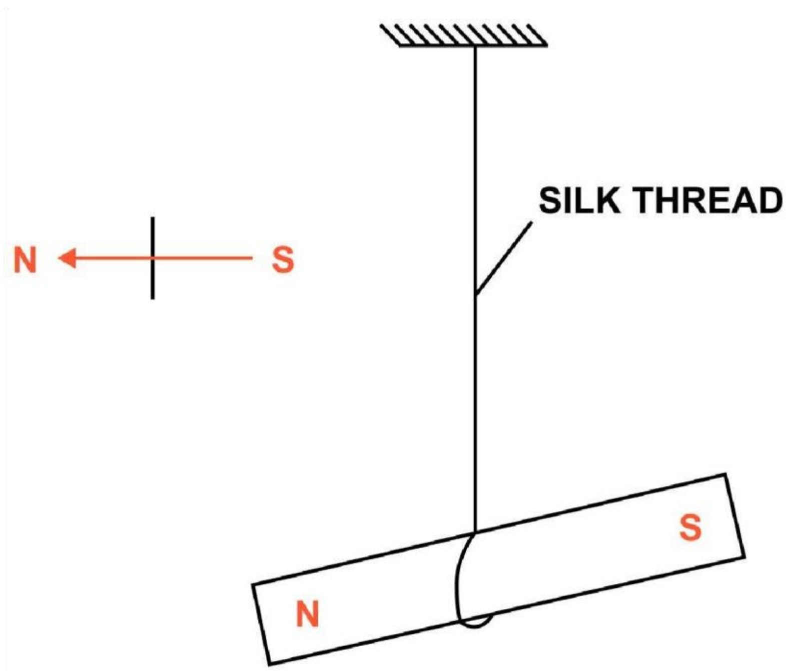
i

Question 4

A small magnet is suspended by a silk thread from a rigid support such that the magnet can freely swing. How w ll it rest? Draw a diagram to show it.

Answer

When a magnet is suspended with a silk thread such that it is free to rotate in a horizontal plane, it will rest in the geographical north-south direction with north pole towards the geographic north, making some angle with the horizontal.



i

Question 5

Explain what do you understand by magnetic induction. What role does it play in attraction of a piece of iron by a magnet?

Answer

i

The **process in wh ch a piece of magnetic material acquires the magnetic properties temporarily in presence of another magnet near it is called magnetic induction**.

Induction precedes attraction — When a piece of iron is brought near one end of a magnet (or one end of a magnet is brought near the piece of iron), the nearer end of the piece acquires an opposite polarity by magnetic induction.

Since unlike poles attract each other, therefore the iron piece is attracted towards the end of the magnet. Thus, the piece of iron first becomes a magnet by induction and then it is attracted. In other words, **induction precedes attraction**.

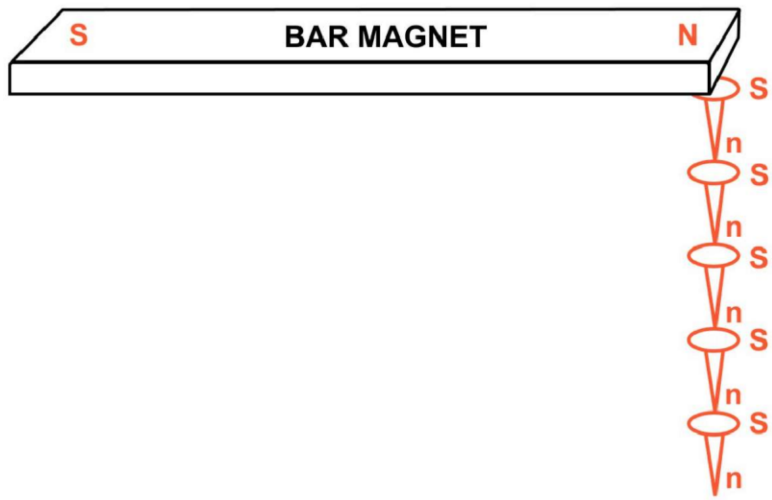
Question 6

Explain the mechanism of attraction of iron nails by a magnet when brought near them.

Answer

If one pole of a bar magnet is brought near small iron nails, they form a chain of nails as shown below, because the bar magnet by induction magnetizes an iron nail which gets attracted to the magnet and clings to it. This magnetized nail magnetizes the other nail near it by magnetic induction and attracts it.

This process continues till force of attraction of magnet on first nail is sufficient to balance the total weight of all the nails in the chain below it.



Now holding the uppermost nail in position by fingers, and if the magnet is removed, we find that all nails fall down. The reason is that on removing the magnet, the uppermost nail loses it's magnetism, so all other nails also lose their magnetism, they get separated from each other and they all fall down due to the force of gravity.

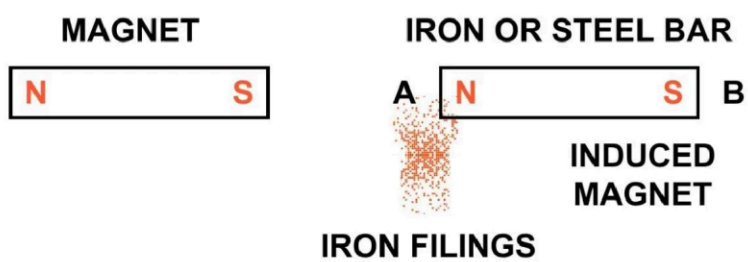
This shows that the magnetism acquired by induction is purely temporary. It lasts so long as the magnet causing induction remains in it's vicinity.

Question 7

A small iron bar is kept near the north pole of a bar magnet. How does the iron bar acquire magnetism? Draw a diagram to show the polarity on the iron bar. What will happen if the magnet is removed?

Answer

When a small iron bar is kept near the north pole of a bar magnet as shown below, the bar becomes a magnet due to magnetic induction i.e., it acquires the property of attracting iron fillings when they are brought near it's ends.



Polarity developed at the end A of the bar AB is north (opposite to the polarity of the magnet near end A) and the polarity at end B is south (i.e. similar to the polarity at the end of the magnet near end A).

If the magnet is now removed, the bar will lose it's magnetism.

Thus, the bar of a magnetic material behaves like a magnet so long it is kept near or in contact with a magnet.

The magnetism so produced is called **induced magnetism**.

Question 8

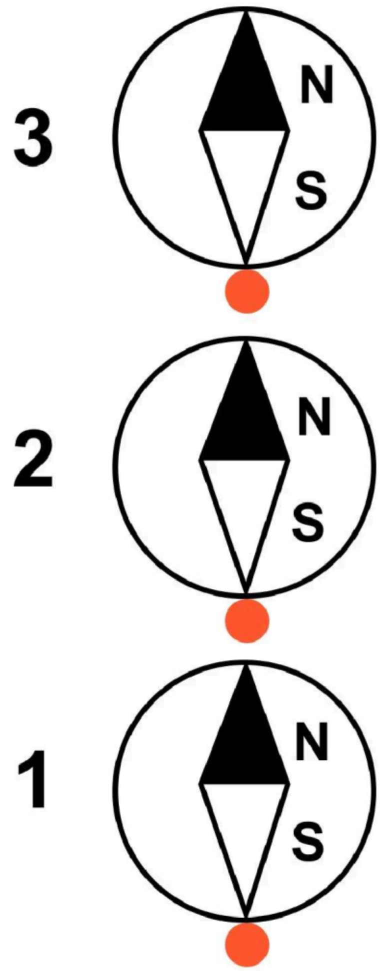
Explain the method of plotting magnetic field lines by using a small compass needle.

Answer

Earth's magnetic field is uniform in a limited space. Experimentally we can plot uniform magnetic field lines of the earth as follows —

Experiment — Fix a sheet of paper on a drawing board (or a table top) by means of brass pins. Place a small compass needle at position 1 (as shown in fig.) and looking from top of the needle, mark two pencil dots exactly in front of the two ends of the needle. Then move the compass needle to position 2 in such a way that one end of the needle coincides with the second pencil dot.

Mark the position of the other end of the needle with a dot. Repeat the process of moving the compass needle to position 3,4,.. to obtain several dots. On joining the different dots, you will get a straight line. Thus, one magnetic field line of the earth is traced.



Repeat the process starting from a different point and trace out another magnetic field line. In this manner, draw several magnetic field lines starting from different points. Label each line with an arrow from the south pole of needle towards the north pole to indicate the direction of the magnetic field. Fig. above shows several magnetic field lines so obtained.

It is noticed that these lines do not intersect each other. They are parallel and equidistant. They are directed from geographic south to geographic north (i.e., the direction in which a magnetic needle, suspended freely in a horizontal plane rests).

Exercise 10(B) — Multiple Choice Type

Question 1(i)

As electromagnet is a temporary strong magnet made from :

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

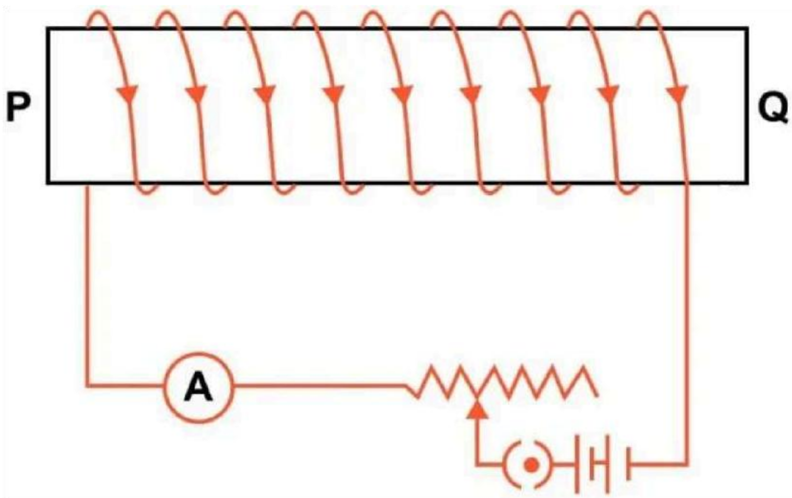
Answer

soft iron

Reason — An electromagnet is a temporary strong magnet made from a piece of soft iron when current flows in the coil wound around it. It is an artificial magnet.

Question 1(ii)

Look at the figure and answer the following questions:



(A) The end P becomes:

1. south pole
2. north pole
3. cannot say
4. none of the above

(B) The end Q becomes:

1. south pole
2. north pole
3. cannot say
4. none of the above

(C) The given bar shows magnetic properties only when .... through the solenoid and it loses the magnetic properties as soon as the ....

1. current is switched off, current is switched on
2. current is switched on, current is switched off

t

e

3. curren is switched on, current is switched on
4. both (a) and (b)

Answer

(A) south pole

(B) north pole

(C) current is switched on, current is switched off

Reason —

(A) When current is passed through the winding of the solenoid by closing the key K, the end P of the bar becomes the south pole, since current at this face is clockwise.

(B) When current is passed through the winding of the solenoid by closing the key K, the end Q of the bar becomes the north pole, since current at this face is anticlockwise.

(C) The bar shows magnetic properties only when an electric current flows through the solenoid and it loses the magnetic properties as soon as the current is switched off (since soft iron has low retentivity), thus it is a temporary magnet.

Question 1(iii)

t

e

The magne ic field of an electromagnet can be increased by .... in the solenoid and by ....through the solenoid.

1. increasing the number of turns, decreasing the current.
2. decreasing the number of turns, increasing the current.
3. decreasing the number of turns, decreasing the current.
4. increasing the number of turns, increasing the current.

Answer

increasing the number of turns, increasing the current

Reason — The strength of a magnet can be increased by —

1. Increasing the number of turns of windings in the solenoid.
2. Increasing the current through the solenoid.

Question 1(iv)

Which of the following statements are correct ?

(A) An electromagnet produces a permanent magnetic field.

t

e

(B) An elec romagnet can produce a strong magnetic field.

(C) The polarity of electromagnet can be reversed by reversing the direction of current in the solenoid.

1. all of the above
2. (A) and (B)
3. (B) and (C)
4. (A) and (C)

Answer

(B) and (C)

Reason — The correct statements for an electromagnet are :

1. An electromagnet can produce a strong magnetic field.
2. The polarity of electromagnet can be reversed by reversing the direction of current in the solenoid.

Question 1(v)

A soft iron piece is in the form of a closed ring (no free ends). A wire is wound over it to make it an electromagnet. What happens when current is passed in the wire ?

1. It does not get magnetised.
2. It gets temporarily magnetised.

3. It becomes magnetised.
4. It can be magnetised if broken into two parts.

Answer

It becomes magnetised

Reason — When the current flows through the soft iron piece in the form of a closed ring, it becomes magnetised. The north and south poles will be present on opposite sides of the ring.

Question 1(vi)

Which of the following devices does not use an electromagnet ?

1. Magnetic compass
2. Electric fan
3. Relay
4. Microphone

Answer

Magnetic compass

Reason — A permanent magnet is used to make a magnetic compass.

Question 1(vii)

The magnetic polarity at the two ends of a horse-shoe magnet depends on :

1. the strength of current in the coil
2. the number of turns in the coil
3. the material on which the coil is wound
4. the direction of current at the ends of the magnet.

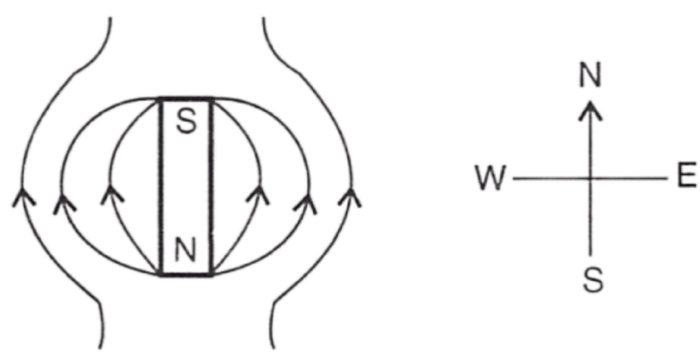
Answer

the direction of current at the ends of the magnet.

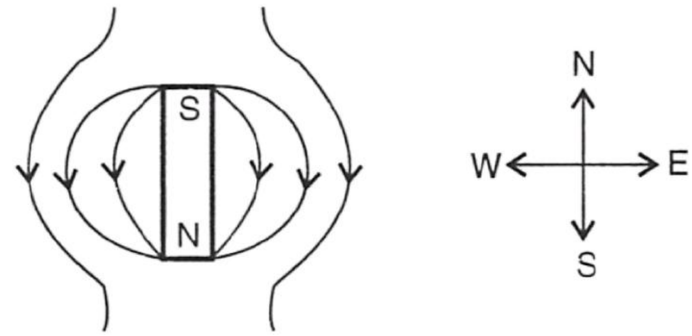
Reason — The magnetic polarity at the two ends of a horse-shoe magnet depends on the direction of current at the ends of the magnet.

Question 1(viii)

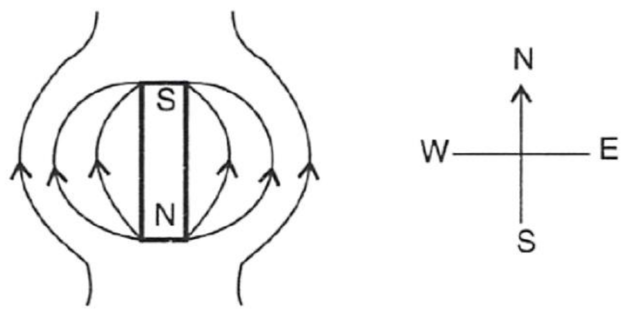
The figure depicting the correct magnetic field lines when the magnet is placed with its south pole pointing towards north is :

1. 

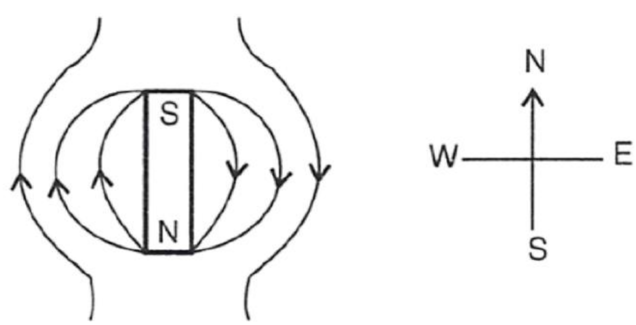
2.



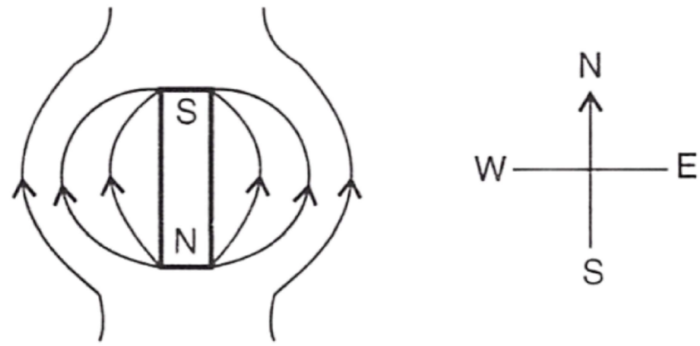
3.



4.



Answer



option 1

Reason —

Options (1) and (3) are correct : Here field lines go from north to south direction outside the magnet which matches the physical rule of magnetic field direction i.e., magnetic field lines originates from north pole and terminate at south pole outside the magnet.

Option (2) is incorrect : As field lines are going from S to N outside the magnet which is opposite of correct magnetic field line direction.

Option (4) is incorrect : Some field lines are coming from north to south while some are going from south to north forming a closed loop outside the magent but magnetic field lines always move from north to south direction outside the magnet.

Exercise 10(B) — Assertion Reason Type

Question 2(i)

Assertion (A) : Two bar magnets attract when they are brought near to each other with the same pole.

Reason (R) : Unlike poles attract each other.

1. both A and R are true and R is the correct explanation of A
2. both A and R are true and R is not the correct explanation of A
3. assertion is false but reason is true
4. assertion is true but reason is false

Answer

assertion is false but reason is true

Explanation

Assertion (A) is false because like poles (e.g., north-north or south-south) repel each other and only unlike poles (north-south) attract so two bar magnets will always repel each other when brought near with the same pole.

Reason (R) is true because it is a correct observed behavior of magnets where only unlike poles (N-S) attract each other while similar poles like N-N or S-S repel each other.

Question 2(ii)

Assertion (A) : Strength of an electromagnet can be increased by increasing the number of turns of winding on solenoid.

Reason (R) : Magnetic field strength is directly proportional to number of turns on the solenoid.

1. both A and R are true and R is the correct explanation of A
2. both A and R are true and R is not the correct explanation of A
3. assertion is false but reason is true
4. assertion is true but reason is false

Answer

both A and R are true and R is the correct explanation of A

Explanation

Assertion (A) is true because the strength of magnetic field of an electromagnet can be increased by the following two ways :

(i) by increasing the number of turns of winding in the solenoid, and

(ii) by increasing the current through the solenoid.

Reason (R) is true because on increasing the number of turns of winding in the solenoid, the magnetic field strength of an electromagnet also increases and vice versa and hence, reason correctly explains the assertion.

Question 2(iii)

Assertion (A) : Magnetic field lines never intersect each other.

Reason (R) : At a particular point, magnetic field has only one direction.

1. both A and R are true and R is the correct explanation of A
2. both A and R are true and R is not the correct explanation of A
3. assertion is false but reason is true
4. assertion is true but reason is false

Answer

both A and R are true and R is the correct explanation of A

Explanation

Assertion (A) is true because if magnetic field lines intersect each other then it would imply that there are two directions of the magnetic field at a single point, which is not possible.

Reason (R) is true because if magnetic field has more than one direction at any point, it would mean that if a compass needle is placed at that point in the magnetic field then north pole of its needle will point in multiple directions simultaneously which is not possible.

This is the correct reason why magnetic field lines do not intersect and hence, reason justifies the assertion.

Question 2(iv)

Assertion (A) : Neutral points are the points at which two magnetic fields are equal in magnitude and in the same direction.

Reason (R) : The net magnetic field at a neutral point is zero.

1. both A and R are true and R is the correct explanation of A
2. both A and R are true and R is not the correct explanation of A
3. assertion is false but reason is true
4. assertion is true but reason is false

Answer

assertion is false but reason is true

Explanation

Assertion (A) is false because neutral points are locations where the magnetic fields from two sources (e.g., a bar magnet and Earth's field) are equal in magnitude but opposite in direction, so they cancel out.

Reason (R) is true because that's the definition of a neutral point i.e., the point at which two magnetic fields are equal in magnitude, but opposite in direction so that net magnetic field is zero and a compass needle if placed at the neutral point then it will rest in any direction.

Exercise 10(B) — Very Short Answer Type

Question 1

Is an electromagnet used as a permanent magnet ?

Answer

No, electromagnet is not used as a permanent magnet. It is a temporary strong magnet.

Question 2

Name the material used for preparing an electromagnet.

Answer

The material used for preparing an electromagnet is a piece of **soft iron**.

Question 3

A coil of insulated copper wire is wound around a piece of soft iron and current is passed in the coil from a battery. What name is given to the device so obtained? Give one use of the device mentioned by you.

Answer

This device is called an **electromagnet.**

Electromagnets are used in electrical devices such as electric bell, electric motor, relay, microphone, etc.

Question 4

Name one device that uses an electromagnet.

Answer

An **electric bell** uses an electromagnet to function.

Question 5

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

Answer

The soft iron bar acquires the magnetic properties only when an electric current flows through the solenoid and loses the magnetic properties as soon as the current is switched off. That's why soft iron is used as the core of the electromagnet in an electric bell.

Exercise 10(B) — Short Answer Type

Question 1

What is an electromagnet?

Answer

An electromagnet is a **temporary strong magnet made from a piece of soft iron when current flows in the coil wound around it. It is an artificial magnet**.

Question 2

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

Answer

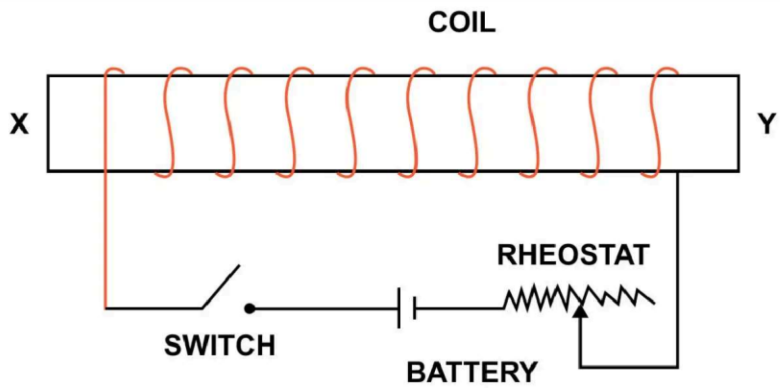
The strength of a magnet can be increased by —

1. Increasing the number of turns of windings in the solenoid.
2. Increasing the current through the solenoid.

Question 3

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 m

way of increasing the strength of the electromagnet so formed.



Answer

(a) The polarity at X — south pole and at Y — north pole.

(b) The strength of the electromagnet so formed can be increased by increasing the current in the coil.

Question 4

State two advantages of an electromagnet over a permanent magnet.

Answer

Advantages of an electromagnet over a permanent magnet are —

1. An electromagnet can produce a strong magnetic field.
2. The strength of the magnetic field of an electromagnet can easily be changed by

changing the current (or the nu ber of turns) in it's solenoid.

Question 5

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

Answer

If alternating current is used instead of direct current then the core of electromagnet will get magnetized, but the polarity at it's ends will change. Since attraction of armature does not depend on the polarity of electromagnet, so the bell will still ring on pressing the switch.

Question 6

Name the material used for making the armature of an electric bell. Give a reason for your answer.

Answer

Soft iron is used for making the armature of an electric bell because it acquires magnetic properties only when an electric current flows through the solenoid and loses the magnetic properties as soon as the current is switched off.

Exercise 10(B) — Long Answer Type

How is an electromagnet made? Name two factors on which the strength of the magnetic field of an electromagnet depends.

Answer

An electromagnet can be made in the following two shapes:

1. I-shape or bar magnet.
2. U-shape or horse-shoe magnet.

The principle behind making both the magnets is the same. An electromagnet can be made by winding an insulated copper wire over a piece of soft iron in U-shape or a solenoid.

The factors on which the strength of the magnetic field of an electromagnet depends are —

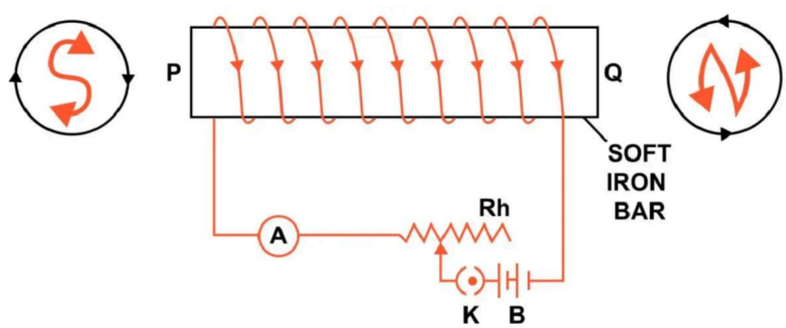
1. **The number of turns of wire wound around the coil** — By increasing the number of turns of wire wound around the coil, the magnetic field of an electromagnet can be increased.
2. **The amount of current flowing through the wire** — By increasing the current through the wire, the magnetic field of an electromagnet can be increased.

Question 2

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

Answer

The labelled circuit diagram for making an electromagnet from a soft iron bar is shown below:



Question 3

State two differences between an electromagnet and a permanent magnet.

Answer

The differences are as follows —

Electromagnet	Permanent magnet

m

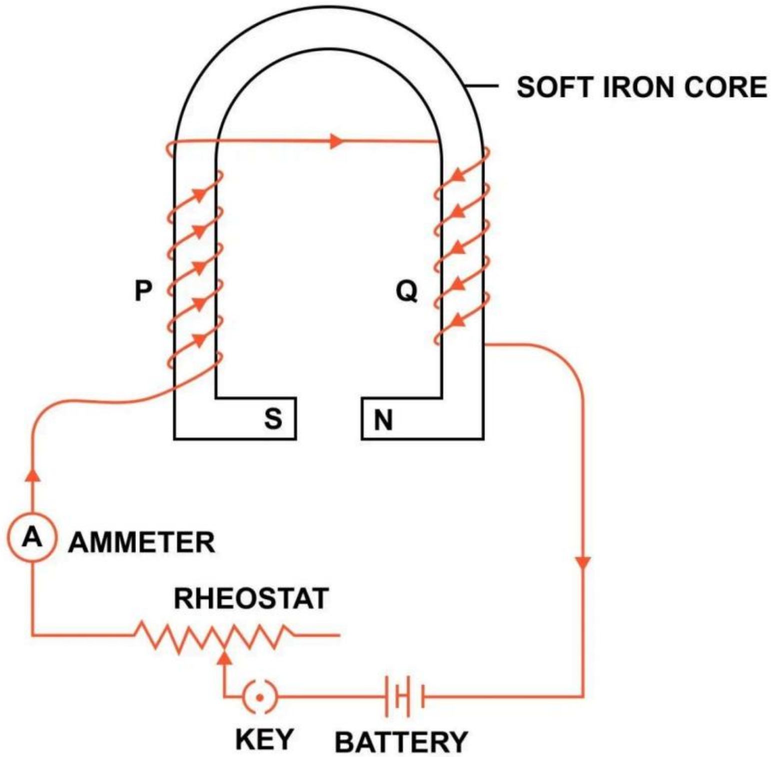
It is made of soft iron.	It is made of steel.
Electromagnet	**Permanent magnet**
It produces magnetic field so long as current flows in it's coil, i.e., it produces temporary magnetic field.	It produces a permanent magnetic field.

Question 4

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.

Answer

Below labelled circuit diagram shows an electromagnet made by winding a wire on a U-shaped piece of soft iron:



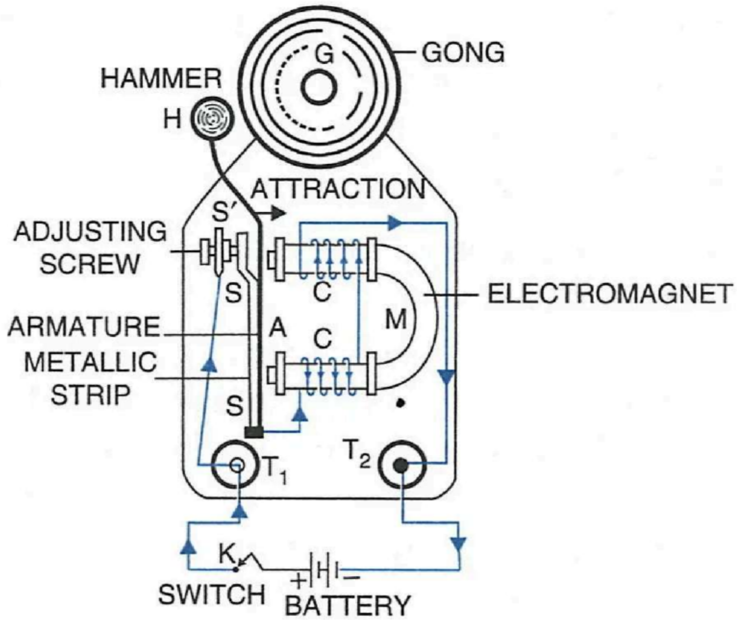
Question 5

Describe the construction and working of an electric bell with the help of a neat and labelled diagram.

Answer

Construction :

An electric bell is shown in below figure :



An electric bell consists of the following main parts:

(i) A **horse-shoe electromagnet (M)** with a soft iron core, wound with coils (CC) in opposite directions.

(ii) A **soft iron armature (A)** fixed to a **metallic spring strip (SS)**.

(iii) A **hammer (H)** attached to the armature.

(iv) A **gong (G)** struck by the hammer.

(v) An **adjusting screw (S')** to set the position of the armature.

(vi) A **switch or bell-push (K)**.

(vii) A **battery** connected across the terminals (**T_1** and **T_2**).

When the switch K is not pressed, the strip remains away from the electromagnet poles.

Working :

When the switch **K** is pressed, current flows through the coils (**CC**) and magnetises the electromagnet. This attracts the armature **A**, causing the hammer **H** to strike the gong **G**, producing sound.

As the armature moves, contact between the strip **SS** and the screw **S’** breaks, stopping the current. The electromagnet loses magnetism, and the spring strip pulls the armature back to its original position. Contact is re-established, current flows again, and the cycle repeats.

This **make and break** action continues rapidly, causing the hammer to strike the gong repeatedly while the switch is pressed.

Prev
← Current Electricity