PHYSICS

BOOKS - TARGET PHYSICS (HINGLISH)

MAGNETIC EFFECT OF ELECTRIC CURRENT

Classical Thinking

1. The dimensions of magnetic induction are

A. $\left[M^0L^0T^{-2}A^{-1}\right]$

B. $\left[M^1L^0T^{-2}A^{-1}\right]$

C. $\left[M^1L^1T^{-2}A^{-1}\right]$

D. $\left[M^1L^1T^{-1}A^{-2}\right]$

Answer: B

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2. Gauss is unit of which quantity

A. H

B. B

C. ϕ

D. I

Answer: B

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3. "On passing current in a conducting wire, the magnetic field is produced around it." It is a law of

A. Lenz

B. Ampere

C. Ohm

D. Maxwell

Answer: B

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4. Direction of force acting on a current carrying conductor $\vec{L}$ in an external magnetic field $\vec{B}$ is

A. perpendicular to $\vec{L}$ and $\vec{B}$

B. perpendicular to $\vec{B}$

C. perpendicular to $\vec{L}$

D. parallel to $\vec{L}$ and $\vec{B}$

Answer: A

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5. Ampere's law is analogous to

A. Kirchhoff's law in current electricity

B. Faraday's law in e.m.f

C. Lenz's law

D. Gauss theorem in electrostatics

Answer: D

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6. The line integral of magnetic field $\overrightarrow{B}$ around any closed path through which current I is flowing is given by $\oint_c \overrightarrow{B}.\overrightarrow{d}l =$

A. $\mu_0 I^2$

B. $\frac{\mu_0}{I}$

C. $\mu_0 I$

D. $\frac{I}{\mu_0}$

Answer: C

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7. Magnetic induction due to a toroid does not depend upon

A. permeability of a free space.

B. number of turns per unit length

C. radius of a toroid

D. current flowing through a toroid

Answer: C

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8. Toroid is a solenoid of

A. infinite length

B. infinite length of non-uniform radius

C. finite length bent into a circle

D. conical shape

Answer: A

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9. A long solenoid of length L has a mean diameter D. It has n layers of windings of N turns each. If it carries a current 'i' the magnetic field at its centre will be

A. proportional to D

B. inversely proportional to D

C. independent of D

D. proportional to L

Answer: C

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10. What is the shape of magnet in moving coil galvanometer to make the radial magnetic field ?

A. concave pole pieces of the magnet

B. iron core

C. rectangular coil

D. mirror

Answer: A

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11. The scale of M.C.G. is linear because of

A. large number of turns of the coil

B. eddy currents induced in it

C. radial magnetic field

D. non-unifrom magnetic field

Answer: C

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12. To make the field radial in a moving coil galvanometer

A. the number of turns in the coil is increased

B. magnet is taken in the form of horse shoe type

C. poles are cylindrically cut

D. coil is wound on an aluminium frame

Answer: C

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13. The coil of a sensitive M.C.G. swings too far on both sides. This movement can be quickly stopped by

A. holding a magnet near the coil

B. earthing the case of the galvanometer

C. connecting a large resistance across the ends of the coil

D. connecting a short length of copper wire across the ends

Answer: D

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14. A galvanometer is said to be sensitive, if it gives

A. large deflection for a small current

B. large deflection for a large current

C. small deflection for a small current

D. small deflection for a large current

Answer: A

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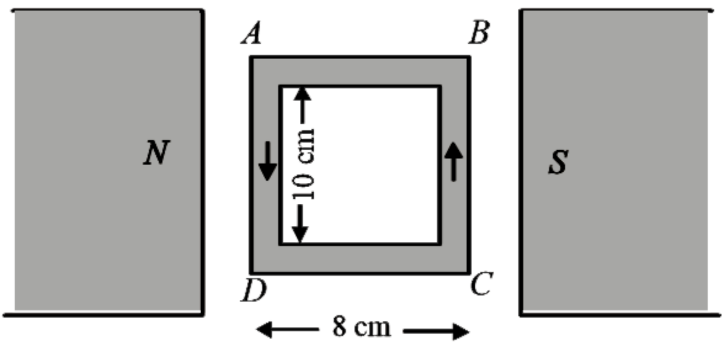
15. A 100 turns coil shown in figure carries a current of 2 amp in a magnetic field $B = 0.2 Wb/m^2$. The torque acting on the coil is



A. 0.32 Nm tending to rotate the side AD out of the page.

B. 0.32 Nm tending to rotate the side AD into the page.

C. 0.0032 Nm tending to rotate the side AD out of the page

D. 0.0032 Nm tending to rotate the side AD into the page

Answer: A

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16. To convert galvanometer into ammeter which one of the following is connected with the coil:

A. small resistance in series

B. small resistance in parallel

C. large resistance in series

D. large resistance in parallel

Answer: B

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17. An ammeter should have very low resistance, so that it may

A. not burn out

B. show large deflection

C. have better stability

D. not change the value of the current

Answer: D

18. If galvanometer is shunted by $1/n^{th}$ of its value, then what fraction of the current passes through the galvanometer ?

A. $\frac{1}{n}$

B. n

C. $\frac{1}{1+n}$

D. n - 1

Answer: C

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19. The range of an ammeter of resistance G, is increased from I to nI.

This can be done by connecting

A. a series resistance of Gn

B. a parallel resistance of G(n-1)

C. a series resistance of G(n - 1)

D. a parallel resistance of G/n

Answer: B

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20. The range of voltmeter can be increased by

A. increasing series resistance

B. decreasing series resistance

C. changing scale of voltmeter

D. using another method

Answer: A

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21. The resistance of an ideal voltmeter is

A. zero

B. very low

C. very large

D. infinite

Answer: D

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22. For the measurement of potential difference, voltmeter is connected

A. in parallel with the circuit

B. in open circuit

C. in series with the circuit

D. beyond the circuit

Answer: A

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23. A voltmeter of resistance G ohm has range V volt. To increase its range upto (nV), one must connect

A. a shunt of $\left(\frac{G}{n}\right)$ across it

B. a shunt of $\left(\frac{G}{n-1}\right)$ across it

C. a series of resistance (n-1) G

D. a series of resistance (nG)

Answer: C

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24. Assertion : The voltmeter is a low resistance galvanometer.

Reason : The potential difference is measured across a resistance.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is True

Answer: D

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25. The sensitivity of a M.C.G. will increase if

A. the restoring torque per unit angular displacemetn is increased.

B. number of turns in the coil is decreased

C. radius of the coil is decreased

D. strong magnet with more number of turns and greater radius is used

Answer: D

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26. The S.I. unit of current sensitivity is

A. ohm/div

B. rad/A

C. volt/div

D. ampere/div

Answer: B

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27. The accuracy of M.C.G. can be measured in terms of

A. current

B. voltage

C. sensitivity

D. error

Answer: D

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28. The accuracy of M.C.G.

A. does not depend on deflection

B. increases with deflection

C. decreases with deflection

D. always fluctuates

Answer: B

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29. A particle moving in a magnetic field increases its velocity, then its radius of the circle

A. decreases

B. increases

C. remains the same

D. becomes half

Answer: B

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30. In a cyclotron, the applied magnetic field

A. changes only the direction of the charged particle

B. increases only te speed of the charged particle

C. changes the direction of the particle and increases the speed of the particle

D. neither increases the speed nor changes the direction.

Answer: A

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31. Which one of the following particles cannot be accelerated by a cyclotron ?

A. Proton

B. Electron

C. Deuteron

D. α particle

Answer: B

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32. A protn and an alpha particle enter into a uniform magnetic field with the same velocity. The period of rotation of the alpha particle will be

A. four times that of the proton

B. two times that of the proton

C. three times that of the proton

D. same as that of the proton

Answer: B

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33. An electron and a proton have equal kinetic energies. They enter in a magnetic field perpendicularly, Then

A. both will follow a circular path with different radii.

B. both will follow a helical path

C. both will follow a parabolic path

D. all the statements are false

Answer: A

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34. Two particles X and Y have charges q and 4q respectively. After being accelerated through the same potential difference, they enter a region of uniform magnetic field and describe circular paths of radii R and $\frac{R}{2}$ respectively.

The ratio of mass of X to that of Y is

A. $2:1$

B. $1:2$

C. $1:1$

D. $1:4$

Answer: C

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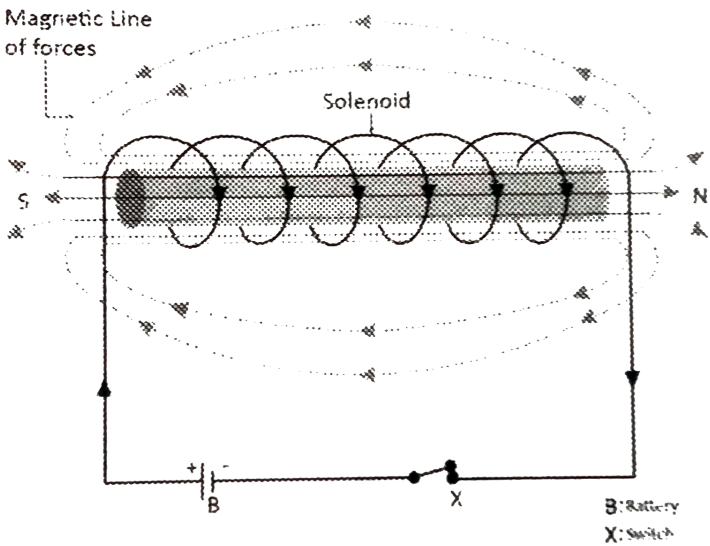
35. Which of the following is a CORRECT statement ?



A. Ammeter is a high resistance galvanometer and voltmeter is a low resistance galvanometer

B. Ammeter is a low resistance galvanometer and voltmeter is a high resistance galvanometer

C. Ammeter and voltmeter cannot be distinguished on the basis of their resistance

D. Both should have zero resistance.

Answer: B

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Critical Thinking

1. A straight wire of length 0.5 m carrying a current of 1.6 ampere is placed in a uniform magnetic field of induction 2 T. If the magnetic field is perendicular to the length of the wire, then force on the wire is

A. 2.4 N

B. 1.2 N

C. 1.6 N

D. 3.2 N

Answer: C

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2. A current of 10 ampere is flowing in a wire of length $1.5m$. A force of $15N$ acts on it when it is placed in a uniform magnetic field of 2 tesla. The angle between the magnetic field and the direction of the current is

A. 30°

B. 45°

C. 60°

D. 90°

Answer: A

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3. No force acts on a current carrying conductor in a magnetic field when angle between current and magnetic field is

A. 0

B. $\frac{\pi}{4}$

C. $\frac{\pi}{2}$

D. $\frac{3\pi}{4}$

Answer: A

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4. The strength of the magnetic field at a point r near a long straight current carrying wire is B. The field at a distance $\frac{r}{2}$ will be

A. $\frac{B}{2}$

B. 2B

C. $\frac{B}{4}$

D. 4B

Answer: B

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5. A long straight wire carries an electric current of $2A$. The magnetic induction at a perpendicular distance of $5m$ from the wire is $\left(\mu_0 4\pi \times 10^7 Hm^{-1}\right)$

A. $4 \times 10^{-8} T$

B. $8 \times 10^{-8} T$

C. $12 \times 10^{-8} T$

D. $16 \times 10^{-8} T$

Answer: B

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6. The magnetic induction at apoint P which is at the distance 4 cm from a long current carrying wire is $10^{-3} T$. The field of induction at a distance 12 cm from the current will be

A. $3.33 \times 10^{-4} T$

B. $1.11 \times 10^{-4} T$

C. $3 \times 10^{-2} T$

D. $9 \times 10^{-2} T$

Answer: D

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7. A toroidal coil has 3000 turns. The inner and outer radii are 10 cm and 12 cm respectively. If current flowing is 5 A, then the magnetic field inside the toroid will be

A. $25 \times 10^{-3}T$

B. $25 \times 10^{-2}T$

C. 2.5 T

D. $2.5 \times 10^{-4}T$

Answer: D

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8. A solenoid of 1.5 metre length and 4.0 cm diameter posses 10 turn per cm. A current of 5 ampere is flowing through it. The magnetic induction at axis inside the solenoid is

A. $2\pi \times 10^{-3} T$

B. $2\pi \times 10^{-5} T$

C. $2\pi \times 10^{-7} T$

D. $2\pi \times 10^{-9} T$

Answer: B

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9. A circular coil of radius 40 mm consists of 250 turns of wire in which the current is 20 mA. The magnetic field at the centre of the coil is

A. $7.9 \times 10^{-5} T$

B. $7.9 \times 10^{-6} T$

C. $7.9 \times 10^{-4} T$

D. $7.9 \times 10^{-3} T$

Answer: A

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10. Two concentric circular coils of five turns each are situated in the same plane. Their radii are 20 cm and 30 cm and they carry respectively 0.2 A and 0.3 A current in same direction. The magnetic field in tesla at the centre is

A. $\frac{\mu_0}{2}$

B. $10\mu_0$

C. $\frac{5}{2}\mu_0$

D. $5\mu_0$

Answer: D

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11. If in circular coil of radius R, current I is flowing and in another coil B of radius $2R$ a current $2I$ is flowing , then the raatio of the magnetic fields B_A and B_B, produced by them will be

A. $4:1$

B. $2:1$

C. $6:1$

D. $1:1$

Answer: D

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12. A wire of length L carrying a current I is bent into a circle. The magnitude of the magneitc field at the centre of the circle is

A. $\frac{\pi \mu_0 I}{L}$

B. $\frac{\mu_0 I}{2L}$

C. $\frac{2\pi\mu_0 I}{L}$

D. $\frac{\mu_0 I}{2\pi L}$

Answer: A

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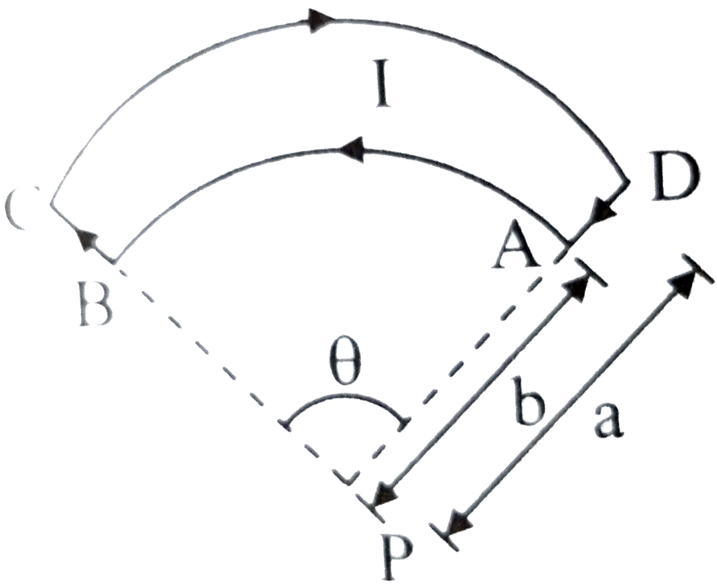
13. If the current flowing in ABCD is I. Then the field at P as shown in the figure will be



A. $\frac{\mu_0 I\theta}{4\pi}\left(\frac{1}{a}+\frac{1}{b}\right)$

B. $\frac{\mu_0 I\theta}{4\pi}\left(\frac{1}{a}-\frac{1}{b}\right)$

C. $\frac{\mu_0 I\theta}{4\pi}(a+b)$

D. $\frac{\mu_0 I\theta}{4\pi}\left(\frac{1}{b}-\frac{1}{a}\right)$

Answer: B

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14. A coil of radius 200 mm is to produce a field of 0.4 G in its centre with a current of 0.25 A. How many turns must be there in the coil ?

A. 61

B. 51

C. 41

D. 63

Answer: B

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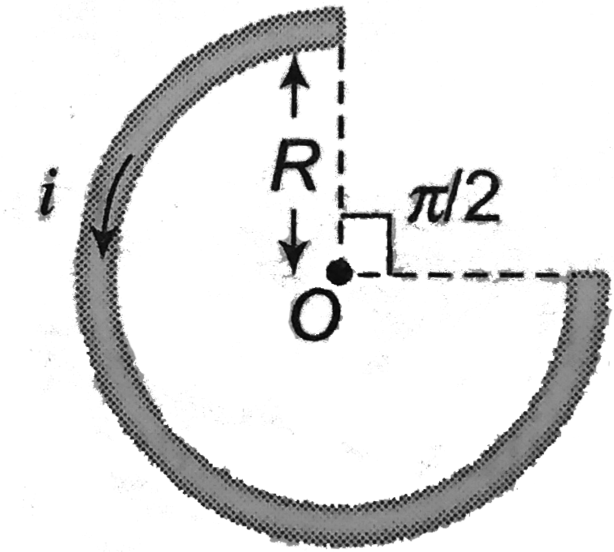
15. A current i ampere flows in a circular arc of wire whose radius is R, which subtend an angle $3\pi/2$ radian at its centre. The magnetic induction B at the centre is



A. $\frac{\mu_0 I}{r}$

B. $\frac{\mu_0 I}{2r}$

C. $\frac{2\mu_0 I}{r}$

D. $\frac{3\mu_0 I}{8r}$

Answer: D

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16. A closely wound flat circuar coil of 25 turns of wire has diameter of $10cm$ which carries current of $4A$, the flux density at the centre of a coil will be

A. 1.679×10^{-5} tesla

B. 2.028×10^{-4} tesla

C. 1.256×10^{-3} tesla

D. 1.512×10^{-6} tesla

Answer: C

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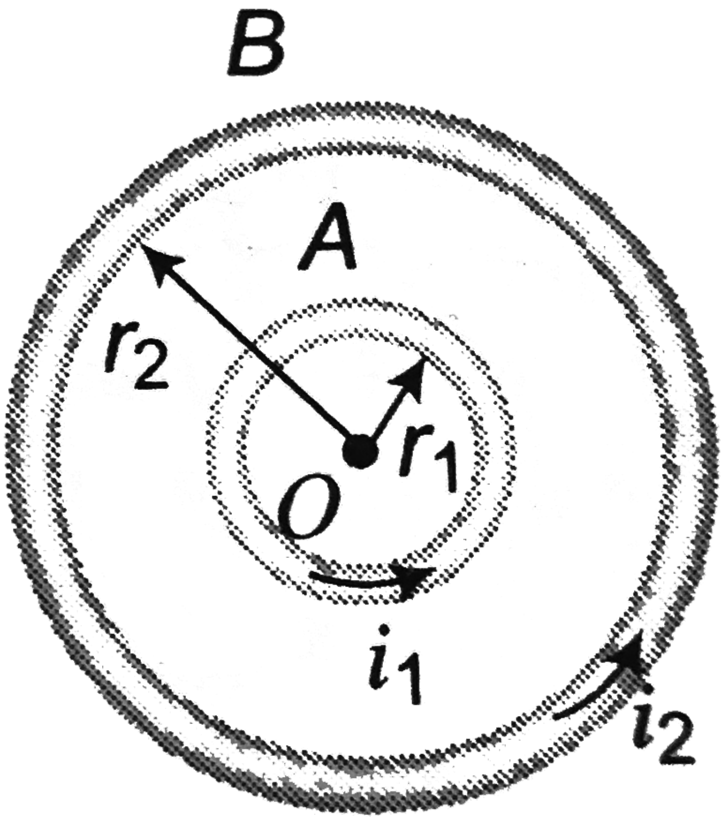
17. A and B are two concentric circular conductors of centre O and carrying currents i_1 and i_2 as shown in the adjacent figure. If ratio of their radii is $1:2$ and ratio of the flux densities at O due to A and B is $1:3$, then the value of i_1 / i_2 is



A. $\frac{1}{6}$

B. $\frac{1}{4}$

C. $\frac{1}{3}$

D. $\frac{1}{2}$

Answer: A

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18. A winding wire which is used to prepare a solenoid of length 80 cm can bear a maximum cuurent of 10 A. the cross-sectional radius of the solenoid is 3 cm. what should be the length of the winding wire if a magnetiic field of 0.2 T is to be produced at the centre of the solenoid along its axis?

A. 1.2×10^2m

B. 4.8×10^2m

C. 2.4×10^2m

D. 6×10^3m

Answer: C

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19. A circular coil of diameter 9 cm has 30 turns of wire which carry current of 1 ampere. The magnetic moment of the coil is

A. $19.08 \times 10^{-2} Am^2$

B. $3.8 \times 10^{-2} Am^2$

C. $7.7 \times 10^{-3} Am^2$

D. $3.8 \times 10^{-3} Am^2$

Answer: A

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20. The coil of a suspended coil galvanometer has a very high resistance when a momentary current is passed through the coil. It

A. shows steady deflection

B. gets deflected and comes to rest slowly

C. oscillates with the decreasing amplitude

D. oscillates with the same amplitude

Answer: C

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21. A rectangular coil has 100 turns each of area 50 cm^2. It is capable of rotation about an axis joining the mid points of two opposite sides. When a current of 5 A is passed through it while its plane is at right angles to a uniform magnetic field, it experiences a torque of 5 Nm. The magnetic field will be

A. T

B. 2T

C. 0.5T

D. 1.5T

Answer: B

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22. A rectangular coil has 100 turns has length 5 cm and breadth 2 cm. It is suspended in radial magnetic field of induction 0.1 Wb/m^2. If a current of 100 μA is passed through the coil, then the torque acting on the coil is

A. 10^{-6} N m

B. 10^{-7} N m

C. 10^{-5} N m

D. 10^{-8} N m

Answer: A

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23. A rectangular coil of 500 turns with an average area per turn 4.00 cm^2 carries a current of 0.2 A. The coil is placed at an angle of 60° with the direction of magnetic induction of $10^{-3} Wb/m^2$. The torque acting on the coil is

A. 10^{-5} N-m

B. 0.5×10^{-5} N-m

C. 2×10^{-5} N-m

D. 4×10^{-5} N-m

Answer: C

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24. A 200 turn rectangular coil measuring 0.02 m $\times$ 0.08 m of an ammeter is in a magnetic field of induction 0.2 tesla. The torsional constant of the suspension fibre is 5×10^{-7} newton $\times$ metre/degree. The maximum reading of the ammeter corresponds to a deflection of the coil through 45°. If the magnetic field is radial, then the maximum current that can be measured with this ammeter is

A. 3.5×10^{-4} A

B. 1.75×10^{-4} A

C. 7.0×10^{-4} A

D. 14.0×10^{-4} A

Answer: A

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25. A rectangular coil of area $5.0 \times 10^{-4} m^2$ and 40 turns is pivoted about one of its vertical sides. The coil is in a horizontal field of 80 gauss. If a current of 0.20 mA produces an angular deflection of 20°, then the torsional constant of the hair spring connected to the coil is (in Nm/degree)

A. 1.6×10^{-9}

B. 1.6×10^{-7}

C. 1.6×10^{-5}

D. 1.6×10^{-11}

Answer: A

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26. Torque acting on a coil is 2×10^{-5} Nm. If the torque produces angular deflection of 10° in the coil, then the torsional rigidity of the suspension fibe (in Nm/degree) connected is coil is

A. 2×10^{-3}

B. 2.0×10^{-5}

C. 2.0×10^{-6}

D. 0.02

Answer: C

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27. A rectangular coil of a moving coil galvanometer containing 100 turns and 5 cm long and 3 cm broad is suspended in a radial magnetic field of induction 0.025 Wb/m^2 by a fibre of torque constant 1.5×10^{-9} Nm per degree. The current for which coil will deflect through an angle of 10° is

A. $4\mu A$

B. $3\mu A$

C. $5\mu A$

D. $6\mu A$

Answer: A

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28. Two identical coils carry equal currents have a common centre and their planes are at right angles to each other. The ratio of the magnitude of the resulatant magnetic field at the centre and the field due to one coil is

A. $2:1$

B. $1:1$

C. $1:\sqrt{2}$

D. $\sqrt{2}:1$

Answer: D

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29. The deflection of galvanometer falls from 60 to 30, when 12 Ω shunt is connected across it. The galvanometer resistance is

A. 12Ω

B. 36Ω

C. 24Ω

D. 30Ω

Answer: A

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30. The deflection in a galnometer falls from 50 divisions to 20 divisions, when a 12Ω shunt is applied. The galvanometer resistance is

A. 24Ω

B. 36Ω

C. 60Ω

D. 48Ω

Answer: D

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31. A galvanometer has a resistance of 3663Ω. A shunt Sis connected across it such that (1/34) of the total current passes through the galvanometer. Then the value of the shunt is :

A. 3663 ohm

B. 111 ohm

C. 1.07.7 ohm

D. 3555.3 ohm

Answer: B

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32. An ammeter gives full deflection when a current of $2amp$. Flows through it. The resistance of ammeter is $12ohms$. If the same ammeter is to be used for measuring a maximum current of $5amp$, then the ammeter must be connected with a resistance of

A. 8 Ω is series

B. 18 Ω in series

C. 8 Ω in parallel

D. 18 Ω in parallel

Answer: C

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33. A milliammeter of resistance 5 ohm gives a full scale deflection for a current of 15 mA. If the mulliammeter is to be used to measure current upto 1.5 A, then the resistance that must be attached to the milliammeter is

A. 0.0505 Ω

B. 0.505 Ω

C. 5.05 Ω

D. 505 Ω

Answer: A

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34. We have a galvanometer of resistance 25Ω. It is shunted by a 2.5Ω wire. The part of total current that flows through the galvanometer is given as

A. $\frac{I_G}{I} = \frac{1}{11}$

B. $\frac{I_G}{I} = \frac{2}{11}$

C. $\frac{I_G}{I} = \frac{3}{11}$

D. $\frac{I_G}{I} = \frac{4}{11}$

Answer: A

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35. A moving coil galvanometer has resistance 30 Ω and gives full scale deflection, when carrying a current of 5.4×10^{-6} A. The current that will give full scale deflection, when galvanometer is shunted by 1 Ω resistance is

A. 8.8×10^{-6} A

B. 10×10^{-5} A

C. 11×10^{-4} A

D. 1.67×10^{-4} A

Answer: D

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36. A 36Ω galvanometer is shunted by resistance of 4Ω. The percentage of the total current, which passes through the galvanometer is

A. 0.09

B. 0.1

C. 0.11

D. 0.08

Answer: B

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37. In an ammeter, 10% of the main current is passing through galvanometer, it the galvanometer is shunted with a 10 Ω resistance. What is the resistance of the galvanometer ?

A. 20Ω

B. 50Ω

C. 90Ω

D. 100Ω

Answer: C

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38. The shunt required for 10% of main current to be sent through the moving coil galvanometer of resistance 99Ω will be-

A. 9Ω

B. 10Ω

C. 11Ω

D. 12Ω

Answer: C

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39. A galvanometer (G = 1000 Ω) gives full scale deflection when a current 10 μA flows through it. It is required to measure a current whose maximum value does not exceed 1 A. To do so we need to connect a esistance of

A. 0.01 Ω in series

B. 100 Ω in parallel

C. 0.01 Ω in parallel

D. 1000 Ω in series

Answer: C

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40. An ammeter is obtained by shunting a 30Ω galvanometer with a 30Ω resistance. What additional shunt should be connected across it to double the range ?

A. 10Ω

B. 15Ω

C. 30Ω

D. 50Ω

Answer: B

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41. A galvanometer of resistance 90 Ω is shunted by a resistance of 10 Ω. What fraction of main current passes through the shunt ?

A. $1/10$

B. 9/100

C. 1/100

D. $9/10$

Answer: D

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42. A voltmeter reads 3 V at full-scale deflection and is graded as 6000 Ω/V. What resistance should be connected in series with it so that it reads 12 V at full scale deflection ?

A. $1.8 \times 10^4 \Omega$

B. $3.6 \times 10^4 \Omega$

C. $5.4 \times 10^4 \Omega$

D. $7.2 \times 10^4 \Omega$

Answer: C

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43. Statement I: The resistance of an ideal voltmeter should be infinite.

Statement II: Lower resistance of voltmeters gives a reading lower than the actual potential difference across the terminals.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is True

Answer: A

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44. A moving coil galvanometer of resistance 40 Ω gives full scales deflection when a current of 0.25 mA is paased through it. To convert it to voltmeter of range 10 V, the resistance requried to be placed in series is

A. 2000 Ω

B. 20000 Ω

C. 3996 Ω

D. 39960 Ω

Answer: D

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45. A galvanometer can withstand safely a maximum current of 5 mA. If is converted into voltmeter readding upto 20 V by connecting in series an external resistance of 3960Ω. The resistance of galvanometer is

A. 36 Ω

B. 40 Ω

C. 44 Ω

D. 48 Ω

Answer: B

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46. A galvanometer gives full scale deflection when the current passed through it is 3 mA. Its resistance is 100 Ω with connecting additional resistance in series, then it can be used as voltmeter of range

A. 3.0 V

B. 0.3 V

C. 0.020 V

D. 0.003 V

Answer: B

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47. A voltmeter of range 3V and resistance 200Ω cannot be converted to an ammeter of range

A. 10 mA

B. 100 mA

C. 1A

D. 10A

Answer: A

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48. A galvanometer of resistance 50Ω is connected to a b attery of 3V alongwith a resistance of 2950Ω in series. A full scale deflection of 30 division is obtained in the galvanometer in order to reduce this deflection to 20 division. The resistance in sereis. should be:-

A. 4450 Ω

B. 5050 Ω

C. 5550 Ω

D. 6050 Ω

Answer: A

Watch Video Solution

49. A galvanometer may be converted into an ammeter or a voltmeter. In which of the following cases is the resistance of the device so obtained least ?

A. Ammeter of range 1 A

B. Ammeter of range 10 A

C. Voltmeter of range 1 V

D. Voltmeter of range 10 V

Answer: B

Watch Video Solution

50. Voltmeters V_1 and V_2 are connected in series across a $D.C.$ line V_1 reads 80 volts and has a per volt resistance of $200 ohms$, V_2 has a total resistance of 32 kilo ohms.

The line voltage is

A. 120 volt

B. 160 volt

C. 220 volt

D. 240 volt

Answer: D

Watch Video Solution

51. What is the relation between voltage sensitivity S_v and the current sensitivity S of a moving coil galvanometer ? (Given that G is the resistance of the galvanometer.)

A. $S_v = GS_1$

B. $S_v = S_1 / G$

C. $S_v S_1 = G$

D. $S_v S_1 = G_2$

Answer: B

Watch Video Solution

52. The Senstivity of a galvanometer is $60\text{div}/Ampere$. When a shunt is used, its sensitivity becomes $10\text{div}/Ampere$. If the resistance of the galvanometer is 20Ω,then the value of the shunt used is

A. 2Ω

B. 4Ω

C. 5Ω

D. 8Ω

Answer: C

Watch Video Solution

53. A moving coil galvanometer of resistance 5 Ω has voltage sensitivity 2 div per mV. Its current sensitivity in div per mA is

A. 10

B. 10×10^{-3}

C. 0.4

D. 0.4×10^{-3}

Answer: A

Watch Video Solution

54. A galvanometer of resistance 95 Ω shunted by a resistance of 5Ω gives deflection of 50 divisions when joined in series with resistance of 20 k Ω and 2.0 V accumulator. The current sensitivity of the galvanometer in division per μA is

A. $1/2$

B. 1

C. 5

D. 10

Answer: A

Watch Video Solution

55. A moving coil galvanometer has 28 turns and area of coil is $4 \times 10^{-2} m^2$.If the magnetic field is 0.2 T, then to increase the current sensitivity by 25% without changing area and field, the number of turns should be changed to

A. 24

B. 35

C. 60

D. 54

Answer: B

Watch Video Solution

56. The coil of galvanometer consists of 80 turns and effective area of 5 cm^2. The restoring couple is 10^{-8} Nm//radian. The magnetic field between the pole pieces is 5 T. The current sensitivity of this galvanometer is

A. $5 \times 10^4 \text{rad}/\mu A$

B. $5 \times 10^{-6} \text{rad/A}$

C. $2 \times 10^{-7} \text{rad/A}$

D. $20 \text{rad}/\mu A$

Answer: D

Watch Video Solution

57. A galvanometer has a current sensitivity of 5 divisions per milliampere and voltage sensitivity of 1 division per millivolt. The galvanometer has 30 divisions and it is to be used as an ammeter to read 6 A. This requires a shunt of value

A. $\frac{5}{999}\Omega$

B. $\frac{1}{333}\Omega$

C. $\frac{1}{111}\Omega$

D. $\frac{7}{999}\Omega$

Answer: A

Watch Video Solution

58. If a shunt $1/10$ of the coil resistance is applied to a moving coil galvanometer, its sensitivity becomes

A. 10 fold

B. 11 fold

C. $\frac{1}{10}$ fold

D. $\frac{1}{10}$ fold

Answer: D

Watch Video Solution

59. An alpha particle of positive charge +2e is compelled to rotate along a circular path of radius r in a cyclotron with linear speed v. The magnetic moment of the closed loop is

A. zero

B. (1/2) evr

C. evr

D. 2 evr

Answer: C

Watch Video Solution

60. A uniform magnetic field acts right angles to the direction of motion of electrones. As a result, the electron moves in acircular path of radius 2 cm. If the speed of electrons is doubled, then the radius of the circular path will be

A. 2 cm

B. 0.5 cm

C. 4 cm

D. 1 cm

Answer: C

Watch Video Solution

61. A cyclotron in which flux density is 1.4 T is employed to accelerate protons. How rapidly should the field between the dees be reversed if mass of protoon be taken as 1.6×10^{-27} kg ?

A. $\frac{49}{22} \times 10^{5}$ Hz

B. $\frac{49}{22} \times 10^{7}$ Hz

C. $\frac{49}{22} \times 10^{4}$ Hz

D. $\frac{49}{22} \times 10^{6}$ Hz

Answer: B

Watch Video Solution

62. In a cyclotron, the time taken by ion to describe a semicircular path is 2.3×10^{-8} s. The cyclotron freqquency will be

A. 2.17×10^{6} Hz

B. 2.17×10^{7} Hz

C. 2.17×10^{5} Hz

D. 2.17×10^{8} Hz

Answer: B

Watch Video Solution

63. The maximum kinetic energy of protons in a cyclotron of radius 0.4 m in a magnetic field of 0.5 T is (mass of proton = 1.67×10^{-27} kg, charge of proton $= 1.6 \times 10^{-19}$ C)

A. 3 MeV

B. 1.9 MeV

C. 5 MeV

D. 4 MeV

Answer: B

Watch Video Solution

64. The scale of galvanometer is divided into 150 equal divisions. The galvanometer has a current sensitivity of $10\text{divisions}/mA$ and the voltage sensitivity of $2\text{divisions}/mV$. How the galvanometer be designed to read (i) 6A per division and (ii) 1 V per division?

A. 0.125 Ω

B. 0.0125 Ω

C. 1.25 Ω

D. 2.5 Ω

Answer: B

Watch Video Solution

65. The ratio of the magnetic field at the centre of a current carrying circular wire and the magnetic field at the centre of a semi-circular coil made from the same length of wire will be

A. $2:1$

B. $4:1$

C. $1:2$

D. $1:4$

Answer: B

Watch Video Solution

66. Two infinite length wires carry currents 8A and 6A and are placed along X-asis and Y-axis respectively. Magnetic field at a point P(0, 0, d)m will be

A. $\frac{7\mu_0}{\pi d}$

B. $\frac{10\mu_0}{\pi d}$

C. $\frac{14\mu_0}{\pi d}$

D. $\frac{5\mu_0}{\pi d}$

Answer: D

Watch Video Solution

67. In an ammeter, 4% of the main current is passing through the galvanometer. If shunt resistance is 5 Ω, then resistance of galvanometer will be

A. 60 Ω

B. 120 Ω

C. 240 Ω

D. 480 Ω

Answer: B

Watch Video Solution

68. Assertion : In a shunted galvanometer, only 10% current passes through the galvanometer. The resistance of the galvanometer is G. Then resistance of the shunt is G/9.

Reason : If S is the shunt, then voltage across S and G is same.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is True

Answer: B

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Competitive Thinking

1. A straight wire of length 0.5 metre and carrying a current of 1.2 ampere is placed in a uniform magnetic field of induction 2 tesla. If the magnetic field is perpendicular to the length of the wire , the force acting on the wire is

A. 2.4 N

B. 1.2 N

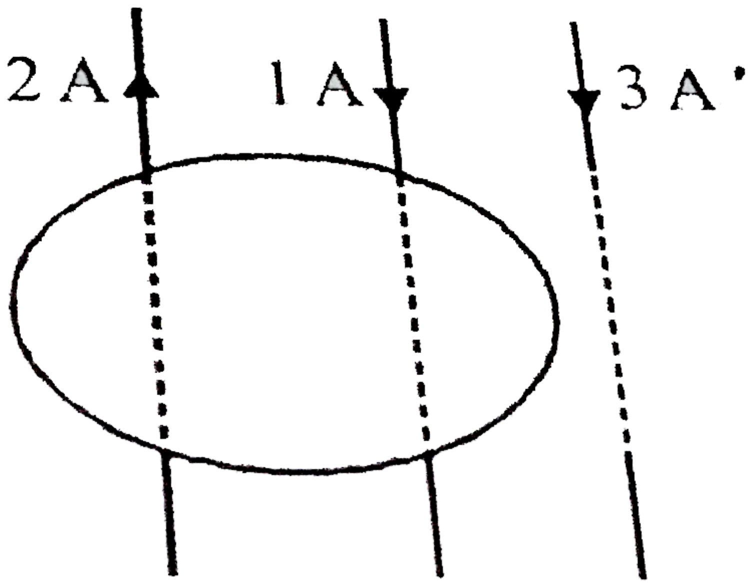
C. 3.0 N

D. 2.0 N

Answer: B

Watch Video Solution

2. Two wires with currents 2A and 1A are enclosed in a circular loop. Another wire with current 3 A is situated outside the loop as shown. The $\oint veB.\,d\vec{I}$ around the loop is



A. μ_0

B. $3\mu_0$

C. $6\mu_0$

D. $2\mu_0$

Answer: A

Watch Video Solution

3. A vertical straight conductor carries a current vertically upwards. A point P lies to the east of it at a small distance and another point Q lies to the west at the same distance. The magnetic field at P is

A. greater than at Q

B. same as at Q

C. less than at Q

D. greater or less than at Q depending upon the strength of the current

Answer: B

Watch Video Solution

4. If a long hollow copper pipe carriers a direct current, the magnetic field associated with the current will be:

A. only inside the pipe

B. only outside the pipe

C. neither inside nor outside the pipe

D. both inside and outside the pipe

Answer: B

Watch Video Solution

5. The magnetic induction at apoint P which is at the distance 4 cm from a long current carrying wire is $10^{-3}T$. The field of induction at a distance 12 cm from the current will be

A. 3.33×10^{-9} tesla

B. 1.11×10^{-4} tesla

C. 3×10^{-3} tesla

D. 9×10^{-2} tesla

Answer: A

Watch Video Solution

6. The magnetic field at a distance r from a long wire carryimg current I is 0.4 T. The magnetic field at a distance 2r is

A. 0.2 tesla

B. 0.8 tesla

C. 0.1 tesla

D. 1.6 tesla

Answer: A

Watch Video Solution

Watch Video Solution

7. A long straight wire carries a current of πamp. The magnetic field due to it will be $5 \times 10^{-5} \text{weber} / m^2$ at what distance from the wire [$\mu_0 =$ permeability of air]

A. $10^4 \mu_0$ metre

B. $\frac{10^4}{\mu_0}$ metre

C. $10^6 \mu_0$ metre

D. $\frac{10^6}{\mu_0}$ metre

Answer: A

Watch Video Solution

8. If the strength of the magnetic field produced 10cm away from a infinitely long straight conductor is$10^{-5} \text{Weber} / m^2$, the value of the current flowing in the conductor will be

A. 5 ampere

B. 10 ampere

C. 500 ampere

D. 1000 ampere

Answer: A

Watch Video Solution

9. Two identical conducting wires AOB and COD are placed at right angles to each other. The wire AOB carries an electric current I_1 and COD carries a current I_2. The magnetic field on a point lying at a distance d from O, in a direction perpendicular to the plane of the wires AOB and COD, will be given by

A. $\frac{\mu_0}{2\pi d}\left(\frac{I_1}{I_2}\right)$

B. $\frac{\mu_0}{2\pi d}(I_1 + I_2)$

C. $\frac{\mu_0}{2\pi d}\left(I_1^2 - I_2^2\right)$

D. $\frac{\mu_0}{2\pi d}\left(I_1^2 + I_2^2\right)^{1/2}$

Answer: D

Watch Video Solution

10. A long starighte wire of radius a carries a steady current I. The curent is unifromly distributed over its cross-section. The ratio of the magnetic fields B and B' , at radial distances $\frac{a}{2}$ and $2a$ respectively from the axis of the wire is:

A. 1

B. 4

C. $\frac{1}{4}$

D. $\frac{1}{2}$

Answer: A

Watch Video Solution

11. A current l flows along the length of an infinitely long, straight, thin-walled pipe. Then,

(a) the magnetic field at all points inside the pipe is the same, but not zero

(b) the magnetic field at any point inside the pipe is zero

(c) the magnetic field is zero only on the axis of the pipe

(d) the magnetic field is different at different points inside the pipe

A. the magnetic fiel at all points inside the pipe is the same but not zero

B. the magnetic field at any point inside the pipe is zero

C. the magnetic field is zero only on the axis of the pipe

D. the magnetic field is different at different points inside the pipe

Answer: B

Watch Video Solution

12. The magnetic field at the centre of a circular coil of radius r carrying current l is B_1. The field at the centre of another coil of radius $2r$ carrying same current l is B_2. The ratio $\frac{B_1}{B_2}$ is

A. $\frac{1}{2}$

B. 1

C. 2

D. 4

Answer: C

Watch Video Solution

13. Two concentric coils of 10 turns each are placed in the same plane. Their radii are 20 cm and 40 cm and carry 0.2 A and 0.3 A current respectively in opposite directions. The magnetic induction (in tesla) at the centre is

A. $\frac{7}{4}\mu_0$

B. $\frac{5}{4}\mu_0$

C. $\frac{3}{4}\mu_0$

D. $\frac{9}{4}\mu_0$

Answer: B

Watch Video Solution

14. The ratio of magnetic field at the centre of a current carrying circular coil to its magnetic momnts is x. If the current and radius both are doubble the new ratio will become

A. $\frac{x}{8}$

B. $\frac{x}{4}$

C. $\frac{x}{2}$

D. 2x

Answer: A

Watch Video Solution

15. A long wire carries a steady curent . It is bent into a circle of one turn and the magnetic field at the centre of the coil is B. It is then bent into a circular loop of n turns. The magnetic field at the centre of the coil will be

A. $2n^2$B

B. nB

C. n^2B

D. 2nB

Answer: C

Watch Video Solution

16. A length of wire carries a steady current. It is first bent to form a circular coil of one turn. The same length is now bent more sharply to give a loop of two turns of smaller radius. The magentic field at the centre caused by the same current now will be

A. a quarter of its first value

B. unaltered

C. four times of its first value

D. a half of its first value

Answer: C

Watch Video Solution

17. When a certain length of wire is turned into one circular loop, the magnetic induction at the centre of coil due to some current flowing is B_1 If the same wire is turned into three loops to make a circular coil, the magnetic induction at the center of this coil for the same current will be

A. B_0

B. $9B_0$

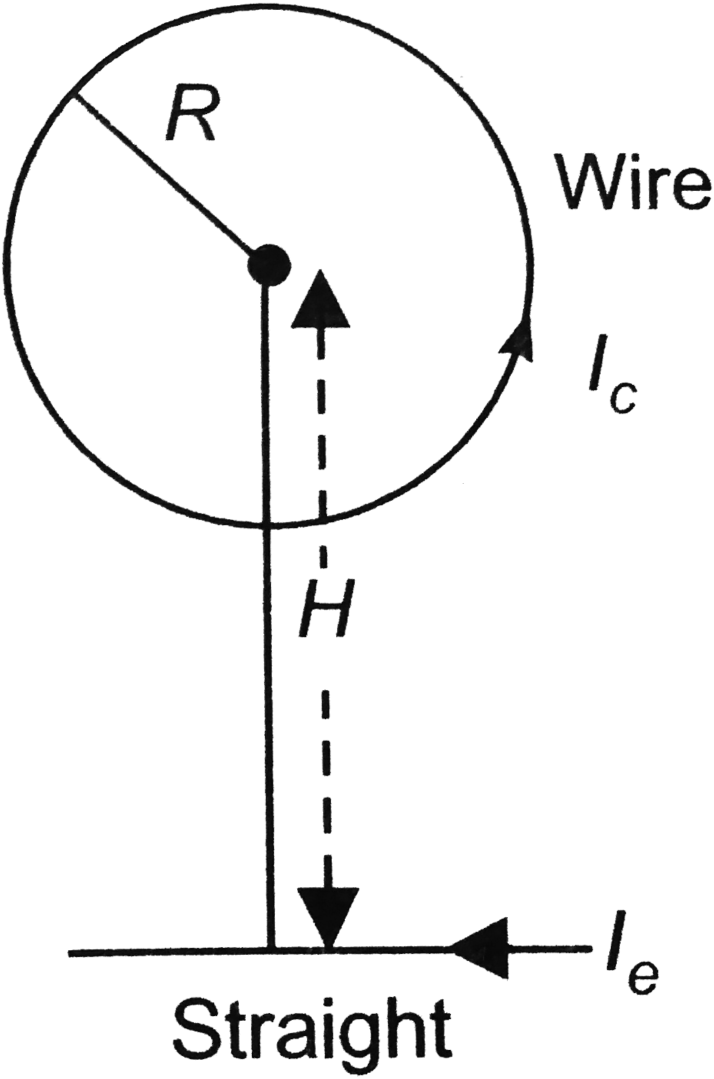
C. $3B_0$

D. $27B_0$

Answer: B

Watch Video Solution

18. Circular loop of a wire and a long straight wire carry current I_c and $I_e$respectively as shown in figure. Assuming that these are placed in the same plane. The magnetic field will be zero at the centre of the loop when the separation H is:



A. $\frac{I_e R}{I_c \pi}$

B. $\frac{I_c R}{I_e \pi}$

C. $\frac{\pi I_c}{I_e R}$

D. $\frac{I_e \pi}{I_c R}$

Answer: A

Watch Video Solution

19. There are 50 turns of a wire in every cm length of a long solenoid. If 4 ampere current is flowing in the solenoid, the approximate value of magnetic field along its axis at an internal point and at one end will be respectively

A. $12.6 \times 10^{-3} Wb/m^2, 6.3 \times 10^{-3} Wb/m^2$

B. $12.6 \times 10^{-3} Wb/m^2, 25.1 \times 10^{-3} Wb/m^2$

C. $25.1 \times 10^{-3} Wb/m^2, 12.6 \times 10^{-3} Wb/m^2$

D. $25.1 \times 10^{-5} Wb/m^2, 12.6 \times 10^{-5} Wb/m^2$

Answer: C

Watch Video Solution

20. A closely wound solenoid of 2000 turns and area of cross-section $1.5 \times 10^{-4} m^2$ carries a current of $2.0A$. It is suspended through its centre and perpendicular to its length, allowing it to turn in a horizontal plane in a uniform magnetic field 5×10^{-2} tesla making an angle of 30° with the axis of the solenoid. The torque on the solenoid with the

A. 3×10^{-3} N.m

B. 1.5×10^{-3} N.m

C. 1.5×10^{-2} N.m

D. 3×10^{-2} N.m

Answer: C

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Watch Video Solution

21. A proton is projected with a uniform velocity 'v' along the axis of a current carrying solenoid, then

A. the proton will be accelerated along the axis

B. the proton path will be circular about the axis

C. the proton move along helical path

D. the proton will continue to move with velocity 'v' along the axis

Answer: D

Watch Video Solution

22. A solenoid has length $0.4m$, radius 1 cm and 400 turns of wire. If a current fo 5 A is passed through this solenoid, then what is the magnetic field inside the solenoid?

A. 6.28×10^{-1} T

B. 6.28×10^{-3} T

C. 6.28×10^{-7} T

D. 6.28×10^{-6} T

Answer: A

Watch Video Solution

23. A small cylindrical soft iron piece is kept in a galvanometer so that

A. a radial magnetic field is produced

B. a uniform magnetic field is produced

C. there is a steady deflection of the coil

D. all of these

Answer: D

Watch Video Solution

24. In a moving coil galvanometer, the deflection of the coil θ is related to the electric current i by the relation

A. $I \propto \tan \theta$

B. $I \propto \theta$

C. $I \propto \theta^{\circ}$

D. $I \propto \sqrt{\theta}$

Answer: B

Watch Video Solution

25. If in a moving coil galvanometer, a current I produces a deflection θ, then

A. $I \propto \tan \theta$

B. $I \propto \theta$

C. $I \propto \theta^{\circ}$

D. $I \propto \sqrt{\theta}$

Answer: B

Watch Video Solution

26. A rectangular coil $20cm \times 20cm$ has 100 turns and carries a current of $1A$. It is placed in a uniform magnetic field $B = 0.5T$ with the direction of magnetic field parallel to the plane of the coil. The magnitude of the torque required to hold this coil in this position is

A. zero

B. 200 N-m

C. 2 N-m

D. 10 N-m

Answer: C

Watch Video Solution

27. The magnets of two suspended coil galvanometer are of the same strength so that they produce identical uniform magnetic fields in the region of the coils. The coil of the first one is in the shape of a square of side a and that of the second one is circular of radius $\frac{a}{\sqrt{\pi}}$. When the same current is passed throught the coils, the ratio of the torque experienced by the first coil to that rxperienced by the second one is

A. $1:\frac{1}{\sqrt{\pi}}$

B. $1:1$

C. $\pi:1$

D. $1:\pi$

Answer: B

Watch Video Solution

Watch Video Solution

28. A recantagular coil of length $0.12m$ and width $0.1m$ having 50 turns of wire is suspended vertically in unifrom magnetic field of srenght 0.2 $Weber / m^2$. The coil carres a current of 2 A. If the plane of the coil is inclined at an angl,e of 30° with the direction of the feld the torque required to keep the coil in stable equilibrium will be

A. 0.12 Nm

B. 0.15 Nm

C. 0.20 Nm

D. 0.24 Nm

Answer: C

Watch Video Solution

29. The resistance of an ideal ammeter is

A. infinite

B. very high

C. small

D. zero

Answer: D

Watch Video Solution

30. Assertion : Higher the range, greater is the resistance of ammeter.

Reason : To increase the range of ammeter, additional shunt needs to be used across it.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is True

Answer: D

Watch Video Solution

31. In a ammeter 0.2% of main current passes through the galvanometer. If resistance of galvanometer is G, the resistance of ammeter will be

A. $\frac{1}{499}$G

B. $\frac{499}{500}$G

C. $\frac{1}{500}$G

D. $\frac{500}{499}$G

Answer: C

Watch Video Solution

32. In a ammeter 0.2% of main current passes through the galvanometer. If resistance of galvanometer is G, the resistance of ammeter will be

A. 10 ohm in series

B. 10 ohm in parallel

C. 810 ohm in series

D. 810 ohm in parallel

Answer: B

Watch Video Solution

33. The resistance of a galvanometer is 90 ohms. If only 10 percent of the main current may flow through the galvanometer, in which way and of what value, a resistor is to be used ?

A. 10Ω

B. $\frac{250}{19}\Omega$

C. $\frac{1000}{19}\Omega$

D. $\frac{125}{19}\Omega$

Answer: A

Watch Video Solution

34. A galvanometer whose resistance is 120Ω gives full scale deflection with a curretn of $0.5A$ so that it can read a maximum current of $10A$. A shunt resistance is added in parallel with it. The resistance of the ammeter so formed is

A. 0.06Ω

B. 0.006Ω

C. 0.6Ω

D. 6Ω

Answer: C

Watch Video Solution

35. What is the value of shunt resistance required to convert a galvanometer of resistance 100Ω into an ammeter of range 1A ? (Given : Full scale deflection of the galvanometer is 5 mA.)

A. $\frac{5}{9.95}\Omega$

B. $\frac{9.95}{5}\Omega$

C. 0.5Ω

D. 0.05Ω

Answer: A

Watch Video Solution

36. A galvanometer of resistance 99 Ω requires 5 mA current for full scale deflection. It can be converted into an ammeter of range 0.5 A by connecting a shunt resistance of

A. 3Ω

B. 1Ω

C. 2Ω

D. 4Ω

Answer: B

Watch Video Solution

37. A galvanometer having a coil resistance of 100ω gives a full scale deflection , when a current of $1mA$ is passed through it. The value of the resistance, which can convert this galvanometer into ammeter giving a full scale deflection for a current of $10A$, is :

A. 2Ω

B. 0.1Ω

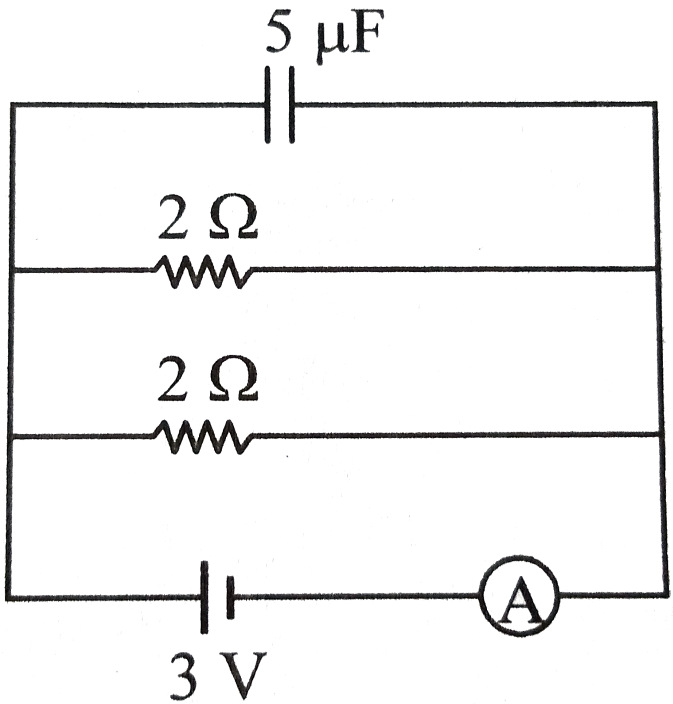
C. 3Ω

D. 0.01Ω

Answer: D

Watch Video Solution

38. What is the reading of ammeter shown in the figure below ?



A. 3A

B. 4A

C. 1.5A

D. 6A

Answer: A

Watch Video Solution

39. For the galvanometer working as voltmeter _____ is connected with the coil of the galvanometer.

A. high resistance in parallel

B. high resistance in series

C. low resistance in parallel

D. low resistance in series

Answer: B

Watch Video Solution

40. Assertion : An ammeter is always connected in series whereas a voltmeter is connected in parallel.

Reason : An ammeter is a low-resistance galvanometer while a voltmeter is high resistance galvanometer.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is True

Answer: A

Watch Video Solution

41. When a resistance of 100Ω is connected in series with a galvanometeer of resistance R, its range is V. To double its range, a resistance of 1000Ω is connected in series. Find R.

A. 700Ω

B. 800Ω

C. 900Ω

D. 100Ω

Answer: C

Watch Video Solution

42. A range of galvanometer is V, when 50Ω resistance is connected in series. Its range gets doubled when 500Ω resistance is connected in series. Galvanometer resistance is

A. 100Ω

B. 200Ω

C. 300Ω

D. 400Ω

Answer: D

Watch Video Solution

43. A galvanometer of resistance 50 Ω giving full scale deflection for a current of 10 milliampere is to be changed into a voltmeter of range 100 V. A resistance of ________ Ω has to be connected in series with the galvanometer.

A. 9950

B. 10025

C. 10000

D. 9975

Answer: A

Watch Video Solution

44. A galvanometer of resistance 50 Ω gives a full scale deflection for a current 5×10^{-4} A. The resistance that should be connected in series with the galvanometer to read 3 V is

A. 5059Ω

B. 595Ω

C. 5950Ω

D. 5050Ω

Answer: C

Watch Video Solution

45. When a current of 5mA is passed through a galvanometer having a coil of resistance 15Ω, it shows full sacle deflection. The value of the resistance to be put in series with the galvanometer to convert it into a voltmeter of range $0-10V$ is:

A. $2.535\times10^3\Omega$

B. $4.005\times10^3\Omega$

C. $1.985 \times 10^3 \Omega$

D. $2.045 \times 10^3 \Omega$

Answer: C

Watch Video Solution

46. A galvanometer coil has a resistance of 50 Ω and the meter shows full scale deflection for a current of 5 mA. This galvanometer is converted into voltmeter of range 0-20 by connecting

A. 3950 Ω in series with galvanometer

B. 4050 Ω in series with galvanometer

C. 3950 Ω in parallel with galvanometer

D. 4050 Ω in parallel with galvanometer

Answer: A

Watch Video Solution

47. A voltmeter reads 6 V at full scale deflection and is graded as 3000 Ω/V. What resistance should be connected in series with it so that it reads 12 V at full-scale deflection ?

A. $1.8 \times 10^4 \Omega$

B. $3.6 \times 10^4 \Omega$

C. $5.4 \times 10^4 \Omega$

D. $7.2 \times 10^4 \Omega$

Answer: A

Watch Video Solution

48. The current sensitivity of a moving coil galvanometer can be increased by

A. decreasing the number of turns of coil

B. increasing the number of turns of coil

C. decreasing the area of a coil

D. by using a weak magnet

Answer: B

Watch Video Solution

49. Three moving coil galvanometer A,B and C are made of coils of three different material having torsional constant $1.8 \times 10^{-8}, 2.8 \times 10^{-8}$ and 3.8×10^{-8} respectively if the three galvanometer are identical in all other respect then in which of the above cases sensitivity maximum

A. A

B. B

C. C

D. Constant in each case

Answer: A

Watch Video Solution

50. Assertion : The sensitivity of a moving coil galvanometer is increased by using a soft iron cylinder as a core inside the coil.

Reason : Soft iron has a high magnetic permeability and cannot be easily magnetised or demagnetised.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is True

Answer: C

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51. The magnetic field at the centre of the M.C.G. is 0.25 T. The coil has an area of $0.2m^2$ and has 28 turns. If the sensitivity of the M.C.G. is to be increased by 25%, the number of turns of the coil should be ______. Assume all other things remaining constant.

A. 30

B. 32

C. 35

D. 38

Answer: C

Watch Video Solution

52. Current sensitivity of a galvanometer is x div/mm and voltage sensitivity is y div/m. If resistance of galvanometer is G then relation between x and y is

A. $G = \frac{y}{x}$

B. $G = \frac{x}{y}$

C. $G = \frac{x}{y} \times 10^3$

D. $y = Gx \times 10^3$

Answer: C

Watch Video Solution

53. Current senstivity of moving coil galvanometer is $5\text{div}/mA$ and its voltage senstivity (angular deflection per unit voltage applied) is $20\text{div}/V$. The resistance of the galvanometer is

A. 40Ω

B. 25Ω

C. 250Ω

D. 500Ω

Answer: C

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54. The coild of a galvanometer consists of 100 turn and effective area $1cm^2$. The restoring couple is $10^{-8} n - m / rad$. The magnetic field between the pole pieces 5 tesla. The current sensitivty per micro ampere.

A. $5 \times 10^4 \text{rad} / \mu A$

B. 5×10^{-6} per A

C. 2×10^{-7} per A

D. $5 \mathrm{rad} / \mu A$

Answer: D

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55. The senstivity of a moving coil galvanometer is 'S'. If a shunt of $\left(\frac{1}{8}\right) th$ of the resistance of the galvanometer is connected to the moving coil galvanometer, its senstivity becomes

A. $\frac{s}{3}$

B. $\frac{s}{6}$

C. $\frac{s}{9}$

D. $\frac{s}{12}$

Answer: C

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56. Cyclotron is used to accelerate

A. only negatively charged particles

B. neutron

C. both positively and negatively charged particles.

D. only positively chared particles

Answer: D

Watch Video Solution

57. A proton of mass m and charge q is moving in a plane with kinetic energy E. if there exists a uniform magnetic field B, perpendicular to the plane motion. The proton will move in a circular path of radius

A. $\frac{2Em}{qB}$

B. $\frac{\sqrt{2Em}}{qB}$

C. $\frac{\sqrt{Em}}{2qB}$

D. $\sqrt{\frac{2Eq}{mB}}$

Answer: B

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58. In cyclotron for a given magnet radius of the semicircle traced by positive ion is directly proportional to (where v= velocity of positive ion)

A. v^{-2}

B. v^{-1}

C. v

D. v^2

Answer: C

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59. An electron is moving in a circle of radius 'r' in a uniform magnetic field 'B'. Suddenly the field is reduced to $\frac{'B'}{2}$. The radius of the circular path now becomes

A. $\frac{r}{2}$

B. 2r

C. $\frac{r}{4}$

D. 4r

Answer: B

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60. In the cyclotron, as radius of the circular path of the charged particle increase (ω = angular velocity, v = linear velocity)

A. both ω and v increases

B. ω only increases, v remains constant

C. v increases, ω remains constant

D. v increases, ω decreases

Answer: C

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61. In a cyclotron, the angular frequency of a charged particle is independent

A. mass

B. speed

C. charge

D. magnetic field

Answer: B

Watch Video Solution

62. Two particles X and Y with equal charges, after being accelerated throuhg the same potential difference, enter a region of uniform magnetic field and describe circular paths of radii R_1 and R_2 respectively. The ratio of the mass of X to that of Y is

A. $\frac{r_1}{r_2}$

B. $\sqrt{\frac{r_1}{r_2}}$

C. $\left[\frac{r_2}{r_1}\right]^2$

D. $\left[\frac{r_1}{r_2}\right]^2$

Answer: D

Watch Video Solution

63. A beam of electrons is accelerated through a potential difference V. It is then passed normally through a uniform magnetic field where it moves in a circle of radius r. It would have moved in a circle of radius $2r$ if it were initially accelarated through a potential difference

A. 2V

B. 4V

C. 1V

D. 3V

Answer: B

Watch Video Solution

64. A charged particle is moving in a uniform magnetic field in a circular path. Radius of circular path is R. When energy of particle is doubled, then new radius will be

A. $R\sqrt{2}$

B. $R\sqrt{3}$

C. 2R

D. 3R

Answer: A

Watch Video Solution

65. An electron having mass 9.1×10^{-11} kg, charge 1.6×10^{-19} C and moving with the velocity of 10^{6} m/s enters a region where magnetic field exists. If it describes a circle of radius 0.2 m then the intensity of magnetic field must be ________ $\times 10^{-5}$T

A. 14.4

B. 5.65

C. 2.84

D. 1.32

Answer: C

Watch Video Solution

66. A proton beam enters magnetic field of $10^{-4}Wb/m^2$ normally. If the specific charge of the proton is $10^{11}C/kg$ and its velocity is $10^9 m/s$ then the radius of the circle described will be

A. 100 m

B. 0.1 m

C. 1 m

D. 10 m

Answer: A

Watch Video Solution

67. The ratio of periods of α-particle and proton moving on circular path in uniform magnetic field is ______.

A. $2:1$

B. $1:2$

C. $4:1$

D. $1:4$

Answer: A

Watch Video Solution

68. A proton of mass m moving with a speed $v(< < c$, velocity of light in vacuum) completes a circular orbit in time T in a uniform magnetic field. If the speed of the proton is increased to $\sqrt{2}v$, what will be time needed to complete the circular orbit?

A. $\sqrt{2}$ T

B. T

C. $\frac{T}{\sqrt{2}}$

D. $\frac{T}{2}$

Answer: B

Watch Video Solution

69. The maximum velocity to which a proton can be accelerated in a cyclotron of 10 MHZ frequency and radius 50 cm is

A. $6.28 \times 10^{8} m/s$

B. $3.14 \times 10^{8} m/s$

C. $6.28 \times 10^{7} m/s$

D. $3.14 \times 10^{7} m/s$

Answer: D

Watch Video Solution

Watch Video Solution

70. The cyclotron frequency of an electron gyrating in a magnetic field of $1T$ is approximately:

A. 28 MHz

B. 280 MHz

C. 2.8 GHz

D. 28 GHz

Answer: D

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71. A cyclotron oscillator frequency is $10MHz$. What should be the operating magnetic field for accelerating protons? If the radius of its dees is $60cm$, what is the kinetic energy of the proton beam produced by the acceleration in MeV?

$(e = 1 \cdot 6 \times 10^{-19} C, m_p = 1 \cdot 67 \times 10^{-27} kg, 1 MeV = 1 \cdot 6 \times 10^{-13} J)$

A. 9 MeV

B. 10 MeV

C. 7 MeV

D. 11 MeV

Answer: C

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72. An electron is moving in a circular path under the influence fo a transerve magnetic field of $3.57 \times 10^{-2} T$. If the value of e/m is $1.76 \times 10^{141} C/kg$. The frequency of revolution of the electron is

A. 6.28 MHz

B. 1 GHz

C. 100 MHz

D. 62.8 MHz

Answer: B

Watch Video Solution

73. A proton is moving with a uniform velocity of $10^6 m.s^{-1}$ along the Y-axis, under the joint action of a magnetic field along Z-axis and an electric field of magnitude $2 \times 10^4 V.m^{-1}$ along the negative X-axis. If the electric field is switched off, the proton starts moving in a circle. The radius of the circle is nearly (given: $\frac{e}{m}$ ratio for proton $\approx 10^8 C.kg^{-1}$)

A. 0.5 m

B. 0.2 m

C. 0.1 m

D. 0.05 m

Answer: A

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74. The operating magnetic field for accelerating protons in a cyclotron oscillator having frequency of 12 MHz is $\left(q = 1.6 \times 10^{-19} C, m_p = 1.67 \times 10^{-27} kg \text{ and } 1 MeV = 1.6 \times 10^{-13 J}\right)$

A. 0.8 T

B. 1.6 T

C. 2.0 T

D. 3.2 T

Answer: A

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75. A proton, a deuteron and an α- particle having the same kinetic energy are moving in circular trajectors in a constant magnetic field. If r_p, r_d and r_α denote respectively the radii of the trajectories of these particles then

A. $r_e < r_p < r_\alpha$

B. $r_e < r_\alpha < r_p$

C. $r_e > r_p = r_\alpha$

D. $r_e < r_p = r_\alpha$

Answer: D

Watch Video Solution

76. A proton, a deuteron and an α-particle with the same KE enter a region of uniform magnetic field, moving at right angles to B. What is the ratio of the radii of their circular paths ?

A. $1 : \sqrt{2} : 1$

B. $1 : \sqrt{2} : \sqrt{2}$

C. $\sqrt{2} : \sqrt{2} : 1$

D. $\sqrt{2} : 1 : 1$

Answer: A

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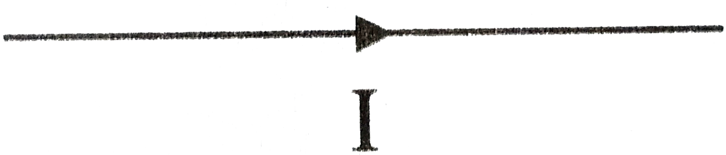
77. A straight wire of length 50 cm carrying a current of 2.5 A is suspended in mid-air by a uniform magnetic field of 0.5 T (as shown in figure). The mass of the wire is (g = 10 ms^{-2})



A. 250 g

B. 125 g

C. 62.5 g

D. 100 g

Answer: C

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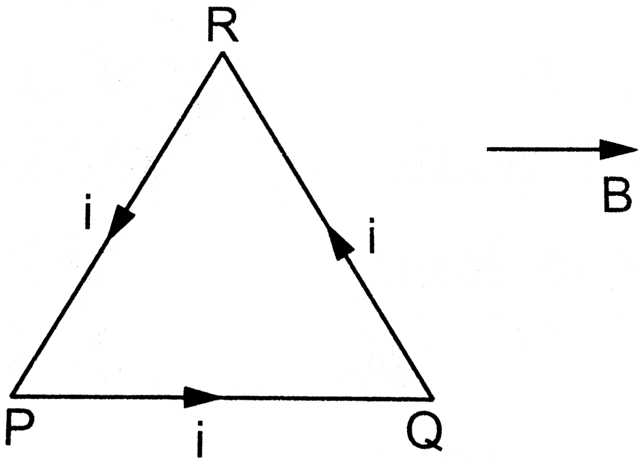
78. shows a triangular loop PQR carrying a current i. The triangle is equilateral with edge-length i. A uniform magnetic field B exists in a direction parallel to PQ. Find the forces acting on the three wirs PQ, QR and RP separately.



A. $0, \frac{\sqrt{3}}{2} i / B, \frac{\sqrt{3}}{2} i / B$

B. $0, \frac{1}{2} i / B, \frac{\sqrt{3}}{2} i / B$

C. $0, \frac{\sqrt{3}}{2} i / B, \frac{1}{2} i / B$

D. $\frac{\sqrt{3}}{2} i / B, 0, 0$

Answer: A

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79. An electron moving in a circular orbit of radius makes n rotations per second. The magnetic field produced at the centre has magnitude :

A. $\frac{\mu_0 \text{ne}}{2\pi r}$

B. Zero

C. $\frac{\mu_0 n^2 e}{r}$

D. $\frac{\mu_0 \text{ne}}{2r}$

Answer: D

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80. A proton, a deuteron and an α particle are accelerated through same potential difference and then they enter a normal uniform magnetic field, the ratio of their kinetic energies will be

A. $1:2:2$

B. $2:2:1$

C. $1:2:1$

D. $1:1:2$

Answer: D

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81. A particle carrying a charge equal to 100 times the charge on an electron is rotating per second in a circular path of radius $0.8 metre$. The value of the magnetic field produced at the centre will be (μ_0 = permeability for vacuum)

A. $\frac{10^{-7}}{\mu_0}$

B. $10^{-17}\mu_0$

C. $10^{-6}\mu_0$

D. $10^{-7}\mu_0$

Answer: B

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82. A helium nucleus makes a full rotation in a circle of radius 0.8 metre in two seconds. The value of the magnetic field B at the centre of the circle will be

A. $\frac{10^{-19}}{\mu_0}$

B. $10^{-19}\mu_0$

C. $2 \times 10^{-10}\mu_0$

D. $\frac{2 \times 10^{-10}}{\mu_0}$

Answer: B

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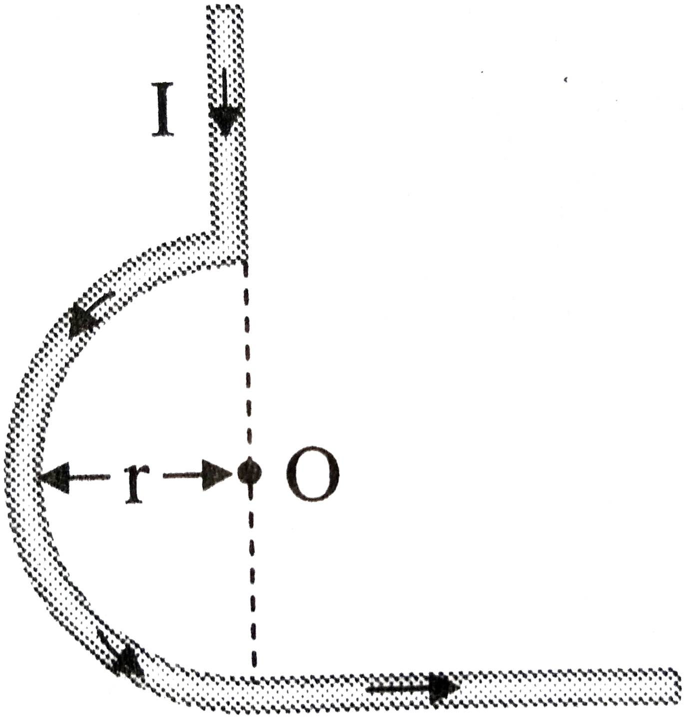
83. In the figure, what is the magnetic field at the point O ?



A. $\dfrac{\mu_0 I}{4\pi r}$

B. $\dfrac{\mu_0 I}{4\pi r} + \dfrac{\mu_0 I}{2\pi r}$

C. $\dfrac{\mu_0 I}{4r} + \dfrac{\mu_0 I}{4\pi r}$

D. $\dfrac{\mu_0 I}{4r} - \dfrac{\mu_0 I}{4\pi r}$

Answer: C

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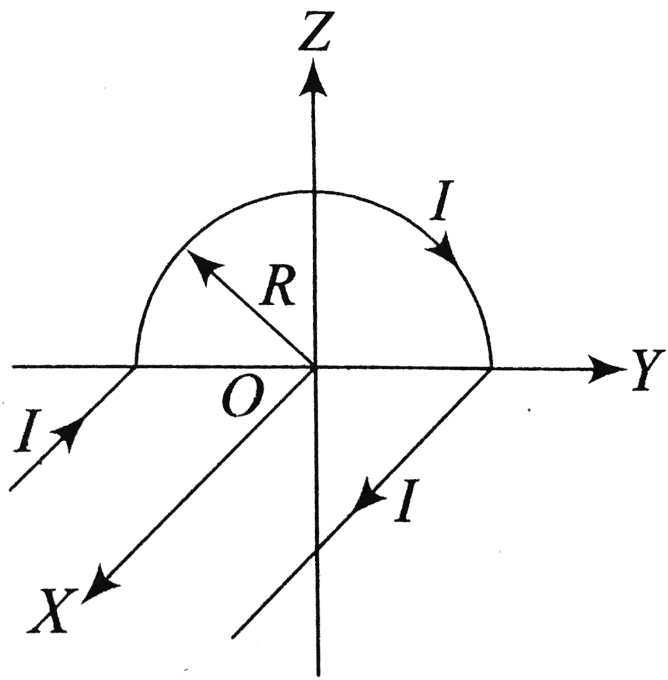
84. A wire carrying current I has the shape as shown in the adjoining figure. Linear parts of the wire are very long and parallel to X-axis while semicicular portion of radius R is lying in $Y - Z$ plane. Magnetic field at point O is



A. $\overrightarrow{B} = \frac{\mu_0}{4\pi} \frac{I}{R} \left(\pi \hat{i} + 2\hat{k}\right)$

B. $\overrightarrow{B} = -\frac{\mu_0}{4\pi} \frac{I}{R} \left(\pi \hat{i} - 2\hat{k}\right)$

C. $\overrightarrow{B} = -\frac{\mu_0}{4\pi}\frac{I}{R}\left(\pi\hat{i} + 2\hat{k}\right)$

D. $\overrightarrow{B} = \frac{\mu_0}{4\pi}\frac{I}{R}\left(\pi\hat{i} - 2\hat{k}\right)$

Answer: C

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85. A staright wire of length (π^2) meter is carrying a current of $2A$ and the magnetic field due to it is measured at a point distant $1cm$ from it. If the wire is to be bent into a circles and is to carry the same current as before, the ratio of the magnetic field at its centre to that obtained in the first case would be

A. $50:1$

B. $1:50$

C. $100:1$

D. $1:100$

Answer: B

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86. Magnetic field at the centre of coil of n turns, bent in the form of a square of side $2l$, carrying current i, is

A. $\frac{\sqrt{2}\mu_0 nI}{\pi l}$

B. $\frac{\sqrt{2}\mu_0 nI}{2\pi l}$

C. $\frac{\sqrt{2}\mu_0 nI}{4\pi l}$

D. $\frac{2\mu_0 nI}{\pi l}$

Answer: A

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87. Two identical wires A and B , each of length 'l', carry the same current I. Wire A is bent into a circle of radius R and $wire B$ is bent to form a square of side 'a' . If B_A and B_B are the values of magnetic field at the centres of the circle and square respectively , then the ratio $\frac{B_A}{B_B}$ is :

A. $\frac{\pi^2}{16\sqrt{2}}$

B. $\frac{\pi^2}{16}$

C. $\frac{\pi^2}{8\sqrt{2}}$

D. $\frac{\pi^2}{8}$

Answer: C

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88. A length L of wire carrying current I is to be bent into circle or a square, each of one turn. The ratio of B_g (greater) to B_s (smaller) is nearly

A. 1

B. 1.15

C. $\frac{4}{\pi}$

D. 2

Answer: B

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89. A current carrying thin uniform wire of length '4l' is bent like a square so that it produces a magnetic induction B_1 at the centre of the square. When the same wire is bent like a circle, it produces a magnetic induction B_2 at the centre of the circle. The ratio between $B_1 \text{ and } B_2$ is

A. $\pi^2 : 8\sqrt{2}$

B. $8 : \pi^2$

C. $\sqrt{2} : \pi^2$

D. $8\sqrt{2} : \pi^2$

Answer: D

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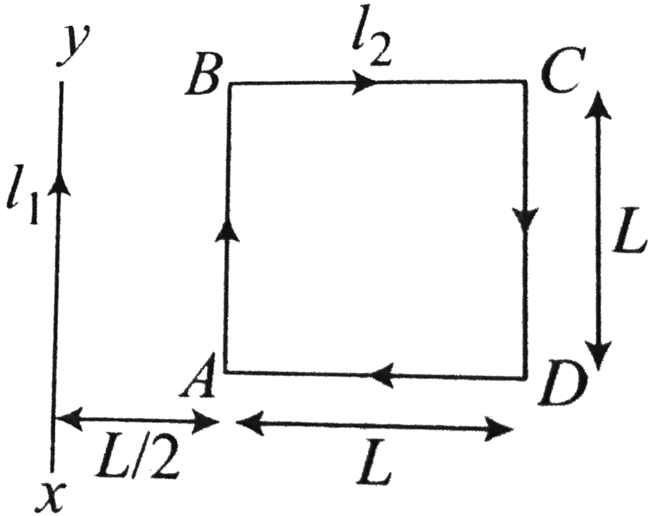
90. A sqaure loop $ABCD$, carrying a current I_2 is placed near and coplanar with a long straight conductor XY, carrying a current I_1 as shwon in Figure. The net force on the loop will be



A. $\dfrac{2\mu_0 IiL}{3\pi}$

B. $\dfrac{\mu_0 IiL}{2\pi}$

C. $\dfrac{2\mu_0 Ii}{3\pi}$

D. $\dfrac{\mu_0 Ii}{2\pi}$

Answer: C

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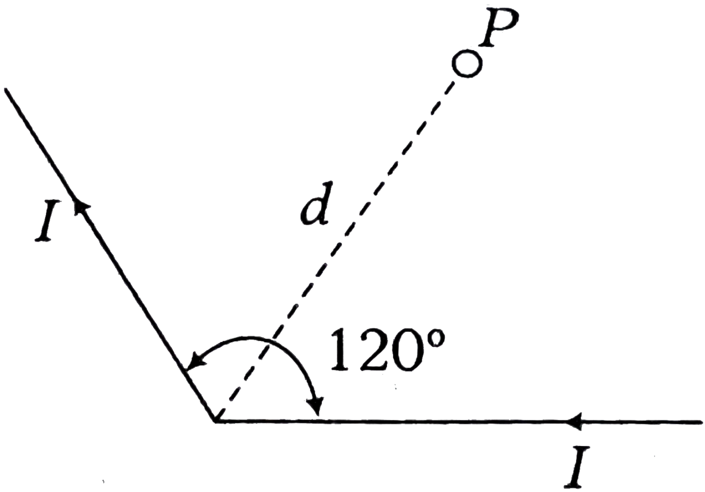
91. A long conducting wire carrying a current I is bent at 120° (see figure). The magnetic field B at a point P on the right bisector of bending angle at a distance d from the bend is

(μ_0 is the permeability of free space)



A. $\frac{3\mu_0 I}{2\pi d}$

B. $\frac{\mu_0 I}{2\pi d}$

C. $\frac{\mu_0 I}{\sqrt{3}\pi d}$

D. $\frac{\sqrt{3}\mu_0 I}{2\pi d}$

Answer: D

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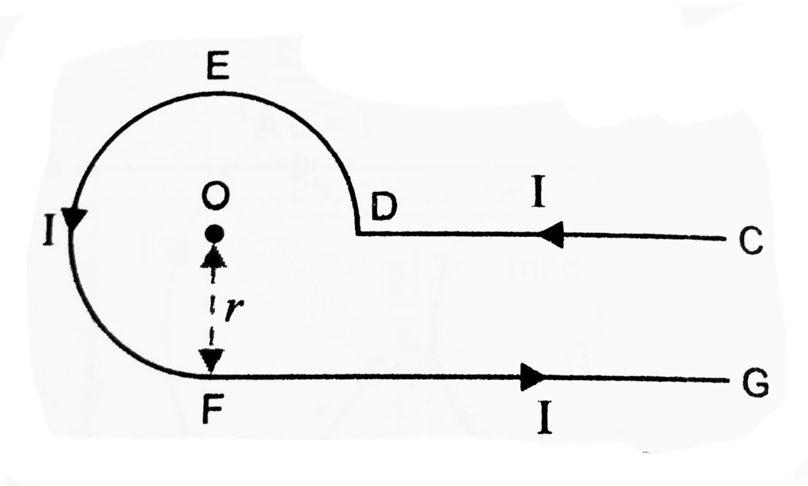
92. A current I is flowing in a conductor shaped as shown in figure. The radius of the curved part is r and length of straight portion is very large. Find the magnetic field induction at the centre O.



A. $\frac{\mu_0 I}{4\pi r}\left(\frac{\pi}{2}+1\right)$

B. $\frac{\mu_0 I}{4\pi r}\left(\frac{\pi}{2}-1\right)$

C. $\frac{\mu_0 I}{4\pi r}\left(\frac{3\pi}{2}+1\right)$

D. $\frac{\mu_0 I}{4\pi r}\left(\frac{3\pi}{2}-1\right)$

Answer: C

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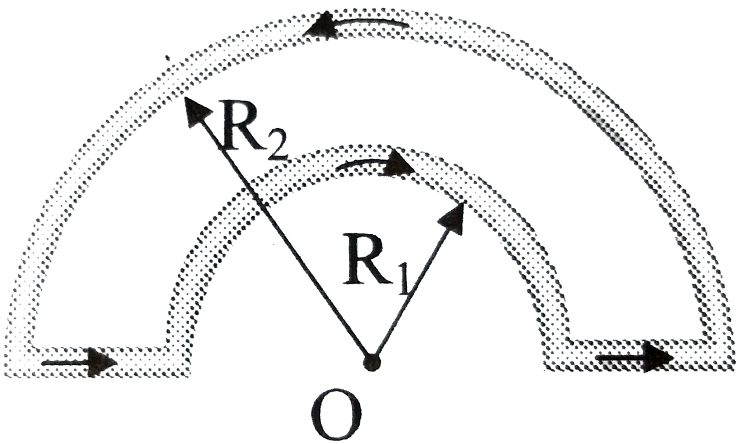
93. The magnetic inductionn at the centre O in the figure shown is



A. $\frac{\mu_0 i}{4}\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$

B. $\frac{\mu_0 i}{4}\left(\frac{1}{R_1}+\frac{1}{R_2}\right)$

C. $\frac{\mu_0 i}{4}(R_1 - R_2)$

D. $\frac{\mu_0 i}{4}(R_1 + R_2)$

Answer: A

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94. Two long parallel wires P and Q are both perpendicular to the plane of the paper with distance $5m$ between them. If P and Q carry current of 2.5 amp and 5 amp respectively in the same direction, then the magnetic field at a point half way between the wires is

A. $\frac{\sqrt{3}\mu_0}{2\pi}$

B. $\frac{\mu_0}{\pi}$

C. $\frac{3\mu_0}{2\pi}$

D. $\frac{\mu_0}{2\pi}$

Answer: D

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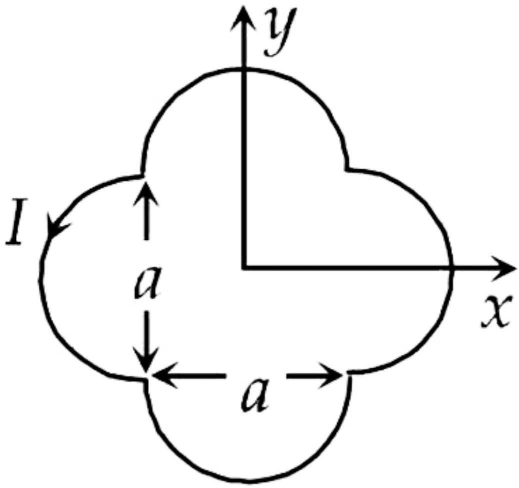
95. A loop carrying current I lies in the $x-y$ plane as shown in the figure . The unit vector $\hat{k}$ is coming out of the plane of the paper . The magnetic moment of the current loop is



A. $a^2 I\hat{k}$

B. $\left(\frac{\pi}{2}+1\right)a^2 I\hat{k}$

C. $-\left(\frac{\pi}{2}+1\right)a^2 I\hat{k}$

D. $(2\pi+1)a^2 I\hat{k}$

Answer: B

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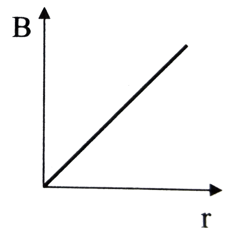
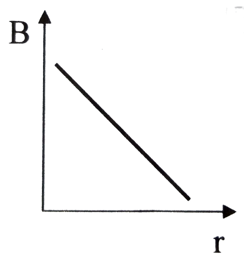
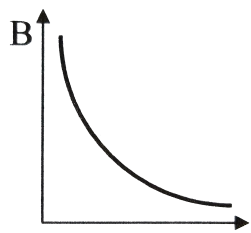
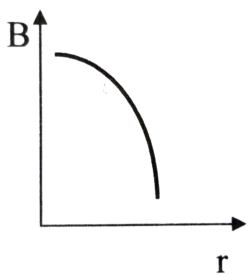
96. The magnetic induction at any point due to a long straight wire carrying a current is

A. 

B. 

C. 

D. 

Answer: C

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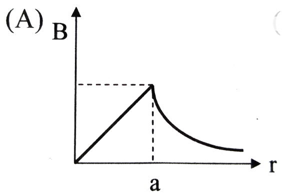
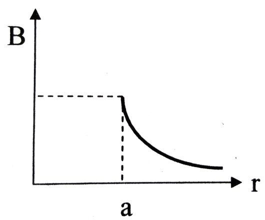
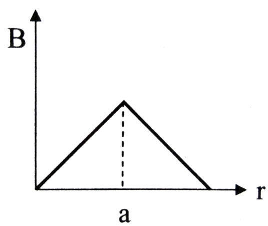
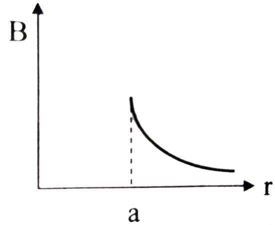
97. The magnetic field due to a conductor fo unifrom cross section of radius a and carrying a steady current is represented by

A. 

B. 

C. 

D. 

Answer: A

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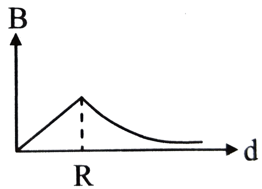
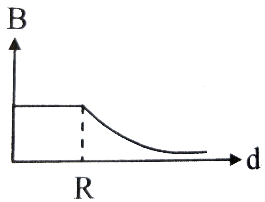
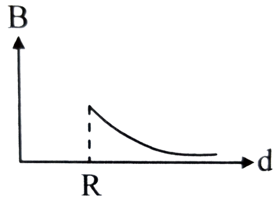
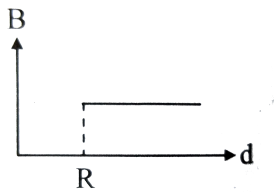
98. A long thin hollow metallic cylinder of radius $'R'$ has a current i ampere. The magnetic induction $'B'$ -away from the axis at a distance r from the axis varies as shown in

A. 

B. 

C. 

D. 

Answer: C

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99. A galvanometer of resistance G is shunted by a resistance $Sohm.$ To keep the main current in the circuit uncharged, the resistnace to be put in series with the galvonmeter

A. $\frac{G^2}{(S+G)}$

B. $\frac{G}{S+G}$

C. $\frac{S^2}{(S+G)}$

D. $\frac{SG}{(S+G)}$

Answer: A

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100. A galvanometer of resistance 50Ω is connected to a battery of 8 V along with a resistance of 3950Ω in series. A full scale deflection of 30 divisions is obtained in the galvanometer. In order to reduce this deflection to 15 divisions, the resistance in series should be .... Ω.

A. 7900

B. 1950

C. 2000

D. 7950

Answer: D

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101. A galvanometer of resistance 30Ω is connected to a battery of emf 2 V with 1970Ω resistance in series. A full scale deflection of 20 divisions is obtained in the galvanometer. To reduce the deflection to 10 divisions, the resistance in series required is

A. 4030Ω

B. 4000Ω

C. 3970Ω

D. 2000Ω

Answer: C

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102. A galvanometer of resistance 50Ω is connected to a battery of $3V$ along with resistance of 2950Ω in series. A full scale deflection of 30 divisions is obtained in the galvanometer. In order to reduce this deflection to 20 division the above series resistance should be

A. 2950Ω

B. 1500Ω

C. 4440Ω

D. 7400Ω

Answer: B

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103. A circuit contains an ammeter, a battery of $30V$ and a resistance $40.8 ohm$ all connected in series. If the ammeter has a coil of resistance $480 ohm$ and a shunt of $20 ohm$, the reading in the ammeter will be

A. 1A

B. 0.5 A

C. 0.25A

D. 2A

Answer: B

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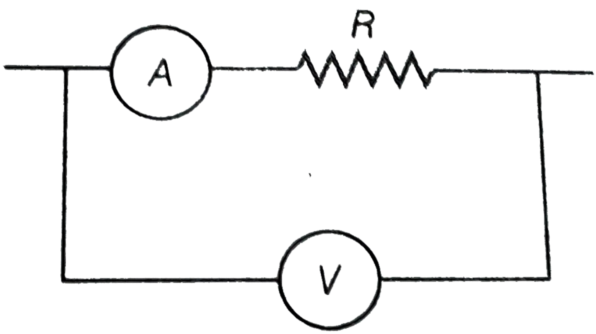
104. In the circuit shown below, the ammeter and the voltmeter readings are 3 A and 6 V respectively . Then, the value of the resistance R is



A. lt 2 Omega`

B. 2Ω

C. $\geq 2\Omega$

D. $> 2\Omega$

Answer: A

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105. The deflection in galvanometer falls to $\left(\frac{1}{4}\right)^{th}$ when it is shunted by 3 Ω. If additional shunt of 2 Ω is connected to earlier shunt, the deflection in galvanometer falls to

A. $\frac{1}{2}$

B. $\left(\frac{1}{3}\right)^{rd}$

C. $\left(\frac{1}{4}\right)^{th}$

D. $\left(\frac{1}{8.5}\right)^{th}$

Answer: D

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106. A voltmeter of 250 mV range having a resistance of 10 Ω is converted into an ammeter of 250 mA range. The value of necessary shunt is (nearly)

A. 2Ω

B. 0.1Ω

C. 1Ω

D. 10Ω

Answer: C

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107. A cyclotron is used to accelerate protons, deuterons, α-particles, etc. If the energy attained, after acceleration, by the protons is E, the energy attained by α-particles shall be

A. 4E

B. 2E

C. E

D. E/4

Answer: C

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108. An alternating electric field, of frequency v, is applied across the dees (radius=R) of a cyclotron that is being used to accelerate protons (mass=m) the operating magnetic field (B) used in the cyclotron and the kinetic energy (K) of the proton beam, produced by it, are given by:

A. $\frac{2\pi mv}{e}, 2\pi^2 mv^2 R^2$

B. $\frac{2\pi^2 mv}{e^2}, 4\pi^2 mv^2 R^2$

C. $\frac{\pi mv}{e}, \pi^2 mv^2 R^2$

D. $\frac{2\pi^2 m^2 v^2}{e}, 2\pi^2 m^2 v^2 R^2$

Answer: A

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109. A proton, an alpha particle both enter a region of uniform magneitc field B, moving at right angles to the field B. If the radius of circular orbits for both the particles is equal and the kinetic energy acquired by proton is 1 MeV, the energy acquired by alpha particle will be :

A. 1 MeV

B. 2 MeV

C. 0.5 MeV

D. 1.5 MeV

Answer: A

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110. An electron revolves along a circular path of radius 20 cm with constant angular velocity 120 rad s^{-1} about an axis passing through the centre and perpendicular to the plane of the circle. If the external magnetic field is absent, then the potential difference between the centre of the circle is (Mass of the electron $= 9.1 \times 10^{-31}$ kg)

A. $3.691 \times 10^{-9} V$

B. $1.738 \times 10^{-9} V$

C. $4.278 \times 10^{-9} V$

D. $2.347 \times 10^{-9} V$

Answer: B

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111. A light charged particle is revolving in a circle of radius 'r' in electrostatic attraction of a static heavy particle with opposite charge. How does the magnetic field 'B' at the centre of the circle due to the moving charge depend on 'r' ?

A. $B \propto \frac{1}{r}$

B. $B \propto \frac{1}{r^2}$

C. $B \propto \frac{1}{r^{\frac{3}{2}}}$

D. $B \propto \frac{1}{r^{\frac{5}{2}}}$

Answer: D

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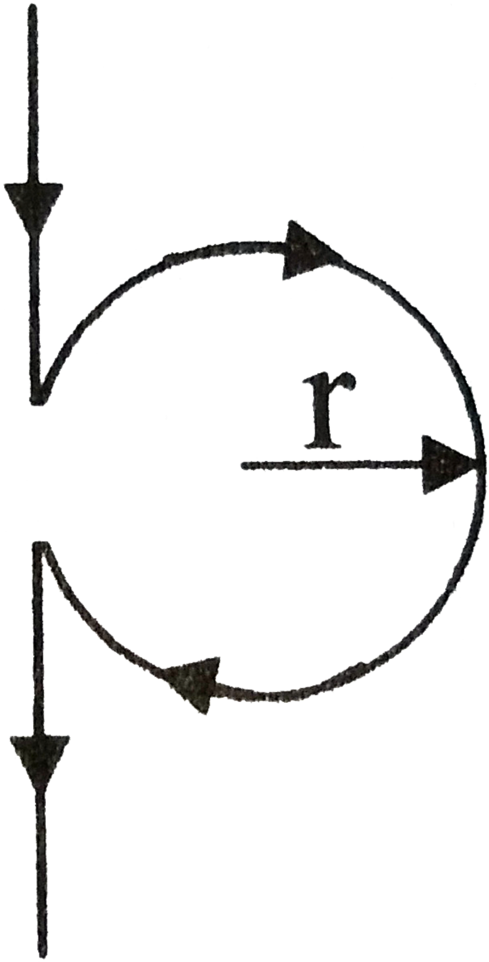
Evaluation Test

1. Magnetic field induction at the centre of a circular coil shown in the figure is



A. $\frac{\mu_0 I(\pi - 1)}{\pi r}$

B. $\frac{(\mu_0 I)(\pi - 1)}{2\pi r}$

C. $\frac{\mu_0 I}{\pi r}$

D. $\frac{\mu_0 I}{2r}\left(\frac{\pi + 1}{\pi}\right)$

Answer: B

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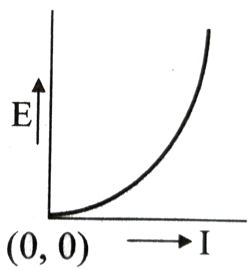
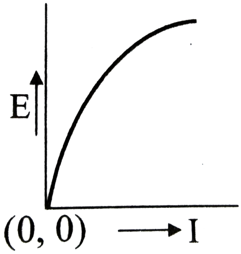
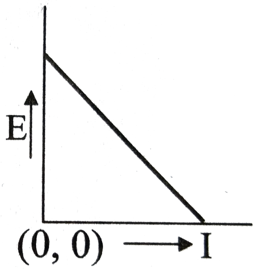
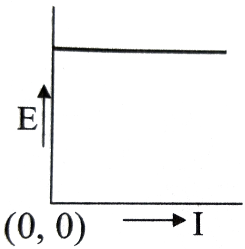
2. A long solenoid carries current I. Curve between energy density (at mid-point of solenoid) E and I is given by

A. 

B. 

C. 

D. 

Answer: A

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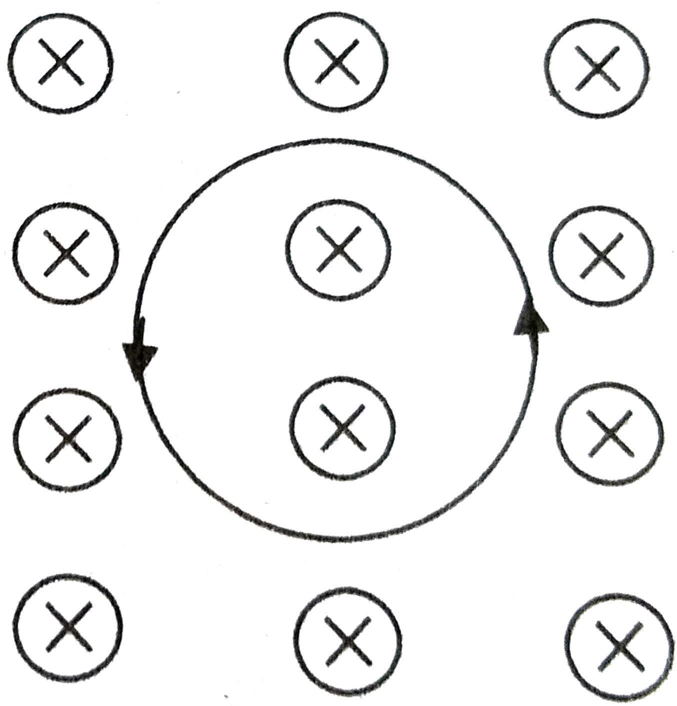
3. A circular coil carrying current is placed in a region of uniform magnetic field acting perpendicular to the plane of the coil as shown in figure. The correct choice among the following is



A. coil contracts

B. coil remains the same

C. coil expands

D. coil moves

Answer: a

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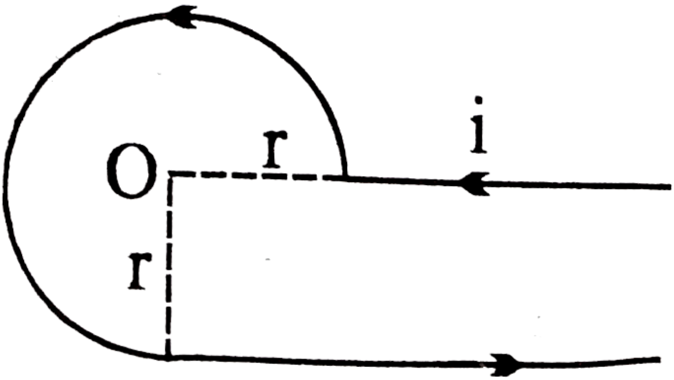
4. Find the magnetic induction at point O if the current carrying wire is in the shape shown in the figure.



A. $\frac{\mu_0 i}{4\pi r}\left[\frac{3}{2}\pi + 1\right]$

B. $\frac{\mu_0 i}{2\pi r}\left[\frac{3}{2}\pi + 1\right]$

C. $\frac{\mu_0 i}{\pi r}\left[\frac{3}{2}\right]$

D. $\frac{\mu_0 i}{2\pi r}\left[1 - \frac{3}{2}\pi\right]$

Answer: A

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5. A proton of mass m and charge q is accelerated by a potential difference V in a perpendicular magnetic field B occupying space t. The value of $\sin\theta$ where θ is deviation of proton from initial direction is

A. $Bt\sqrt{\frac{q}{3Vm}}$

B. $Bt\sqrt{\frac{q}{2Vm}}$

C. $Bt\sqrt{\frac{2q}{Vm}}$

D. $Bt\sqrt{\frac{q}{Vm}}$

Answer: B

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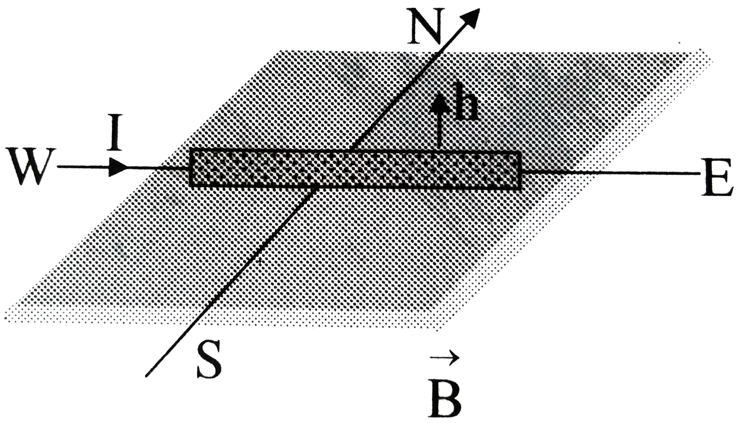
6. A conductor of length l is placed in E - W direction on a plane. Earth's horizontal magnetic field is B. The amount of charge passed through it when it is found to jump to a hight h is



A. $\frac{2}{3}\frac{m\sqrt{2gh}}{Bl}$

B. $\frac{m\sqrt{2gh}}{2Bl}$

C. $\frac{m\sqrt{2gh}}{Bl}$

D. $\frac{m\sqrt{3gh}}{Bl}$

Answer: C

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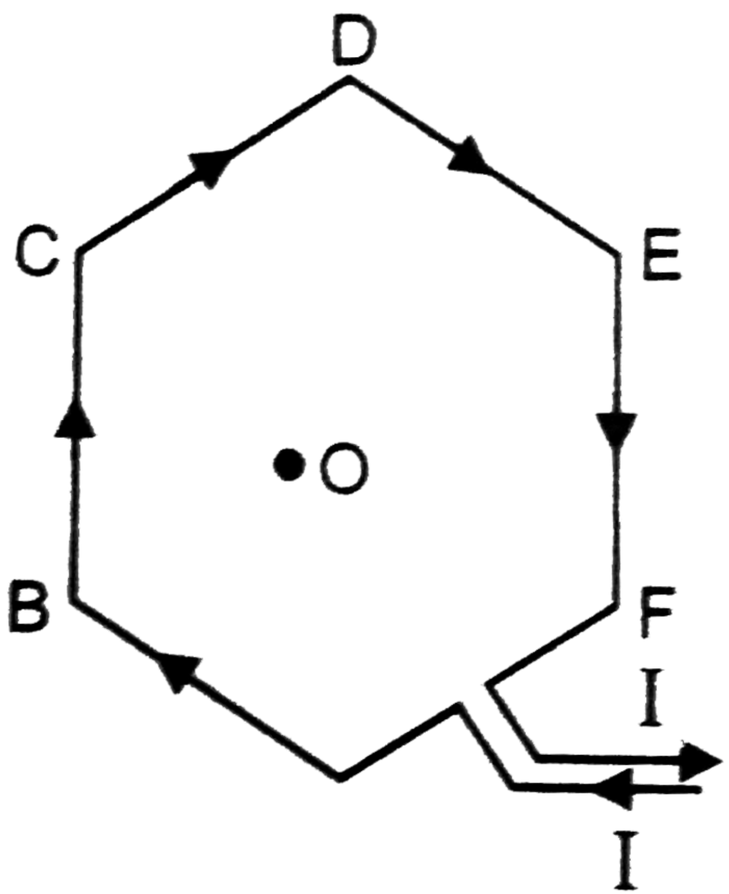
7. A current I is flowing in a hexgonal coil of side a figure. The magnetic field induction at the centre O of the coil will be



A. $\dfrac{\mu_0 i}{4\pi x}$

B. $\dfrac{\pi}{\sqrt{3}}\dfrac{\mu_0 i}{x}$

C. zero

D. $\dfrac{\sqrt{3}\mu_0 i}{\pi x}$

Answer: D

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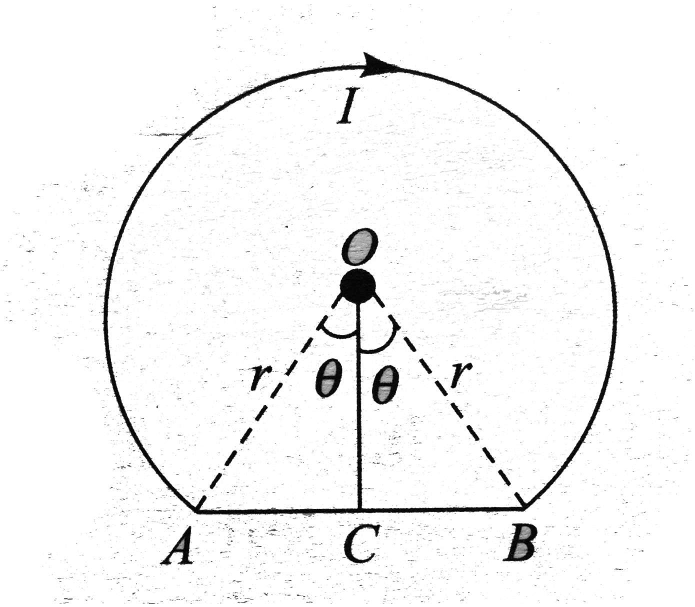
8. A wire is bent in the form of a circular arc with a straight portion AB.

Magnetic induction at O when current flowing in the wire, is



A. $\dfrac{\mu_0 I}{2R}(\pi - \theta + \tan\theta)$

B. $\frac{\mu_0 I}{2\pi R}(\pi + \theta - \tan\theta)$

C. $\frac{\mu_0 I}{2\pi R}(\pi - \theta + \tan\theta)$

D. $\frac{\mu_0 I}{2R}(-\tan\theta + \pi - \theta)$

Answer: C

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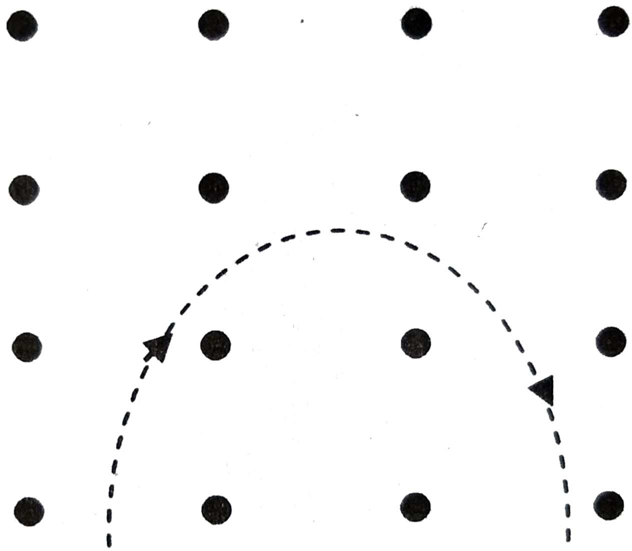
9. α particles, each of energy 2 MeV, are transmitted in a uniform magnetic field B. If the magnetic field is increased to double and deuterons are passed in the same system, the energy of a transmitted deuteron is given by



A. 8 MeV

B. 4 MeV

C. 12 MeV

D. 6 MeV

Answer: B

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10. The field normal to the plane of a wire of n turns and radis r which carriers i is measured on the axis of the coil at a small distance h from the centre of the coil. This is smaller than the field at the centre by the fraction.

A. $\frac{3}{2}\frac{a^2}{r^2}$

B. $\frac{2}{3}\frac{a^2}{r^2}$

C. $\frac{3}{2}\frac{a}{r}$

D. $\sqrt{\frac{3}{2}\frac{a^2}{r^2}}$

Answer: A

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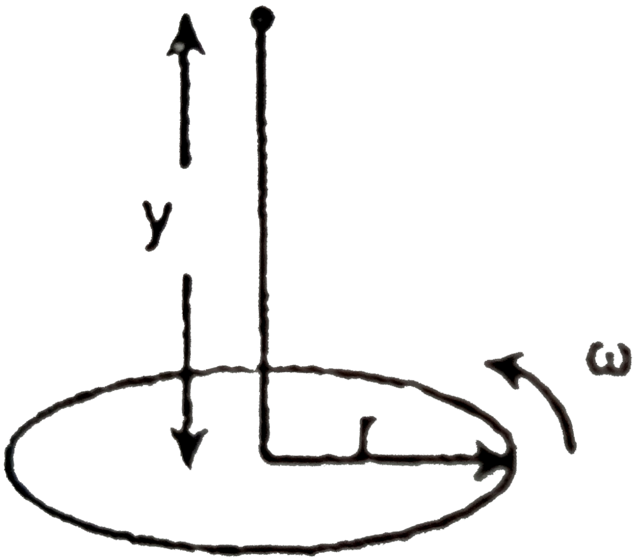
11. Calculate the magnetic field at distance y from the centre of the axis of a disc of radius r and unifrom surface charge density σ, If the disc spins with angular velocity ω ?



A. $\frac{\mu_0 \sigma \omega}{2}\left(\frac{R^2+y^2}{\sqrt{R^2+y^2}}\right)$

B. $\frac{\mu_0 \sigma \omega}{2}\left(\frac{R^2+y^2}{\sqrt{R^2+y^2}}-2y\right)$

C. $\frac{2\mu_0 \sigma \omega}{3}\left(\frac{R^2+y^2}{\sqrt{R^2+y^2}}-2y\right)$

D. $\frac{\mu_0 \sigma \omega}{3}\left(\frac{R^2-2y^2}{\sqrt{R^2-y^2}}+2y\right)$

Answer: B

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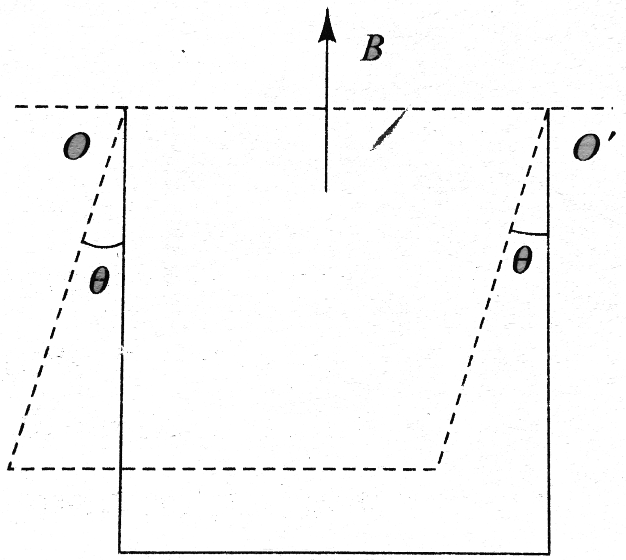
12. A wire of cross-sectional area A forms three sides of a square and is free to rotate about axis OO'. If the structure is deflected by an angle θ from the vertical when current i is passed through it in a magnetic field B acting vertically upward and density of the wire is ρ, then the value of θ is given by



A. $\frac{2A\rho g}{I} \cot\theta$

B. $\frac{2A\rho g}{I} \tan\theta$

C. $\frac{A\rho g}{I} \sin\theta$

D. $\frac{A\rho g}{2I}\cos\theta$

Answer: B

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13. A wider conductor strip of width x is bent into a slender tubing of radius r with its two ends forming two plane extensions. A current I flowing through it gives magnetic field in tubular portion given by

A. $\frac{\mu_0 I}{2\pi r}$

B. $\frac{\mu_0 I}{2x}$

C. $\frac{\mu_0 I}{\pi x}$

D. $\frac{\mu_0 I}{x}$

Answer: D

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14. A long wire carrying a steady current is bent into a single coil such that magnetic induction at centre is B. Then same wire is bent to form a coil of smaller radius of 4 turns when magnetic induction at centre is B'. Then

A. B' = B

B. B' = 2B

C. B' = 16 B

D. B = 4B'

Answer: C

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15. Find the magnetic moment of a thin round loop with current if the radius of the loop is equal to r and the magnetic induction at its centre is equal to X.

A. $\frac{Xr^2}{\mu_0}$

B. $\frac{3\pi Xr^3}{\mu_0}$

C. $\frac{2\pi Xr^3}{\mu_0}$

D. $\frac{4\pi xr^3}{\mu_0}$

Answer: C

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16. A microammeter has as resistance of 100Ω and full scale range of $50\mu A$. It can be used a voltmeter or as ahigher range ammeter provided a resistance is added to it. Pick the correct range and resistance combinations

50 V range with $10k\Omega$ resistance in series

b.$10V$ range with $200k\Omega$ resistance in series

c. 5mA rangw with 1Ω resistance in parallel

$10mA$ range with 1Ω resistance in parallel

A. 50 V range with 10 k Ω resistance in series

B. 10 V range with 200 k Ω resistance in series

C. 5 mV range with 10 k Ω resistance in parallel

D. 10 mA range with 1 Ω resistance in parallel

Answer: B

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17. A current i is flowing in a straight conductor of length L. The magnetic induction at a point distant $\frac{L}{4}$ from its centre will be-

A. $\frac{4\mu_0 I}{\sqrt{5}\pi L}$

B. $\frac{\mu_0 I}{2\pi L}$

C. $\frac{\mu_0 I}{\sqrt{2} L}$

D. $\frac{2\mu_0 I}{\pi L}$

Answer: A

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18. A circular coil of radius r carries a current I. The magnetic field at its centre is B. At what distance from the centre, on the axis of the coil the magneitc field will be B/27 ?

A. 3r

B. 2r

C. $\sqrt{3}$ r

D. $2\sqrt{2}$ r

Answer: D

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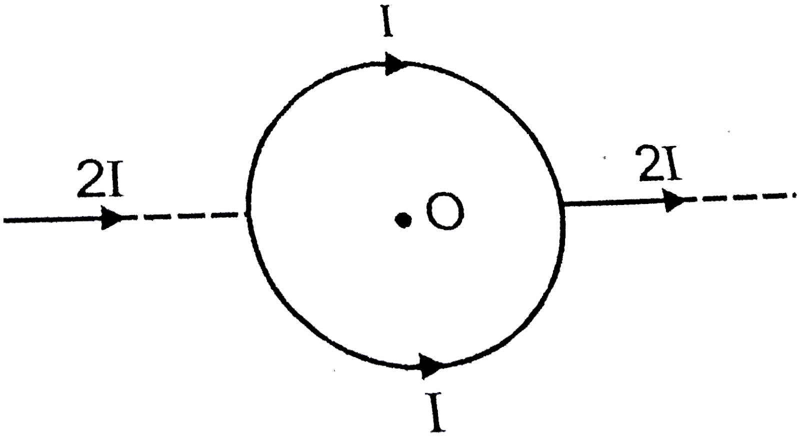
19. An infinite straigh conductor carrying current 2 I is split into a loop of radius r as shown in fig. the magnetic field at the centre of the coil is



A. $\frac{\mu_0}{4\pi}\frac{2(\pi+1)}{r}$

B. $\frac{\mu_0}{4\pi}\frac{2(\pi-1)}{r}$

C. $\frac{\mu_0}{4\pi}\frac{(\pi+1)}{r}$

D. zero

Answer: D

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