NDA-CDS 1 2025

GS

LIVE

PHYSICS

MAGNETIC EFFECTS OF ELECTRIC CURRENT

MCQS

NAVJYOTI SIR

SSBCrack EXAMS

05 Feb 2025 Live Classes Schedule

9:00AM	05 FEBRUARY 2025 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:30AM	OVERVIEW OF GD & LECTURETTE	ANURADHA MA'AM

AFCAT 1 2025 LIVE CLASSES

3:00PM	STATIC GK - RAMSAR & LAKES IN INDIA	DIVYANSHU SIR
4:30PM	ENGLISH - IDIOMS & PHRASES - CLASS 2	ANURADHA MA'AM
5:30PM	MATHS - MENSURATION 2D - CLASS 1	NAVJYOTI SIR

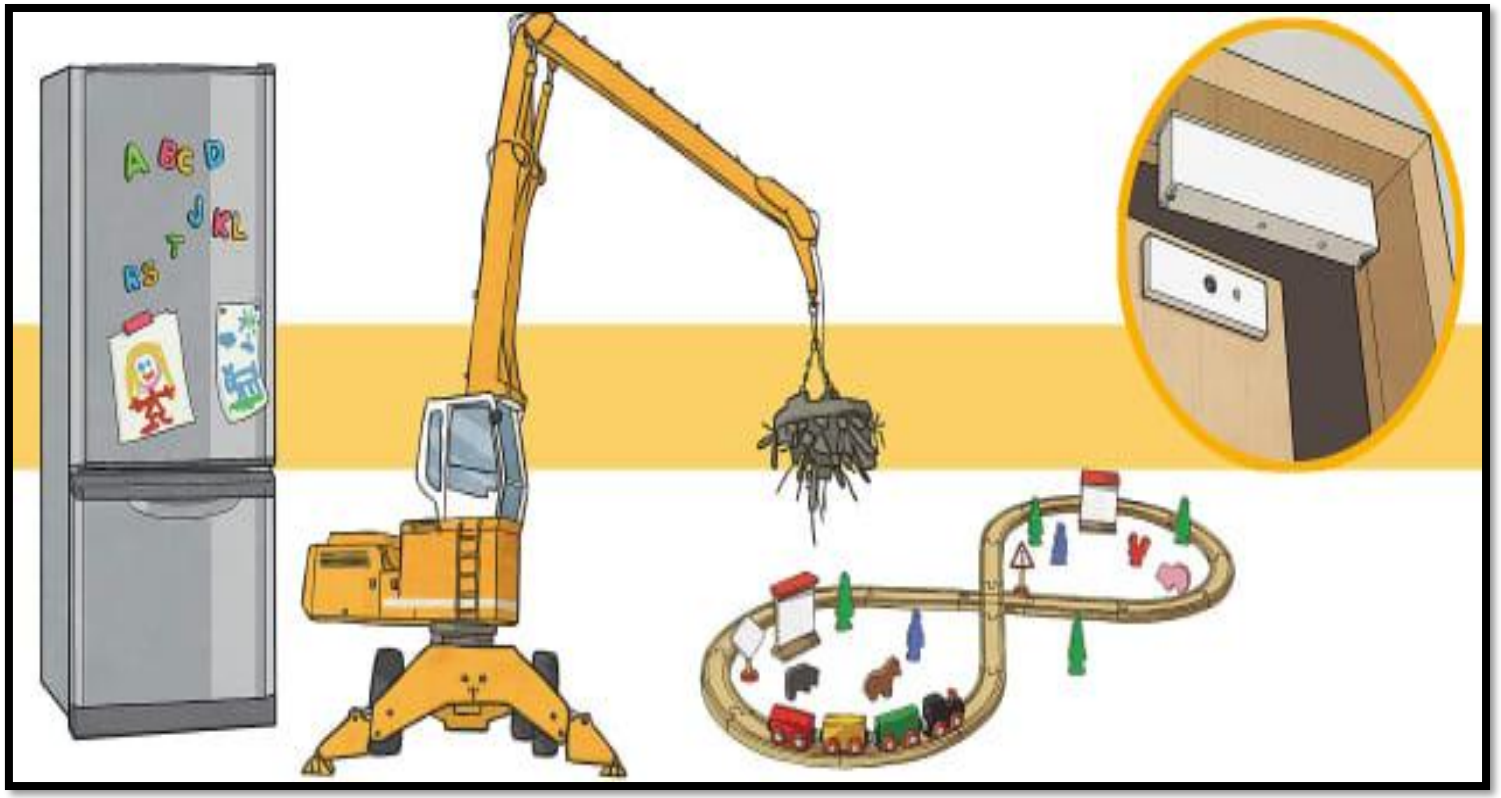
NDA 1 2025 LIVE CLASSES

10:00AM	MATHS - BINOMIAL THEOREM	NAVJYOTI SIR
1:00PM	PHYSICS - MAGNETIC EFFECTS OF ELECTRIC CURRENT	NAVJYOTI SIR
4:30PM	ENGLISH - IDIOMS & PHRASES - CLASS 2	ANURADHA MA'AM

CDS 1 2025 LIVE CLASSES

1:00PM	PHYSICS - MAGNETIC EFFECTS OF ELECTRIC CURRENT	NAVJYOTI SIR
4:30PM	ENGLISH - IDIOMS & PHRASES - CLASS 2	ANURADHA MA'AM
5:30PM	MATHS - MENSURATION 2D - CLASS 1	NAVJYOTI SIR

MAGNETISM - MCQs



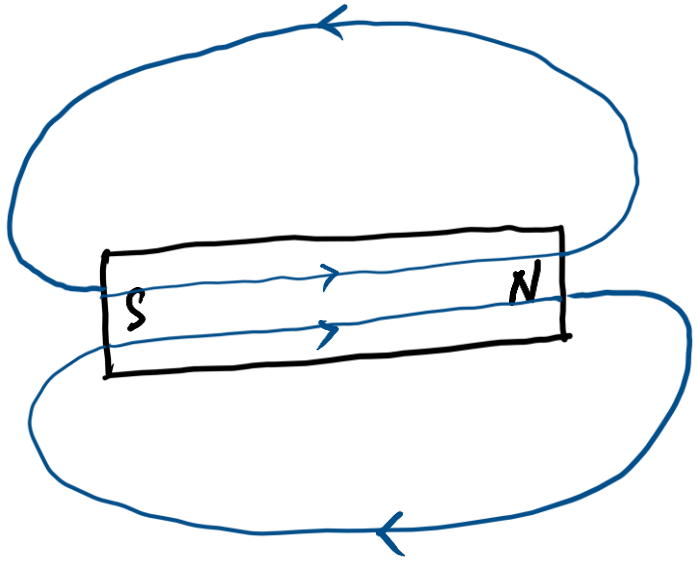
Which one of the following statements about magnetic field lines is NOT correct ?

(a) They can emanate from a point

(b) They do not cross each other

(c) Field lines between two poles cannot be precisely straight lines at the ends

(d) There are no field lines within a bar magnet



Magnetic field lines always form closed loops.

Which one of the following statements about magnetic field lines is NOT correct ?

(a) They can emanate from a point

(b) They do not cross each other

(c) Field lines between two poles cannot be precisely straight lines at the ends

(d) There are no field lines within a bar magnet

Answer: (D)

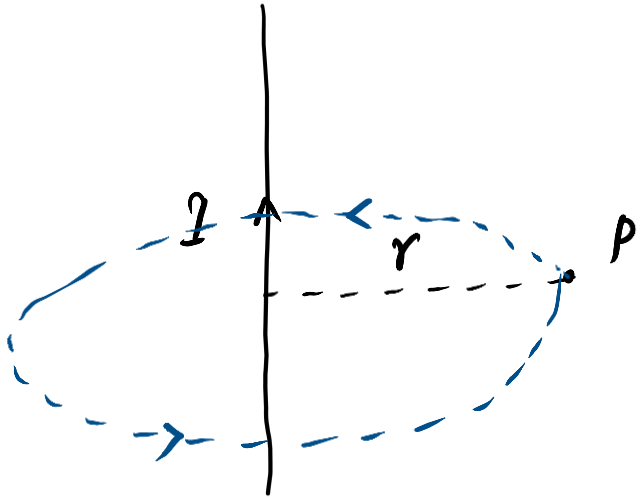
The magnetic field strength of a current-carrying wire at a particular distance from the axis of the wire

(a) depends upon the current in the wire

(b) depends upon the radius of the wire

(c) depends upon the temperature of the surroundings

(d) None of the above



$$B = \frac{\mu_0 I}{2\pi r}$$

I → current

r → distance from wire

The magnetic field strength of a current-carrying wire at a particular distance from the axis of the wire

(a) depends upon the current in the wire

(b) depends upon the radius of the wire

(c) depends upon the temperature of the surroundings

(d) None of the above

Answer: (A)

Consider the following statements about a solenoid :

1. The magnetic field strength in a solenoid depends upon the number of turns per unit length in the solenoid ✓
2. The magnetic field strength in a solenoid depends upon the current flowing in the wire of the solenoid ✓
3. The magnetic field strength in a solenoid depends upon the diameter of the solenoid ✗

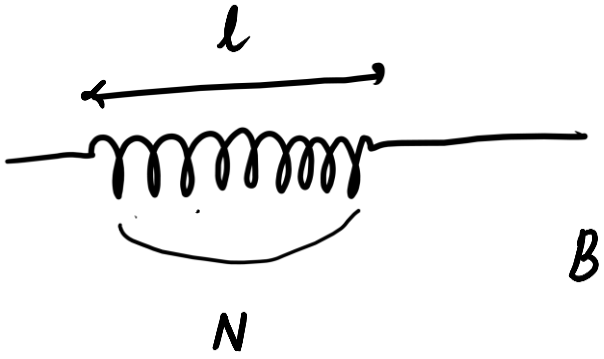
Which of the statements given above are correct ?

(a) 1, 2 and 3

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1 and 2 only ✓



$B = \mu_0 n I$ — I: current

n: number of turns per unit length

$n = \frac{N}{l}$

Consider the following statements about a solenoid :

1. The magnetic field strength in a solenoid depends upon the number of turns per unit length in the solenoid
2. The magnetic field strength in a solenoid depends upon the current flowing in the wire of the solenoid
3. The magnetic field strength in a solenoid depends upon the diameter of the solenoid

Which of the statements given above are correct ?

(a) 1, 2 and 3

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1 and 2 only

Answer: (D)

Which one of the following statements regarding magnetic field is NOT correct ?

(a) Magnetic field is a quantity that has direction and magnitude (vector quantity)

(b) Magnetic field lines are closed curves ✓

(c) Magnetic field lines are open curves ✗

(d) No two magnetic field lines are found to cross each other ✓

Which one of the following statements regarding magnetic field is NOT correct ?

(a) Magnetic field is a quantity that has direction and magnitude

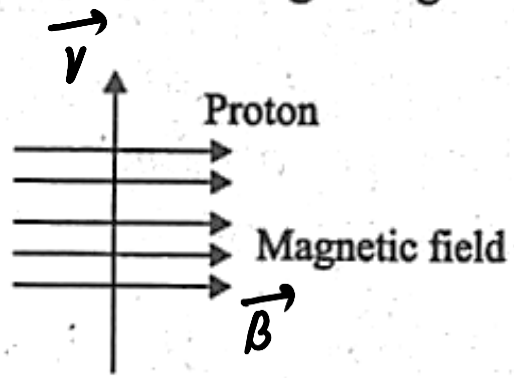
(b) Magnetic field lines are closed curves

(c) Magnetic field lines are open curves

(d) No two magnetic field lines are found to cross each other

Answer: (C)

Consider the following image :



A proton enters a magnetic field at right angles to it, as shown above. The direction of force acting on the proton will be

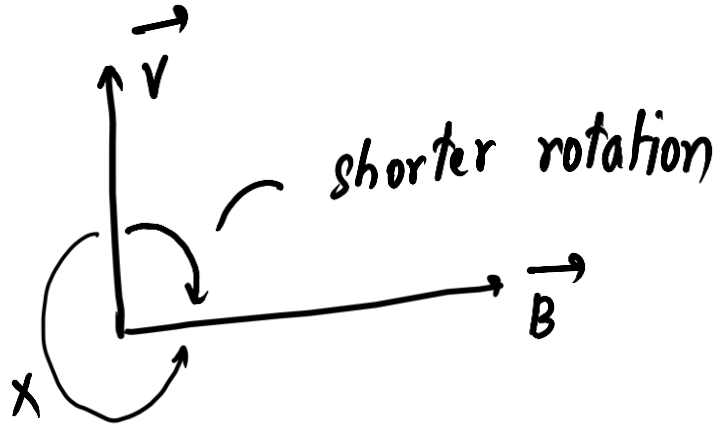
(a) to the right

(b) to the left

(c) out of the page

(d) into the page

$\vec{F} = q(\vec{v} \times \vec{B})$



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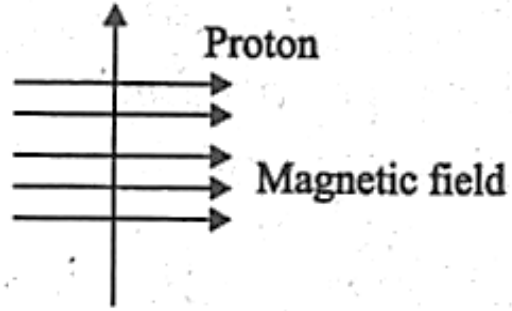


A proton enters a magnetic field at right angles to it, as shown above. The direction of force acting on the proton will be

(a) to the right

(b) to the left

(c) out of the page

(d) into the page

Answer: (D)

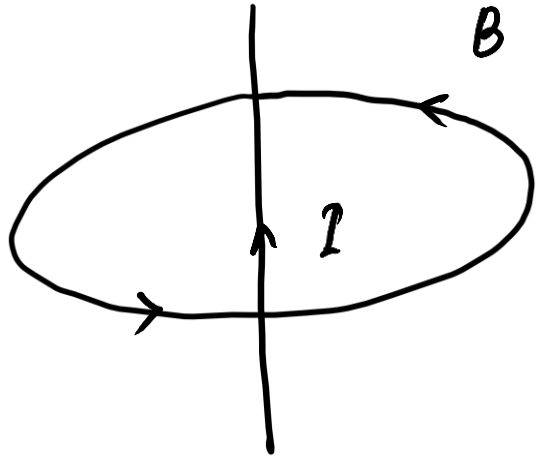
Imagine a current-carrying straight conductor with magnetic field of lines in anti-clockwise direction. Then the direction of current is determined by

(a) the Right-Hand Thumb rule and it would be in the downward direction.

(b) the Left-Hand Thumb rule and it would be in the downward direction.

(c) the Right-Hand Thumb rule and it would be in the upward direction. ✓

(d) the Left-Hand Thumb rule and it would be in the upward direction.



Right Hand Thumb Rule.

Imagine a current-carrying straight conductor with magnetic field of lines in anti-clockwise direction. Then the direction of current is determined by

(a) the Right-Hand Thumb rule and it would be in the downward direction.

(b) the Left-Hand Thumb rule and it would be in the downward direction.

(c) the Right-Hand Thumb rule and it would be in the upward direction.

(d) the Left-Hand Thumb rule and it would be in the upward direction.

Answer: (C)

The magnetic field produced by a current-carrying straight wire at a point outside the wire depends

(a) inversely on the distance from it ✓

(b) directly on the distance from it

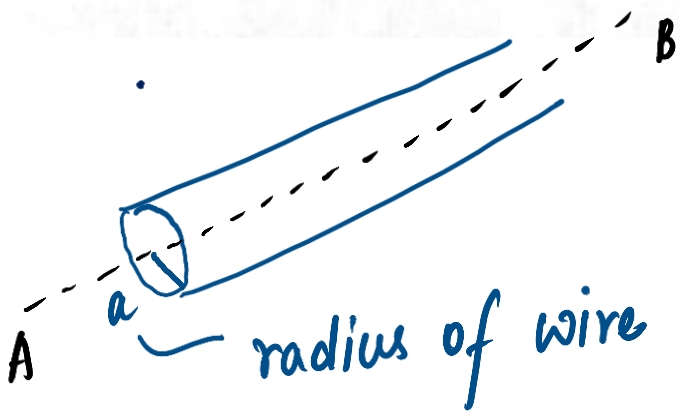
(c) inversely at short distances and directly at large distances from it

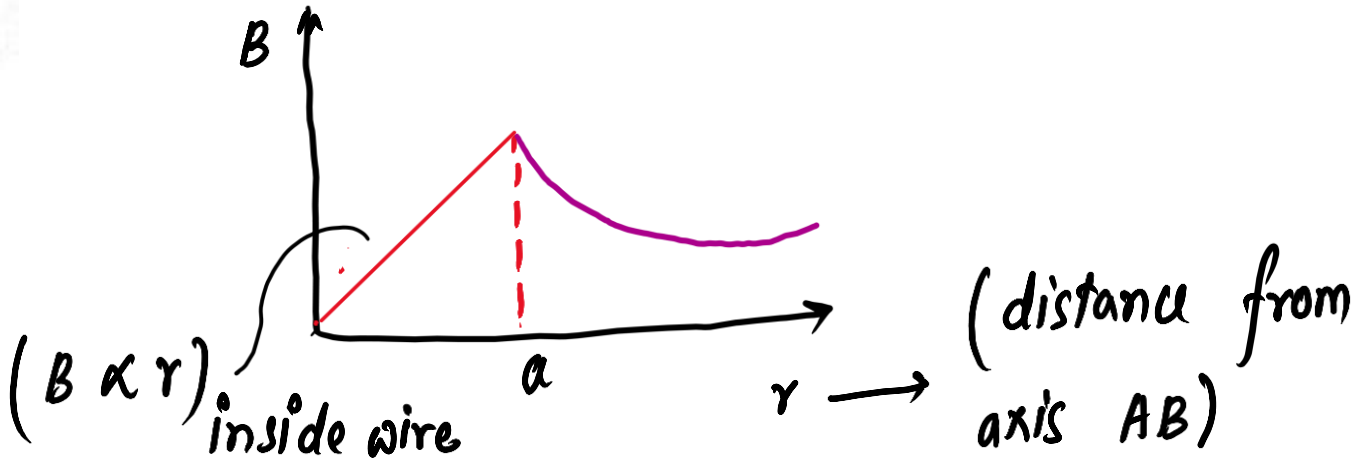
(d) directly on the distance (at short distances) and inversely on the distance (at long distances) from it

$$B = \frac{\mu_0 I}{2\pi r} \quad \text{(outside wire)}$$

If I is same, $B \propto \frac{1}{r}$

(inversely related)





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(c) inversely at short distances and directly at large distances from it

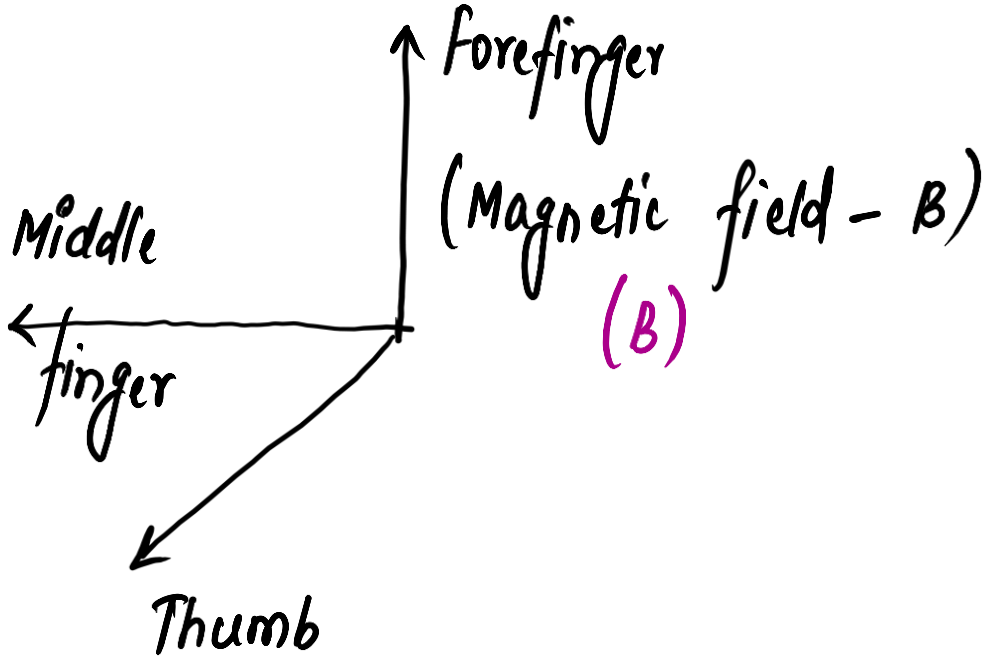
(d) directly on the distance (at short distances) and inversely on the distance (at long distances) from it

Answer: (A)

According to Fleming's right-hand rule, if the forefinger indicates the direction of magnetic field and thumb shows the direction of motion of conductor, then the stretched middle finger will predict the direction of

(a) force acting on the conductor
(b) electric field
(c) induced current
(d) current

Induced current (I)



(Force on conductor/ Motion of conductor (F)

(FBI)

→ Fleming's Left Hand Rule ⟹ direction of B and I are known, calculates F direction (Electric Motor)

→ Fleming's right hand Rule ⇒ direction of F and B are known, calculates induced current's direction (Electric Generator)

Electromagnetic induction

According to Fleming's right-hand rule, if the forefinger indicates the direction of magnetic field and thumb shows the direction of motion of conductor, then the stretched middle finger will predict the direction of

(a) force acting on the conductor

(b) electric field

(c) induced current

(d) current

Answer: (C)

A DC generator works on the principle of

(a) Ohm's law

(b) Joule's law of heating

(c) Faraday's laws of electromagnetic induction

(d) None of the above

A DC generator works on the principle of

(a) Ohm's law

(b) Joule's law of heating

(c) Faraday's laws of electromagnetic induction

(d) None of the above

Answer: (C)

The presence of magnetic field can be determined using which one of the following instruments?

(a) Ammeter

(b) Voltmeter

(c) Magnetic needle

(d) Motor

The presence of magnetic field can be determined using which one of the following instruments?

(a) Ammeter — value of current

(b) Voltmeter — value of voltage

(c) Magnetic needle — presence of magnetic field → Deflects

(d) Motor

Galvanometer — if current is there or not

Answer: (C)

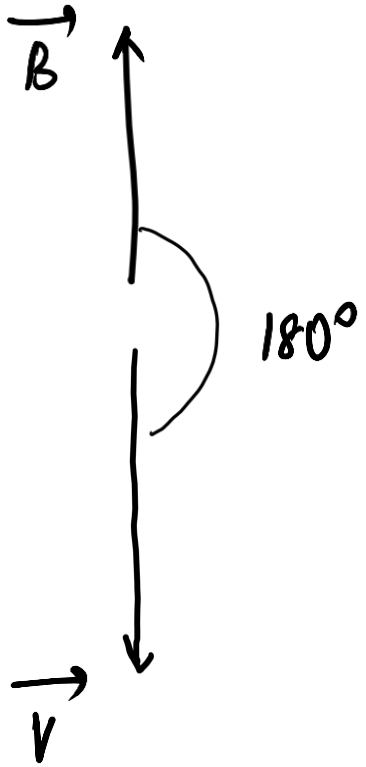
A positive charge is moving towards south in a space where magnetic field is pointing in the north direction. The moving charge will experience :

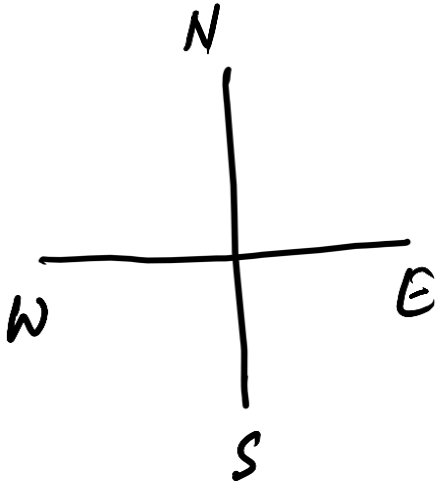
(a) a deflecting force towards north direction.

(b) a deflecting force towards east direction.

(c) a deflecting force towards west direction.

(d) no deflecting force.





$\vec{F} = q(\vec{v} \times \vec{B})$

$F = qvB\sin\theta$

$\theta = 180^\circ \Rightarrow \sin 180^\circ = 0$

$\vec{F} = qvB(0) = \underline{0}$

A positive charge is moving towards south in a space where magnetic field is pointing in the north direction. The moving charge will experience :

(a) a deflecting force towards north direction.

(b) a deflecting force towards east direction.

(c) a deflecting force towards west direction.

(d) no deflecting force.

Answer: (D)

Choose the <u>incorrect</u> statement from the following regarding magnetic lines of field

A. The direction of magnetic field at a point is taken to be the direction in which the north pole of a magnetic compass needle points ✓

B. Magnetic field lines are closed curves ✓

C. If magnetic field lines are parallel and equidistant, they represent zero field strength ✗

D. Relative strength of magnetic field is shown by the degree of closeness of the field lines ✓

uniform magnetic field

Choose the incorrect statement from the following regarding magnetic lines of field

A. The direction of magnetic field at a point is taken to be the direction in which the north pole of a magnetic compass needle points

B. Magnetic field lines are closed curves

C. If magnetic field lines are parallel and equidistant, they represent zero field strength

D. Relative strength of magnetic field is shown by the degree of closeness of the field lines

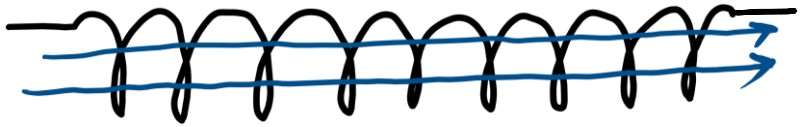
For a current in a long straight solenoid N and S poles are created at the two ends. Among the following statements, the <u>incorrect</u> statement is

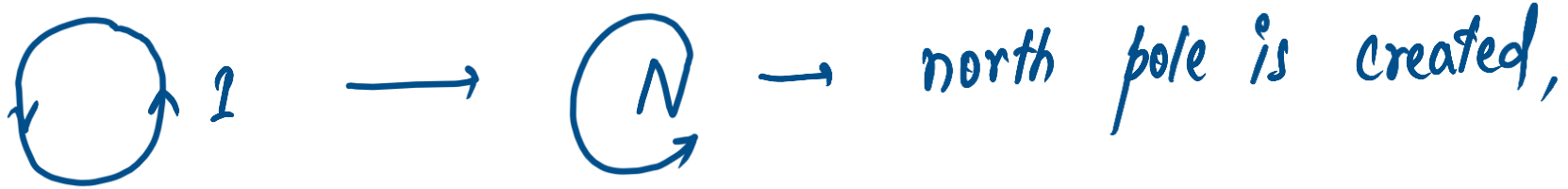
(a) The field lines inside the solenoid are in the form of straight lines which indicates that the magnetic field is the same at all points inside the solenoid ✓

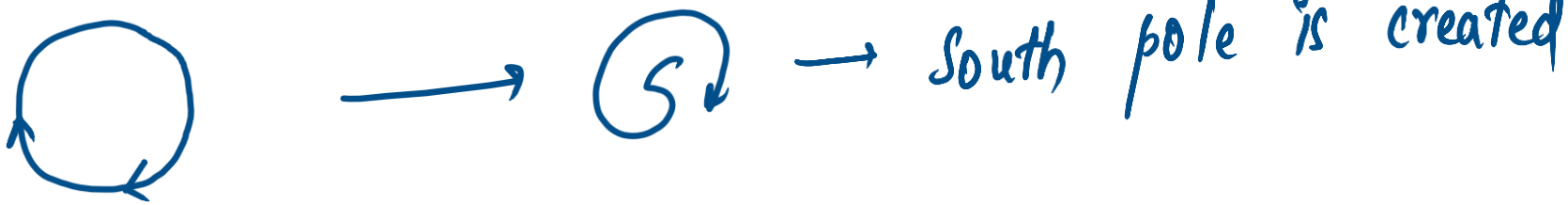
(b) The strong magnetic field produced inside the solenoid can be used to magnetize a piece of magnetic material like soft iron, when placed inside the coil ✓

(c) The pattern of the magnetic field associated with the solenoid is different from the pattern of the magnetic field around a bar magnet ✗

(d) The N- and S-poles exchange position when the direction of current through the solenoid is reversed. ✓


uniform B


I
N
north pole is created,


S
South pole is created

For a current in a long straight solenoid N and S poles are created at the two ends. Among the following statements, the incorrect statement is

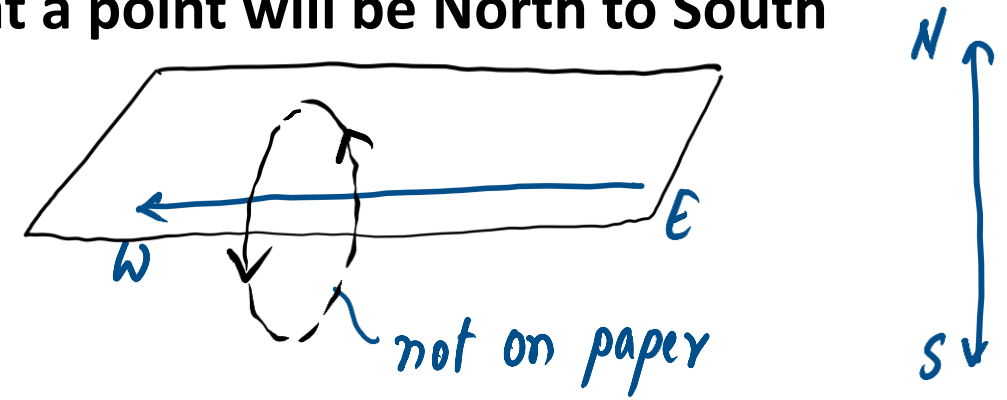
(a) The field lines inside the solenoid are in the form of straight lines which indicates that the magnetic field is the same at all points inside the solenoid

(b) The strong magnetic field produced inside the solenoid can be used to magnetize a piece of magnetic material like soft iron, when placed inside the coil

(c) The pattern of the magnetic field associated with the solenoid is different from the pattern of the magnetic field around a bar magnet

(d) The N- and S-poles exchange position when the direction of current through the solenoid is reversed.

A constant current flows in a horizontal wire in the plane of the paper from east to west. The direction of magnetic field at a point will be North to South



(a) directly above the wire

(b) directly below the wire

(c) at a point located in the plane of the paper, on the north side of the wire

(d) at a point located in the plane of the paper, on the south side of the wire

A constant current flows in a horizontal wire in the plane of the paper from east to west. The direction of magnetic field at a point will be North to South

(a) directly above the wire

(b) directly below the wire

(c) at a point located in the plane of the paper, on the north side of the wire

(d) at a point located in the plane of the paper, on the south side of the wire

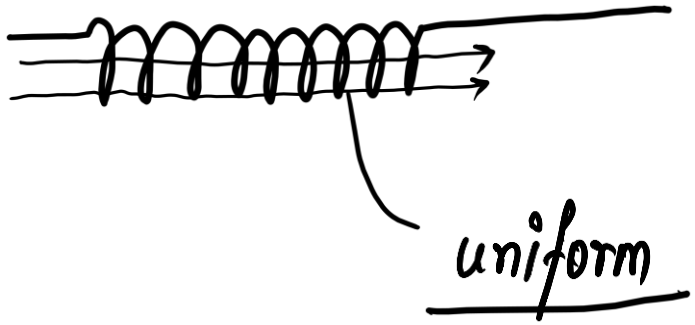
The strength of magnetic field inside a long current carrying straight solenoid is

(a) more at the ends than at the centre

(b) minimum in the middle

(c) same at all points

(d) found to increase from one end to the other



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(b) minimum in the middle

(c) same at all points

(d) found to increase from one end to the other

To convert an AC generator into DC generator

(a) split-ring type commutator must be used

(b) slip rings and brushes must be used

(c) a stronger magnetic field has to be used

(d) a rectangular wire loop has to be used

To convert an AC generator into DC generator

(a) split-ring type commutator must be used → DC generator

(b) slip rings and brushes must be used → AC generator

(c) a stronger magnetic field has to be used

(d) a rectangular wire loop has to be used

Statement I It is not necessary that every bar magnet has one North pole and one South pole.

Statement II Magnetic poles occur in pair.

Codes

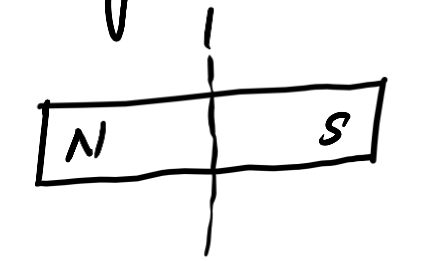
(a) Both the statements are individually true and Statement II is the correct explanation of Statement I

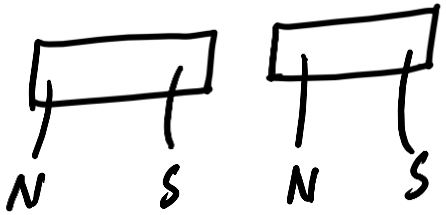
(b) Both the statements are individually true but Statement II is not the correct explanation of Statement I

(c) Statement I is true but Statement II is false

(d) Statement I is false but Statement II is true

Magnetic monopole does not exist.





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(d) Statement I is false but Statement II is true

Answer: (D)

The phenomenon of electromagnetic induction implies a production of induced

(a) resistance in a coil when the magnetic field changes with time

(b) current in a coil when an electric field changes with time

(c) current in a coil when a magnetic field changes with time

(d) voltage in a coil when an electric field changes with time

The phenomenon of electromagnetic induction implies a production of induced

(a) resistance in a coil when the magnetic field changes with time

(b) current in a coil when an electric field changes with time

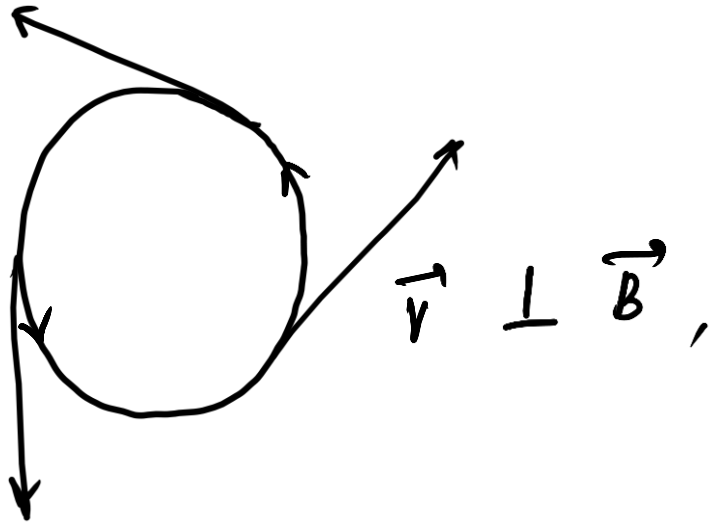
(c) current in a coil when a magnetic field changes with time

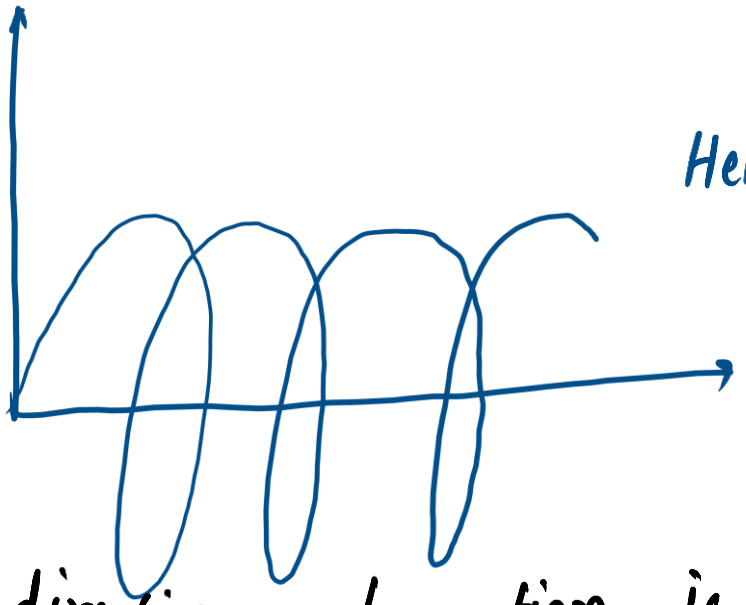
(d) voltage in a coil when an electric field changes with time

Answer: (C)

Which one among the following properties of a proton may change, while it moves freely in a magnetic field?

(a) Speed (b) Charge
(c) Mass (d) Velocity





Helical motion

$\vec{v}$ is not perpendicular to $\vec{B}$

At each point, direction of motion is changing → velocity is changing.

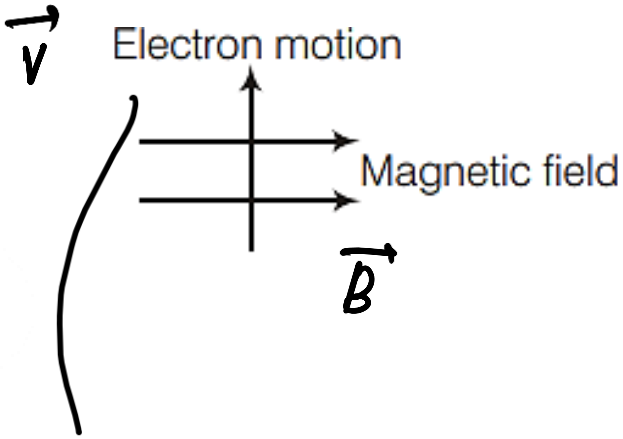
Which one among the following properties of a proton may change, while it moves freely in a magnetic field?

(a) Speed
(b) Charge
(c) Mass
(d) Velocity

Answer: (D)

The motion of an electron in presence of a magnetic field is depicted in the figure given above. The force acting on the electron will be directed

(a) into the page
(b) out of the page
(c) opposite to the motion of the electron
(d) along the motion of the electron

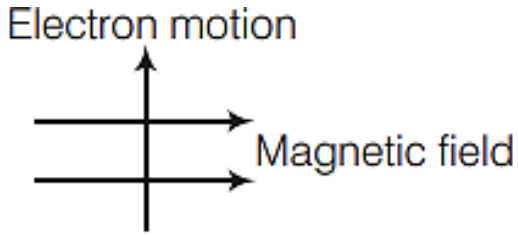


$$F = q(\vec{v} \times \vec{B})$$

$$= -e(\vec{v} \times \vec{B})$$

direction of force is reversed. $\Rightarrow$ Out of the page.

The motion of an electron in presence of a magnetic field is depicted in the figure given above. The force acting on the electron will be directed



(a) into the page
(b) out of the page
(c) opposite to the motion of the electron
(d) along the motion of the electron

Answer: (B)

A current-carrying wire is known to produce magnetic lines of force around the conducting straight wire. The direction of the lines of force may be described by

(a) left-hand thumb rule for up current and right-hand thumb rule for down current
(b) right-hand thumb rule for up current and left-hand thumb rule for down current
(c) right-hand thumb rule for both up and down currents
(d) left-hand thumb rule for both up and down currents

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(b) right-hand thumb rule for up current and left-hand thumb rule for down current
(c) right-hand thumb rule for both up and down currents
(d) left-hand thumb rule for both up and down currents

Answer: (C)

For which among the following house appliances, magnet is an essential part?

(a) Calling bell (b) Fan
(c) Washing machine (d) All of these

For which among the following house appliances, magnet is an essential part?

(a) Calling bell (b) Fan
(c) Washing machine (d) All of these

Answer: (D)

Which of the following statements are not correct?

I. Magnetic monopoles do not exist. ✓

II. Two iron bars which are magnetised always attract. ✗

III. A wire freely suspended in a magnetised field orients itself parallel to the field. ✗ — N – S direction

IV. Copper is diamagnetic and aluminium is paramagnetic.

Choose the answer from the following codes

(a) I, III and IV (b) Both II and IV

(c) Both II and III (d) II, III and IV

Which of the following statements are not correct?

I. Magnetic monopoles do not exist.
II. Two iron bars which are magnetised always attract.
III. A wire freely suspended in a magnetised field orients itself parallel to the field.
IV. Copper is diamagnetic and aluminium is paramagnetic.

Choose the answer from the following codes

(a) I, III and IV (b) Both II and IV
(c) Both II and III (d) II, III and IV

Answer: (D)

A conductor carrying current when placed in an external magnetic field, experiences a mechanical force. The device whose working is based on this principle is

(a) electric motor
(b) dynamo
(c) electric bell
(d) None of the above

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(d) None of the above

Answer: (A)

. In a step-down transformer, the input voltage is 200 V and the output voltage is 5V. The turn ratio of the transformer is

(a) 40 : 1 (b) 30 : 2 (c) 20 : 1 (d) 1 : 30

$$\frac{N_p}{N_s} = \frac{V_i}{V_0} = \frac{200\,V}{5\,V} = \frac{40}{1} = 40:1$$

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Answer: (A)

In the process of magnetisation of a bar

(a) only the outer layers of the bar get magnetised

(b) only the surface of the bar gets magnetised

(c) only the ends of the bar get magnetised

(d) the entire bulk of the bar gets magnetised

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Answer: (D)

Heating a magnet will

(a) weaken it

(b) strengthen it

(c) reverse its polarity

(d) have no effect

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Answer: (D)

An electric motor is used to convert

(a) electrical energy into mechanical energy

(b) mechanical energy into kinetic energy

(c) mechanical energy into electrical energy

(d) higher voltage to lower voltage

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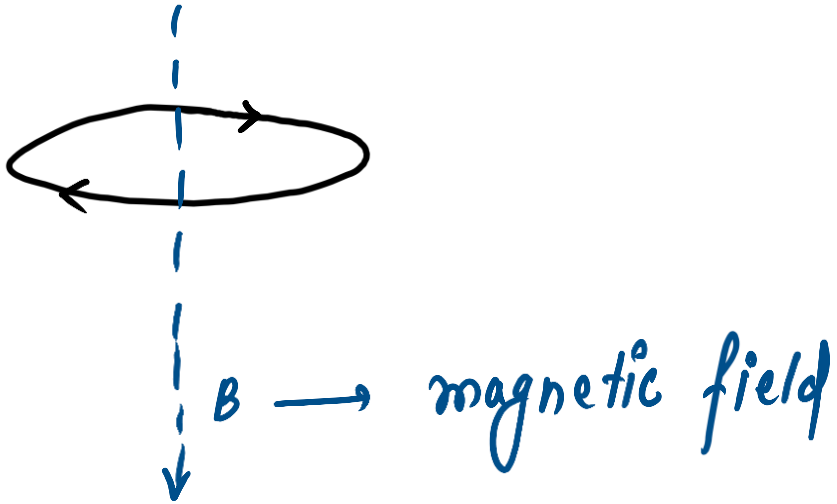
(c) mechanical energy into electrical energy

(d) higher voltage to lower voltage

Answer: (A)

A current is flowing in a circular conductor in clockwise direction. The coil is in the plane of the paper. The direction of the magnetic field is

(a) perpendicular to the plane of paper in the upward direction
(b) perpendicular to the plane of the paper in the downward direction
(c) along the plane of the paper
(d) None of the above



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(d) None of the above

Answer: (B)

Which one of the following statements about electric or magnetic fields is not true?

(a) All electric charges, whether static or in motion with respect to an observer, give rise to electric fields

(b) All electric charges, whether static or in motion with respect to an observer, give rise to magnetic fields

(c) Electric fields exert forces on all charges

(d) Magnetic fields exert forces on charges only when the charges are in motion with respect to an observer

only moving charges will produce current. Magnetic field is produced only when current is there.

Which one of the following statements about electric or magnetic fields is not true?

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Answer: (B)

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