PHYSICS

BOOKS - BITSAT GUIDE

MAGNETIC FIELD

Bitsat Archieves

1. A narrow beam of protons and deutrons, each having the same momentum, enters a region of uniform magnetic field directed

perpendicular to their direction of momentum. The ratio of the radii of the circular paths described by them is

A. $1:2$

B. $1:1$

C. $2:1$

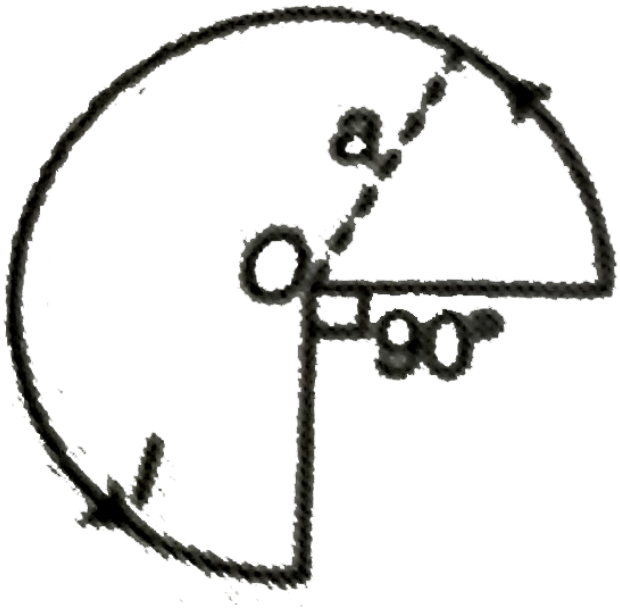
D. $1:3$

Answer: b

Watch Video Solution

Others

1. For the arrangment as shown in the figure, the magnetic induction at the centre is



A. $\frac{3\mu_0 I\pi}{4a}$

B. $\frac{\mu_0 I}{4\pi a}(1+\pi)$

C. $\frac{\mu_0 I}{4\pi a}$

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

Answer: d

Watch Video Solution

2. If the resistance of the upper half of rigid loop is twice that of the lower half, the magnitude of magnetic induction at the

centre is equal to

A. zero

B. $\frac{\mu_0 I}{4a}$

C. $\frac{\mu_0 I}{12a}$

D. None of these

Answer: c

Watch Video Solution

3. The earth's magnetic field at a certain point is 0.70 gauss. This field is to be annulled by the magnetic field at the centre of a circular conducting loop 5.0 cm in radius. The required current is about

A. 0.66 A

B. 5.6 A

C. 0.28 A

D. 2.8 A

Answer: b

Watch Video Solution

4. Three circular concentric wires of radii a, 2a and 3a are carrying currents 3l, 2l and l in same manner. Find the magnetic field at the common centre.

A. $\frac{13\mu_0 I}{6a}$

B. $\frac{\mu_0 I}{6a}$

C. $\frac{\mu_0 I}{a}$

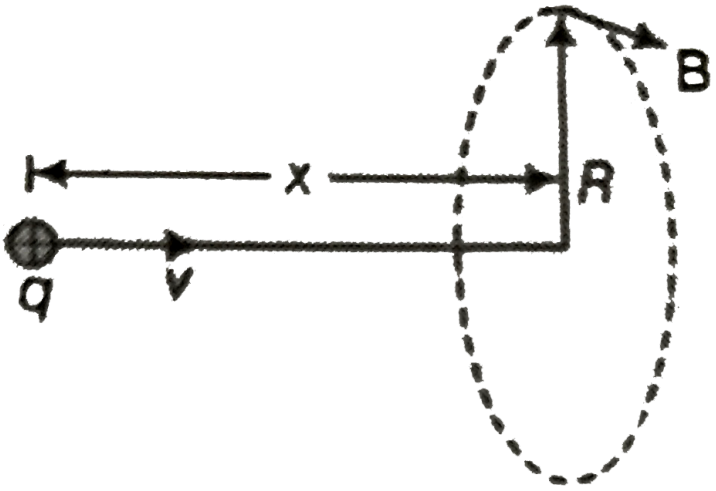
D. None of these

Answer: a

Watch Video Solution

5. A charge q(gt0) moves towards the centre of a circular loop of radius R along its axis. The magnitude of B along the periphery of the

loop is



A. zero

B. $\frac{\mu_0}{4\pi}\frac{qvR}{\sqrt{\left(R^2+x^2\right)^3}}$

C. $\frac{qvR}{\sqrt{R^2+x^2}}$

D. None of these

Answer: d

Watch Video Solution

6. A current carrying loop is free to turn in a uniform magnetic field. The loop will then come into equilibrium when its plane is inclined at

A. 0° to the direction of the field

B. 45° to the directin of the field

C. 90° to the direction of the field

D. 135° to the direction of the field

Answer: a

Watch Video Solution

7. In the given figure, the loop is fixed but straight wire can move. The straight wire will

A. remain stationary

B. move towards the loop

C. move away from the loop

D. rotates about the axis

Answer: b

Watch Video Solution

8. The dimension of $\frac{1}{\sqrt{\mu_0 \varepsilon_0}}$ are same as

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

B. $\frac{B}{E}$

C. $\frac{E^2}{B^2}$

D. $\sqrt{\left(\frac{E}{B}\right)}$

Answer: a

Watch Video Solution

9. A charged particle is moving in a uniform magnetic field and losses 4% of its KE. The radius of curvature of its path change by

A. 0.02

B. 0.04

C. 0.1

D. None of these

Answer: a

 Watch Video Solution

10. A charged particle of mass m and charge q, a uniform magneric field B acting into the plane. The plane is frictional having coefficient of friction μ. The speed of charged particle just before entering into the region is V_0. The

radius of curvature of the path after the time $\frac{v_0}{2\mu g}$ is

A. $\frac{mv_0}{qB}$

B. $\frac{mv_0}{2qB}$

C. $\frac{mv_0}{4qB}$

D. None of these

Answer: b

Watch Video Solution

11. A γ-ray photon is passing near a nucleus and breaks into an electron and positron. The region contains a uniform magnetic field B perpendicular to the plane of motion. Find the time after which they again converted into γ-ray. The force of electrostatic interaction and gravitational interaction may be neglected

A. $\frac{2\pi m}{eB}$

B. $\frac{\pi m}{2qB}$

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

D. None of these

Answer: a

Watch Video Solution

12. If a charged particle of charge $5\mu C$ and mass 5 g is moving with constant speed 5 m/s in a uniform magnetic field B on a curve $x^2 + y^2 = 25$, where x and y are in meter. The value of magnetic field will be

A. 1 tesla

B. 1 kilo tesla along z-axis

C. 5 kilo tesla along the x-axis

D. 1 kilo tesla along any line in the x-y plane

Answer: b

Watch Video Solution

13. A charged particle of mass m and charge q is accelerated through a potential differences of V volts. It enters of uniform magnetic field B which is directed perpendicular to the

direction of motion of the particle. The particle will move on a circular path of radius

A. $\sqrt{\frac{Vm}{qB^2}}$

B. $\frac{2Vm}{qB^2}$

C. $\sqrt{\frac{2Vm}{q}}\left(\frac{1}{B}\right)$

D. $\sqrt{\frac{Vm}{q}}\left(\frac{1}{B}\right)$

Answer: c

Watch Video Solution

14. A circular flexible loop of wire of radius r carrying a current I is placed in a uniform magnetic field B . If B is doubled, then tension in the loop

A. remain unchanged

B. is doubled

C. is halved

D. becomes 4 times

Answer: b

Watch Video Solution

Watch Video Solution

15. A non-relativistic proton beam passes without deviation through a region of space where there are uniform transverse mutually perpendicular electric and magnetic fields with $E = 120kVm^{-1}$ and $B = 50mT$. Then the beam strikes a grounded target. Find the force which the beam acts on the target if the beam current is equal to $i = 0.8mA$.

Mass of protons $= 1.67 \times 10^{-27}kg$.

A. $80\mu N$

B. $25\mu N$

C. $20\mu N$

D. $35\mu N$

Answer: c

Watch Video Solution

16. An (α)-particle and a proton are both simultaneously projected in opposite direction into a region of constant magnetic field perpendicular to the direction of the field.

After some time it is found that the velocity of the (α)-particle has changed in a direction by 45°. Then at this time, the angle between velocity vectors of (α)-particle and proton is

A. 90°

B. 45°

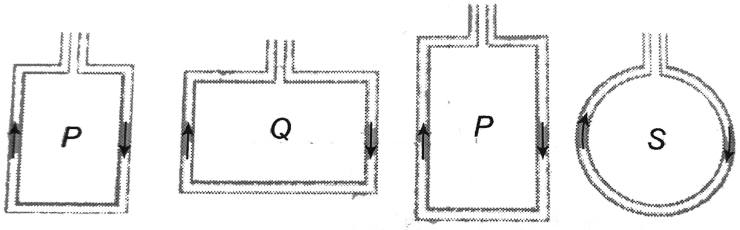
C. $45^\circ + 90^\circ$

D. $\frac{45^\circ + 90^\circ}{2}$

Answer: c

Watch Video Solution

17. Four wires each of length 2.0 meters area bent into four loops P, Q, R and S and then suspended into uniform magnetic field. Same current is passed in each loop. Which statement is correct?



A. Couple on loop P will be the highest

B. Couple on loop Q will be the highest

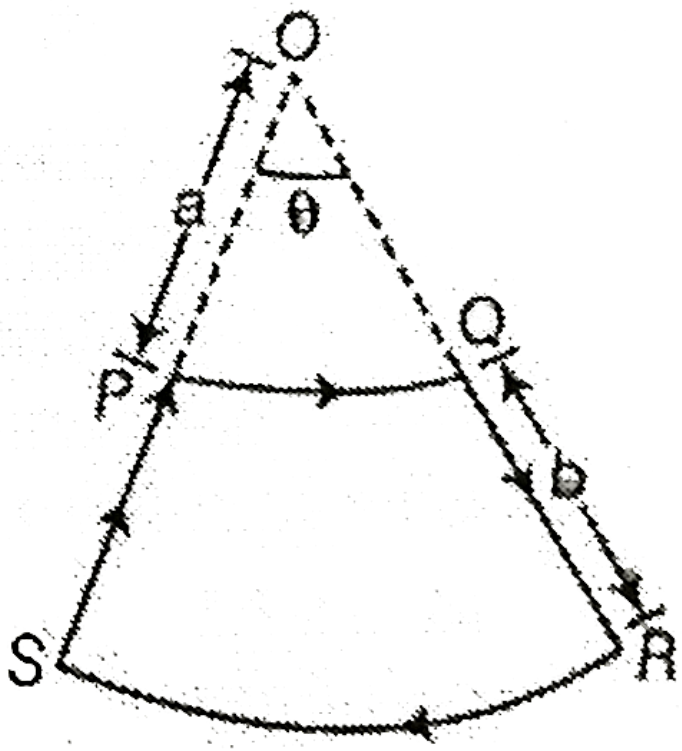
C. couple on loop R will be the highest

D. Couple on loop S will be the highest

Answer: d

Watch Video Solution

18. The magnetic moment of the current carrying loop shown in the figure is equal to



A. $\frac{l\left(b^2+2ab\right)\theta}{2}$

B. $lab\theta$

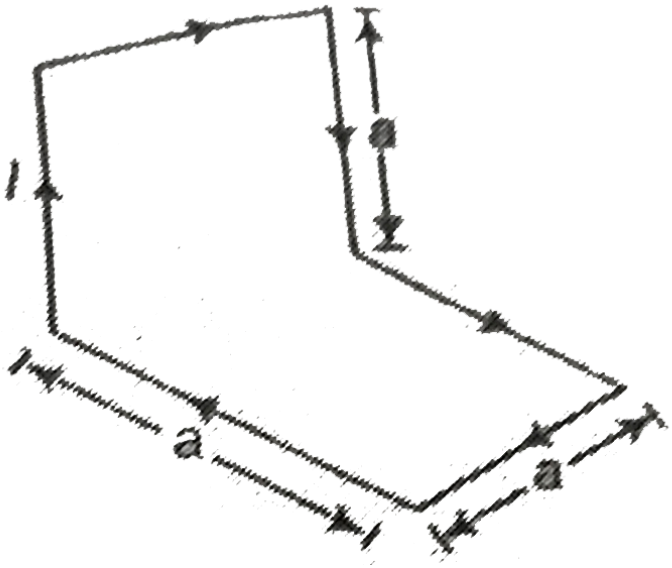
C. $\frac{l\left(a^2+ba\right)\theta}{2}$

D. None of the above

Answer: a

Watch Video Solution

19. The magnitude of magnetic moment of the current loop in the figure is



A. la^2

B. $\sqrt{2}la^2$

C. zero

D. none of the above

Answer: b

Watch Video Solution

20. A wire of length l is bent in the form a circular coil of some turns. A current I flows through the coil. The coil is placed in a

uniform magnetic field B. The maximum torqur on the coil can be

A. lBl^2

B. $4\pi lBl^2$

C. $\frac{ll^2B}{4\pi}$

D. zero

Answer: c

Watch Video Solution

21. The ratio of the energy required to set up in a cube of side 10 cm, a uniform field of 4 Wb/m^2 and a uniform electric field of $10^6 V/m$ is

A. 1.44×10^7

B. $1.44 \times 10^{-5} c.$

C. 1.44×10^6

D. 1.44×10^3

Answer: c

Watch Video Solution

Watch Video Solution

22. A magnetic field of $\left(4.0 \times 10^{-3}\hat{k}\right)T$ exerts a force $\left(4.0\hat{i} + 3.0\hat{j}\right) \times 10^{-10}N$ on a particle having a charge $10^{-9}C$ and moving in te $x - y$ plane. Find the velocity of the particle.

A. $-75\hat{i} + 100\hat{j}$

B. $-100\hat{i} + 75\hat{j}$

C. $25\hat{i} + 2\hat{j}$

D. $2\hat{i} + 25\hat{j}$

Answer: a

Watch Video Solution

23. A uniform magnetic field $B = B_0\hat{j}$ exists in space. A particle of mass m and charge q is projected towards X-axis with speed v from a point (a,0, 0). The maximum value of v for which the particle does not hit the Y-Z plane is

A. $\frac{Bqa}{m}$

B. $\frac{Bqa}{2m}$

C. $\frac{Bq}{am}$

D. $\frac{Bq}{2am}$

Answer: a

Watch Video Solution

24. Currents of $10A, 2A$ are passed through two parallel wires A and B respectively in opposite directions. If the wire A is infinitely long and the length of the wire B is 2 metre,

the force on the conductor B, which is situated at $10cm$ distance from A will be

A. $8 \times 10^{-7} N$

B. $8 \times 10^{-5} N$

C. $4 \times 10^{-7} N$

D. $4 \times 10^{-5} N$

Answer: b

Watch Video Solution

25. Two parallel, long wires carry currents $t_1 \text{and} t_2$ with $t_1 > t_2$. When the currents are in the same direction, the magnetic field at a point midway between the wires is 10 μT. If the direction of i_2 is reversed, the field becomes 30 μT. Find the ratio $i_1 i_2$.

A. 1

B. 3

C. 2

D. 4

Answer: c

Watch Video Solution

26. A circular coil of 100 turns and effective diameter $20cm$ carries a current of $0.5A$. It is to be turned in a magnetic field of $B = 2.0T$ from a position in which the normal to the plane of the coil makes an angle θ equals to zero to one in which θ equals to 180°. Thw work required in this process is

A. π joule

B. 2π joule

C. 4π joule

D. 8π joule

Answer: b

Watch Video Solution

27. Two long wires each oflength I are placed on a smooth horizontal table. Wires have equal but opposite charges. Magnitude

oflinear charge density on each wire is λ. Calculate the work required to increase the separation between the wires from a to 2a:

A. $\frac{\lambda^2 \ln 2}{4\pi\varepsilon_0}$

B. $\frac{\lambda^2}{\pi\varepsilon_0}\ln 2$

C. $\frac{\lambda^2}{4\pi\varepsilon_0 a}$

D. $\frac{\lambda^2}{2\pi\varepsilon_0}\ln 2$

Answer: d

Watch Video Solution

28. Two long straight parallel conductors are separated by a distance of 5 cm and carrying current 20 A. what work per unit length of a conductor must be done to increases the separation between conductors to 10 cm, if the current flows in the same direction ?

A. $8 \times 10^{-5} \log_e 2$

B. $\log_e 2$

C. $10^{-7} \log_e 2$

D. none of these

Answer: a

Watch Video Solution

29. A solenoid of length 1.0 m has a radius of 1 cm and has a total of 1000 turns wound on it. It carries a current of 5A. If an electron was to move with a speed of $10^4 ms^{-1}$ along the axis of this current carrying solenoid, then force experienced by this electron is

A. 2N

B. 1.2 N

C. zero

D. 2.5 N

Answer: c

Watch Video Solution

30. Magnetic field

A. can increase the speed of charged particle

B. can accelerate a charged particle

C. both a and b are correct

D. both a and b are incorrect

Answer: b

Watch Video Solution

31. A square coil of side 10 cm has 20 turns and carries a current of 12 A. the coil is suspended vartically and the normal to the plane of the coil, makes an angle θ with the direction of a

uniform horizontal magnetic field of 0.80 T. if the torque, experienced by the coil, equals 0.N-m , the value of θ is

A. 0°

B. $\frac{\pi}{2}$ rad

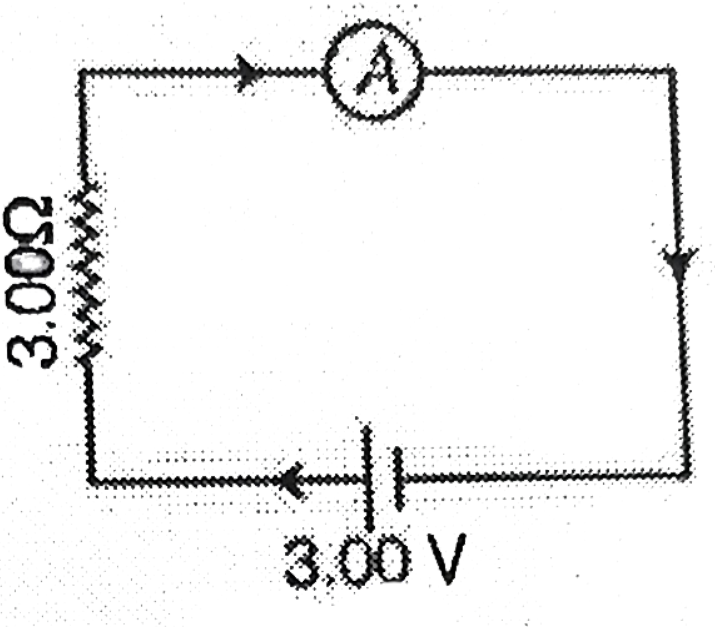
C. $\frac{\pi}{3}$ rad

D. $\frac{\pi}{6}$ rad

Answer: d

Watch Video Solution

32. For the circuit (figure) the currents is to be measured. The ammeter shown is a galvanometer with a resistance $R_G = 60.00\Omega$ converted to an ammeter by a shunt resistance $r_S = 0.02\Omega$. The value of the current is



A. 0.79 A

B. 0.29 A

C. 0.99 A

D. 0.8 A

Answer: c

Watch Video Solution

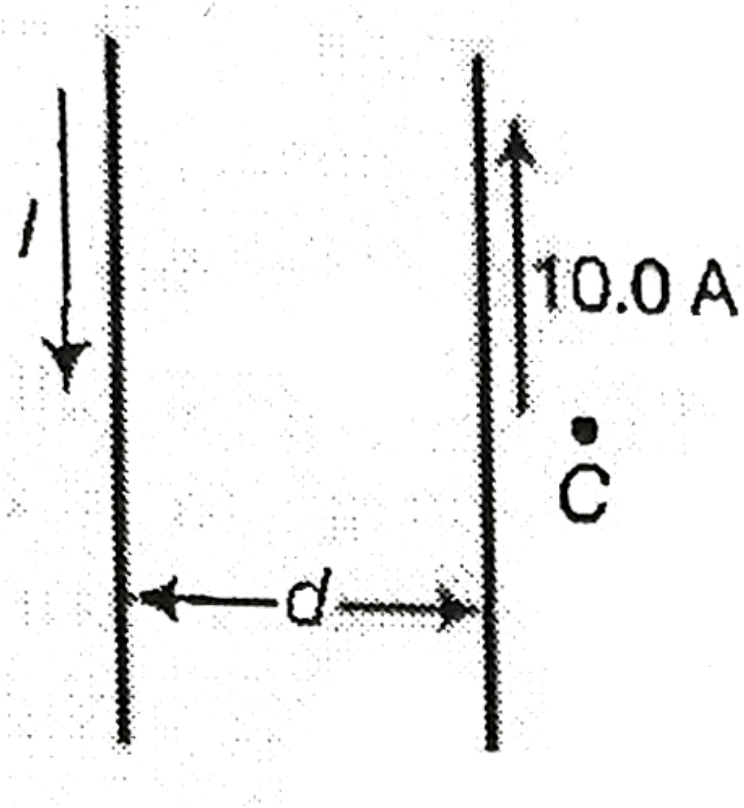
33. A square shaped current loop of side length L and carrying current I lies in a uniform magnetic field B acting perpendicular

to the plane of squre loop and directed inward. The net magnetic force acting on current loop is

Watch Video Solution

34. Two parallel conductors carry current in opposite direction as shown in figure. One conductor carries a current of 10.0 A. point C is a distance $\frac{d}{2}$ to the right of the 10.0 A current. If the d=18 cm and I is adjusted so that the magnetic field at C is zero, the value of the

current I is



A. 10.0 A

B. 30.0A

C. 8.0 A

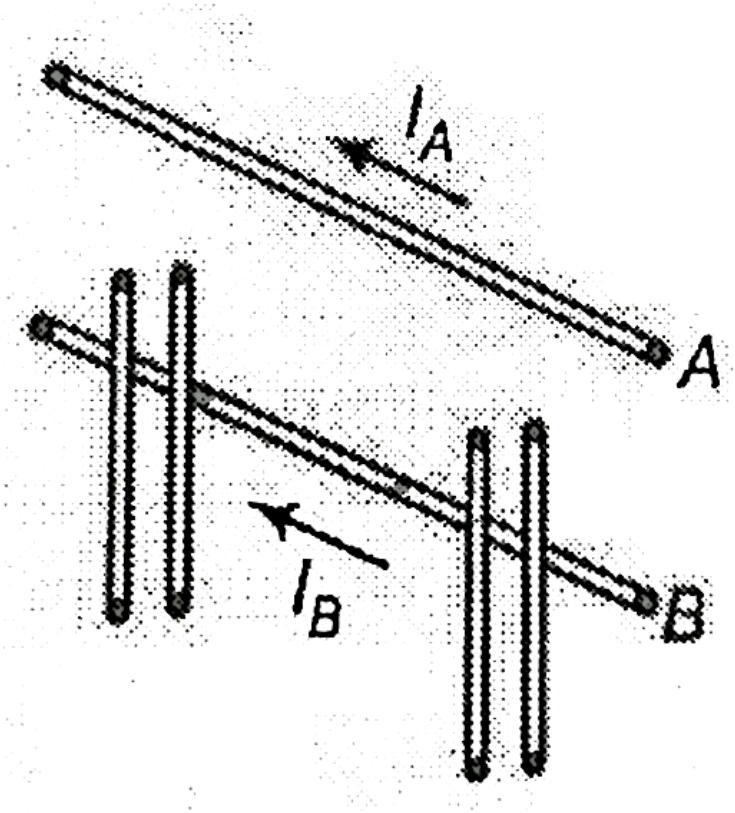
D. 18.0 A

Answer: b

Watch Video Solution

35. Two long, parallel conductors carry currents in the same direction, as shown in figure. Conductors A held firmly in position. Conductors B carries a current I_B and is allowed to slide freely up and down (parallel to A) between a se of non-conducting guides.

the mass per unit length of conductors B is 0.1 g/cm and the distance between the two conductors is 5 cm. if system of conductors is in equilibrium , the value of current I_B is



A. 250 A

B. 240 A

C. 220 A

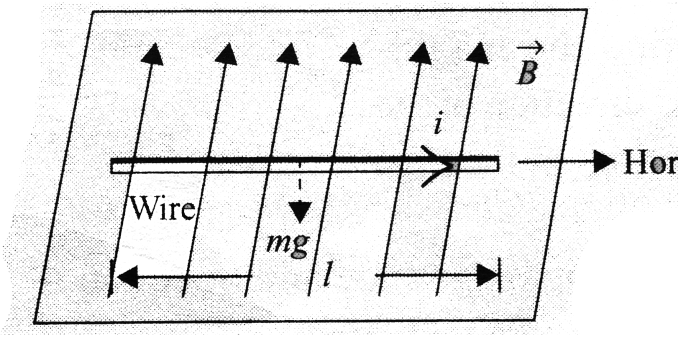
D. 230 A

Answer: a

 Watch Video Solution

36. A straight wire of mass 200 g and length 1.5 m carries a current of 2 A. It is suspended in mid-air by a uniform horizontal magnetic field B. What is the magnitude of the magnetic

field?



A. 2

B. 1.5

C. 0.55

D. 0.65

Answer: d

Watch Video Solution

37. the intensity of the magnetic induction field at the centre of a single turn circular coil of radius 5 cm carrying current of 0.9 A is

A. $36\pi \times 10^{-7}T$

B. $9\pi \times 10^{-7}T$

C. $36\pi \times 10^{-6}T$

D. $9\pi \times 10^{-6}T$

Answer: a

Watch Video Solution

38. The maximum current that can be measured by a galvanometer of resistance 40Ω is 10 mA . It is converted into a voltmeter that can read upto 50 V . The resistance to be connected in series with the galvanometer is ... (in ohm)

A. 2010

B. 4050

C. 5040

D. 4960

Answer: d

 Watch Video Solution

39. A galvanometer of 100Ω resistance gives full scale deflection when 10 mA of current is passed. To convert it into 10 A range ammeter, the resistance of the shunt required will be

A. 0.100Ω

B. 1.00Ω

C. $10.\ \infty\Omega$

D. 100.00Ω

Answer: a

Watch Video Solution

40. A glavanometer of 50Ω resistance has 25 divisions. A current of 4×10^{-4} A gives a deflection of one division. To convert this galvanometer into a voltmeter having a range

of $25V$, it should be connected with a resistance of

A. 2500Ω as a shunt

B. 2950Ω as a shunt

C. 2550Ω in series

D. 2450Ω in series

Answer: d

Watch Video Solution

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

A. 28 MH z

B. 280 MHz

C. 2.8 GHz

D. 28 GHz

Answer: d

Watch Video Solution

42. A current carrying circular coil is bent so as to convert it into a double loop, both the loops being concentric and are carrying current in the same direction. If B is the initial magnetic field at the centre, the final magnetic field at the centre will be

A. zero

B. B

C. 2B

D. 4B

Answer: d

Watch Video Solution

43. In order to increase the sensitivity of a moving coil galvanometer, one should decrease

A. number of turns of the coil should be increased

B. the strength of the magnetic field should be increased

C. area of coil should be increased

D. All of the above

Answer: d

 Watch Video Solution

44. In an ammeter 10% of main current is passing through the galvanometer. If the resistance of the galvanometer is G, then the shunt resistance, in ohms is

A. 9G

B. $\frac{G}{9}$

C. 90 G

D. $\frac{G}{90}$

Answer: b

Watch Video Solution

45. Due to the earth's magnetic field, charged cosmic ray particles

A. required greater kinetic energy to reach the equator than the poles

B. required lesser kinetic energy to reach the equator than the poles

C. can never reach the equator

D. can never reach the poles

Answer: c

Watch Video Solution

46. In a circuit 5 percent of total current passes through a galvanometer. If resistance of the galvanometer is G then value of the shunt is

A. 19 G

B. $\frac{G}{19}$

C. 20 G

D. $\frac{G}{20}$

Answer: b

Watch Video Solution

Watch Video Solution

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

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

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

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

Answer: b

Watch Video Solution

48. A current carrying small loop behaves like a small magnet. If A be its area and M its magnetic moment, the current in the loop will be

A. M/A

B. A/M

C. MA

D. AM^2

Answer: a

Watch Video Solution

49. A magnet of magnetic moment 20 C.G.S. units is freely suspended in a uniform magnetic field of intensity 0.3 C.G.S. units. The amount of work done in deflecting it by an angle of 30° in C.G.S. unit is

A. 6

B. $3\sqrt{3}$

C. $3\left(2-\sqrt{3}\right)$

D. 3

Answer: c

Watch Video Solution

50. In a magnetic field of $0.05T$, area of a coil changes from $101cm^2$ to $100cm^2$ without changing the resistance which is 2Ω. The

amount of charge that flow during this period is

A. $2.5 \times 10^{-6} C$

B. $2 \times 10^{-6} C$

C. $10^{-6} C$

D. $8 \times 10^{-6} C$

Answer: a

Watch Video Solution

51. An electric field of 1500 V/m and a magnetic field of 0.40 Wb/m^2 act on a moving electron. The minimum uniform speed along a straight line, the electron could have is

A. $1.6 \times 10^{15} m/s$

B. $6 \times 10^{-16} m/s$

C. $3.75 \times 10^{3} m/s$

D. $3.75 \times 10^{2} m/s$

Answer: c

Watch Video Solution

Watch video solution