PHYSICS

RESONANCE ENGLISH

MAGNETIC FIELD AND FORCES

Exercise

1. One tesla is equal to

A. 10^7 gauss

B. 10^{-4} gauss

C. 10^{4} gauss

D. 10^{-8} gauss

Answer: B

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2. A short bar magnet of magnet moment $0.4JT^{-1}$ is placed in a uniform magnetic field of 0.16 T. The magnet is in stable equilibrium when the potential energy is :

A. $-0.064J$

B. zero

C. $-0.082J$

D. 0.064 J

Answer: A

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3. Two bar magnet having same geometry with magnetic moment M and WM are placed in such a way that their similar poles are on the

same side, then its time period of oscillation is T_1. Now, if the polarity of one of the magnet is reversed, then time period of oscillation is T_2, then

A. $T_1 < T_2$

B. $T_1 > T_2$

C. $T_1 = T_2$

D. $T_2 = \infty$

Answer: A

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4. A charge of $10^{-6}C$ is describing a circular path of radius 1cm making 5 revolution per second. The magnetic induction field at the centre of the circle is

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

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

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

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

Answer: A

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5. A straight section PQ of a circuit lise along the X-axis from $x = -\frac{a}{2}$ to $x = \frac{a}{2}$ and carriers a steady current i. The magnetic field due to the section PQ at a point $X = +a$ will be

A. $\propto a$

B. zero

C. $\propto a^2$

D. $\propto \frac{1}{a}$

Answer: B

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6. The magnetic flux density at a point distant d from a long straight current carrying conductor is B, then its value at distance $\frac{d}{2}$ will be-

A. 4B

B. 2B

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

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

Answer: B

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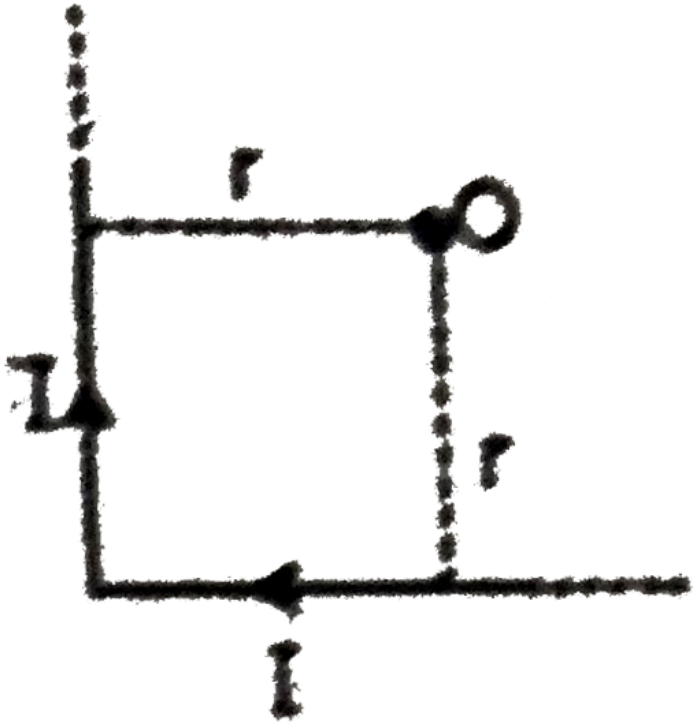
7. A current carrying wire is bent in the L shapes as shown in figure. The length of both arms extend to infinity. Then, the magnetic

field at O is-



A. zero

B. $\mu_0 I / 2\pi r$

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

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

Answer: C

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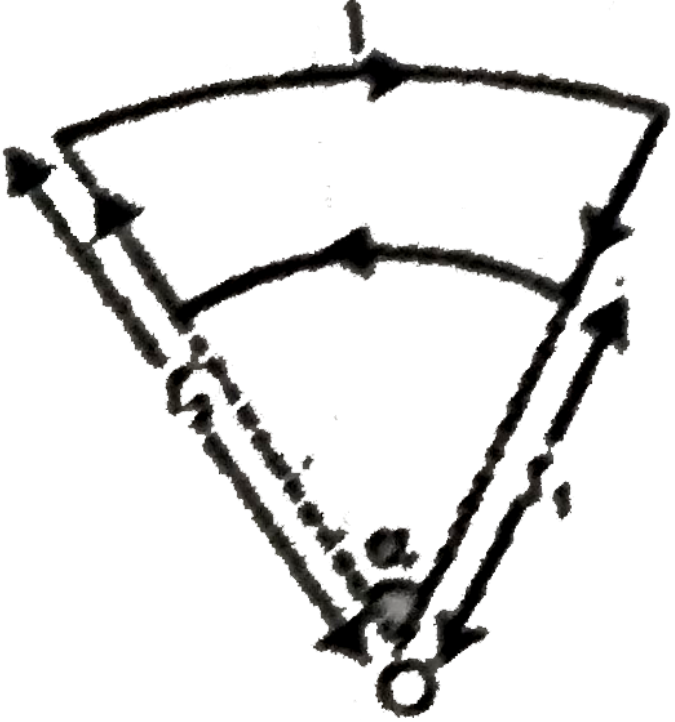
8. The magnetic induction at centre O in the following figure will be



A. $\frac{\mu_0 i\alpha}{4\pi}\left(\frac{1}{r_1}-\frac{1}{r_2}\right)\odot$

B. $\frac{\mu_0 i\alpha}{4\pi}\left(\frac{1}{r_1}+\frac{1}{r_2}\right)\odot$

C. $\frac{\mu_0 i\alpha}{2\pi}\left[\frac{1}{r_1}-\frac{1}{r_2}\right]\otimes$

D. $\frac{\mu_0 i\alpha}{2\pi}\left[\frac{1}{r_1}+\frac{1}{r_2}\right]\otimes$

Answer: A

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9. The ratio of magnetic inductions at the centre of a circular coil of radius a and on its axis at a distance equal to its radius, will be-

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

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

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

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

Answer: D

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10. A current loop consists of two identical semicircular parts each of radius R, one lying in the x-y plane and the other in x-z plane. If the current in the loop is i, the resultant magnetic field due to two semicircular parts at their common centre is

A. $\frac{\mu_0 i}{2\sqrt{2R}}$

B. $\frac{\mu_0 i}{2R}$

C. $\frac{\mu_0 i}{4R}$

D. $\frac{\mu_0 i}{\sqrt{2}R}$

Answer: A

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11. The use of Helmholtz coils is to produce-

A. uniform magnetic field

B. non-uniform magnetic field

C. varying magnetic field

D. zero magnetic field

Answer: A

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12. 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. zero

Answer: A

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13. The magnetic field inside a solenoid is-

A. infinte

B. zero

C. uniform

D. non-uniform

Answer: C

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14. When the number of turns in a toroidal coil is doubled, then the value of magnetic flux density will becomes-

A. four times

B. eight times

C. half

D. double

Answer: D

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15. A long solonoid carrying a current produces a magnetic field along its axis. If the current is doubled and the number of turns

per cm is halved, the new value of the magnetic field is

A. 2B

B. 4B

C. B/2

D. B

Answer: D

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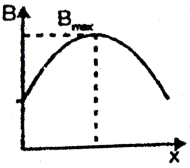
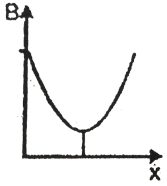
16. The correct curve between the magnetic induction (B) along the axis of a along solenoid due to current flow i in it and distance x from one end is -

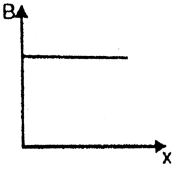
A. (1)



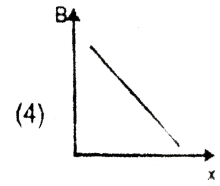
B. (2)



C. (3)



D.



Answer: A

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17. If a long hollow copper pipe carries a current, then magnetic field is produced:

A. inside the pipe only

B. outside the pipe only

C. both inside and outside the pipe

D. no where

Answer: B

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18. Magnetic dipole moment of a rectangular loop is

A. inversely proportional to current in loop

B. inversely proportional to area of loop

C. parallel to plane of loop and proportional to area of loop

D. perpendicular to plane of loop and proportional to area of loop

Answer: D

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19. If the angular momentum of an electron is $\vec{J}$ then the magnitude of the magnetic moment will be

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

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

C. eJ 2m

D. $\frac{2m}{eJ}$

Answer: B

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20. When a charged partical moves at right angles to a mangetic field then which of the following quantities changes-

A. energy

B. momentum

C. speed

D. all of above

Answer: B

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21. A charged particle (charge q) is moving in a circle of radius R with uniform speed v.

The associated magnetic momment μ is given by

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

B. qvR^2

C. $\frac{qvR^2}{2}$

D. qvR

Answer: A

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22. A proton and an α-particle enter a uniform magnetic field perpendicular with the same speed. If proton takes 20μ seconds to make 5 revolutions, then the periodic time for the α-particle would be

A. 50μ sec

B. 25μ sec

C. 10μ sec

D. 5μ sec

Answer: C

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23. A charged particle having charge q, is moving at right angles to a magnetic field. The quantity which is varying for it is-

A. its kinetic energy

B. its speed

C. its angular velocity

D. its path of motion

Answer: D

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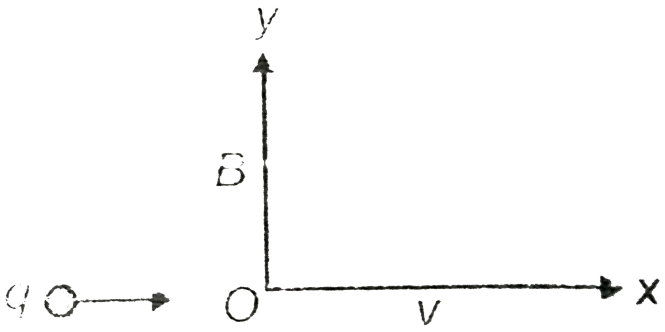
24. If a positively charged particle is moving as shown in the figure, then it will get deflected due to magnetic field towards



A. $+x$ direction

B. $+y$ direction

C. $-x$ direction

D. $+z$ direction

Answer: D

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25. A particle of mass 0.6 g and having charge of 25 nC is moving horizontally with a uniform velocity $1.2 \times 10^4\ ms^{-1}$ in a unifo magnetic ficld, then the value of the magnetic induction is $\left(g = 10ms^{-2}\right)$

A. zero

B. 10 T

C. 20 T

D. 200 T

Answer: C

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26. A beam of protons enters a uniform magnetic field of 0.3T with velocity of $4 \times 10^5 m/s$ in a direction making an angle of

60° with the direction of magnetic field. The path of motion of the particle will be

A. circular

B. Straight line

C. Spiral

D. helical

Answer: D

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27. In the above question, the radius of path of the particle will be

A. 12.0 m

B. 1.2 m

C. 0.12 m

D. 0.012 m

A. 12.0 m

B. 1.2 m

C. 0.12 m

D. 0.012m

Answer: D

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28. In the above question, the pitch of the helix will be

A. 4.37 m

B. 0.437 m

C. 0.0437 m

D. 0.00437 m

A. 4.37 m

B. 0.437 m

C. 0.0437m

D. 0.00437 m

Answer: C

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29. A charged particle enters a unifrom magnetic field with velocity vector at an angle of 45° with the magnetic field . The pitch of the helical path followed by the particles is ρ . The radius of the helix will be

A. $\frac{p}{\sqrt{2}\pi}$

B. $\sqrt{2}p$

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

D. $\frac{\sqrt{2}p}{\pi}$

Answer: C

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30. Uniform electric and magnetic fields are produced in the same direction. An electron moves in such a way that its velocity remains in the direction of electric field. The electron will-

A. turn towards left

B. turn towards right

C. get decelerated

D. get accelerated

Answer: C

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31. A charged particle moves through a magnetic field perpendicular to its direction. Then:

A. Acceleration remain unchanged

B. velocity remains unchanged

C. speed of the particle remains unchanged

D. Direction of the particle remains unchanged

Answer: C

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32. An electron and proton enter a uniform magnetic field perpendicularly. Both have same kinetic energy. Which of the following is true?

A. Trajectory of electron is less curved

B. Trajectory of proton is less curved

C. Both trajectories are equally curved

D. Both move on straight line path

Answer:

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33. Sometimes positive charged particle comes from space towards earth with high velocity.

Its deviation due to the magnetic field of earth will be:

A. towards north

B. towards south

C. towards west

D. towards east

Answer: D

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34. A particle of charge per unit mass α is released from origin with a velocity $\bar{v} = v_0\hat{i}$ in a uniform magnetic field $\overline{B} = -B_0\hat{k}$. If the partile passes through $(0, y, 0)$ then y is equal to

A. $-\dfrac{2v_0}{B_0\alpha}$

B. $\dfrac{v_0}{B_0\alpha}$

C. $\dfrac{2v_0}{B_0\alpha}$

D. $-\dfrac{v_0}{B_0\alpha}$

Answer: C

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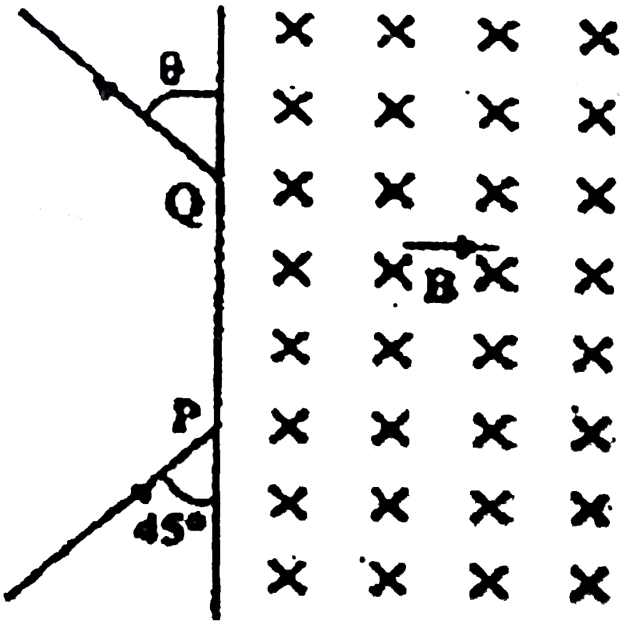
35. A particle of mass $1.6 \times 10^{-27} kg$ and charge 1.6×10^{-19} coulomb enters a uniform magnetic field of 1 Tesla as shown in the figure. The speed of the particle is $10^7 m/s$. The

distance PQ will be



A. 0.14 m

B. 0.28 m

C. 0.4 m

D. 0.5 m

Answer: A

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36. A particle of mass m, charge q and kinetic energy T enters in a transverse uniform magnetic field of induction B. After the 3 s, the kinetic energy of the particle will be

A. 3T

B. 2T

C. T

D. 4T

Answer: C

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37. A particle having a charge$20\mu C$ and mass $20\mu g$ moves along a circle of radius 5.0 cm under the action of a magnetic field 5.0 cm under the action of a magnetic field B = 1.0 T. When the particle is at a point P, a uniform electric field is switched on and it is found that

the particla continues on the tangent through P qith a uniform velocity. Find the electric field.

A. 0.1 V/m

B. 0.5 V/m

C. 10.0 V/m

D. 100 V/m

Answer: B

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38. When a charged particle moving with velocity $\overrightarrow{v}$ is subjected to a magnetic field of induction $\overrightarrow{B}$, the force on it is non-zero. This implies that:

A. angle between $\overrightarrow{v}$ and $\overrightarrow{B}$ is necessarily 90°

B. angle between $\overrightarrow{v}$ and $\overrightarrow{B}$ can have any value other then 90°

C. angle between $\overrightarrow{v}$ and $\overrightarrow{B}$ can have any value other than zero and 180°

D. angle between $\vec{v}$ and $\vec{B}$ is either zero or 180°

Answer: C

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39. A beam of electrons passes undeflected through uniformly perpendicular electric and magnetic fields. If the electric field is switched off, and the same magnetic field is maintained then the electrons move:

A. in an elliptical orbit

B. in a circular orbit

C. along a parabolic path

D. along a straight line

Answer: B

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40. a very long straight wire carries a current I.

at the instant when are charge -Q at point P

has velocity v as shown in figure the force on the charge is 

A. Opposite to ox

B. along ox

C. opposite to oy

D. along oy

Answer: D

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41. A charge q moves in a region where electric field as well as magnetic field exist, then force on it is

A. $q\overrightarrow{v} \times \overrightarrow{B}$

B. $q\overrightarrow{E} + q\overrightarrow{v} \times \overrightarrow{B}$

C. $q\overrightarrow{E} + q\overrightarrow{B} \times \overrightarrow{v}$

D. $q\overrightarrow{B} + q\left(\overrightarrow{E} \times \overrightarrow{v}\right)$

Answer: B

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42. A 0.5m long straight wire in which a current of 1.2A is flowing is kept a right angles to a uniform magnetic field of 2.0 tesla. The force acting on the wire will be-

A. 2N

B. 2.4N

C. 1.2N

D. 3N

Answer: C

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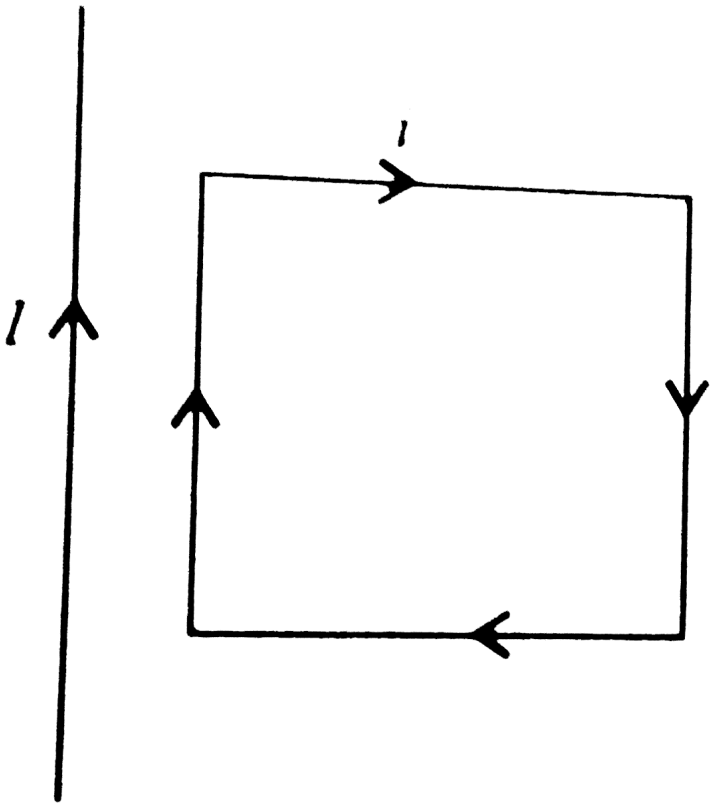
43. A rectanguar doop carrying a current I is situated near a long straight wire such that the wire is parallel to one of the sides of the loop. If a steady current I is established in the

wire, as shown in figure, the loop will



A. moves towards the wire

B. move away from the wire

C. remain stationary

D. rotate about an axis parallel to the wire

Answer: A

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44. A circular loop of radius R carrying a current I is placed in a uniform magnetic field B perpendicular to the loop. The force on the loop is

A. IRB

B. $2\pi IRB$

C. zero

D. πIRB

Answer: C

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45. If current in two parallel wires flow in opposite directions, the force between the wires will:

A. attractive

B. repulsive

C. zero

D. attractive or repulsive depending on the material of wires

Answer: B

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46. A conductor in the form of a right angle ABC with $AB = 3cm$ and $BC = 4cm$ carries a current of $10A$.There is a uniform magnetic field of $5T$ perpendicular to the palne of the conductor. The force on the conductor will be

A. 1.5N

B. 2.0N

C. 2.5N

D. 3.5N

Answer: C

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47. The intensity of uniform magnetic field between poles of a magnetic is H. If a straight wire carrying current is placed in between the poles. The direction of force on the wire is-

A. perpendicular to both current and magnetic field

B. in the direction of current

C. same as magnetic field

D. in all directions

Answer: A

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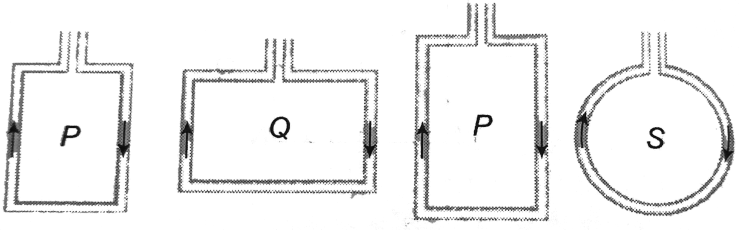
48. Four wires each of length 2.0 meters area bent into four loops P, Q, R and S and then suspended into uniform magnetic field. Same current is passed in each loop. Which statement is correct?



A. Couple on loop P will be highest

B. Couple on loop Q will be highest

C. Couple on loop R will be highest

D. Couple on loop S will be highest

A. Couple on loop P will be highest

B. Couple on loop Q will be highest

C. Couple on loop R will be highest

D. Couple on loop S will be highest

Answer: D

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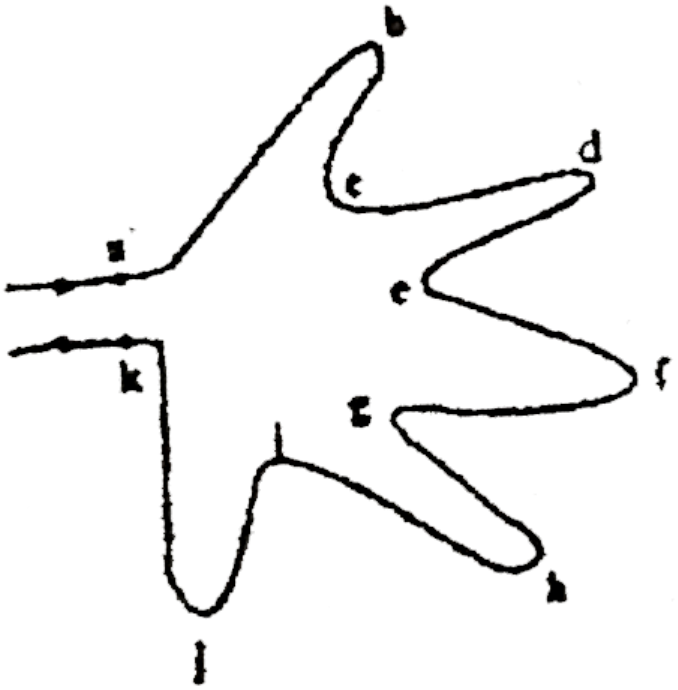
49. An irregular loop of conducting wire is lying on a frictionless table as shown in the figure. The wire is clamped at points a and k, when a current i is passed thorugh it, then the wire will



A. become parallel in two parts

B. collapse more

C. from a circular loop

D. none of these

A. becomes parallel in two parts

B. collapse more

C. form a circular loop

D. none of these

Answer: C

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

A. mass

B. speed

C. charge

D. magnetic field

Answer: B

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51. When a small magnetising field H is applied to a magnetic material the intensity of magnetisation (I) is proportional to:

A. H^{-2}

B. $H^{1/2}$

C. H

D. H^2

A. H^{-2}

B. $H^{1/2}$

C. H

D. H^2

Answer: C

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52. How does the magnetic susceptibility of a paramagnetic material change with temperature?

A. $\chi \propto T$

B. $\chi \propto T^{-1}$

C. $\chi = \text{constant}$

D. $\chi \propto e^{T}$

Answer: B

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53. How does the intensity of magnetization of a paramagnetic material vary with increasing applied magnetic field?

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54. Which of the following relations is not correct?

A. $B = \mu_0(H + 1)$

B. $B = \mu_0 H(1 + \chi_m)$

C. $\mu_0 = \mu(1 + \chi_m)$

D. $\mu_r = 1 + \chi_m$

Answer: C

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55. The hysteresis loop for the material of a permanent magnet is:

A. short and wide

B. tall and narrow

C. fall and wide

D. short and narrow

Answer: A

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56. The desirable properties for making permanent magnets are

A. high retenstivity, high coercivity

B. hight retentivity, low coercivity

C. low retentivity, high coercivity

D. low retentivity, low coercivity

Answer: A

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57. (a)Soft iron is a conductor of electricity. (b) It is a magnetic material. (c) It is an alloy of iron. (d) It is used for making permanent magnets. State whether:

A. a and c are true

B. a and b are true

C. c and d are true

D. b and d are true

Answer: B

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58. Soft iron is used in many parts of electronical matchines for

A. low hysteresis loss and low permeability

B. low hysteresis loss and high permeability

C. high hysteresis loss and low permeability

D. high hysteresis loss and high permeability

Answer: B

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59. For protecting a sensitive equipment from the external magnetic field, it should be

A. placed inside an aluminium can

B. placed inside an iron can

C. wrapped with insulation around it when passing current through it

D. surrounded with fine copper sheet

Answer: B

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60. Electromagnets are made of soft iron because soft iron has

A. low retentivity and high coercive force

B. high retentivity and high coerive force

C. low retentivity and low coercive

D. high retentivity and low coercive force

Answer: C

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61. The magnetic moment of a diamagnetic atom is

A. much greater than one

B. one

C. between zero and one

D. high retentivity and low coercive force

Answer: D

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62. How does the magnetic susceptibility χ of a paramagnetic material change with absolute temperature T?

A. $\propto T^2$

B. $\propto T^1$

C. $\propto T^{-1}$

D. $\propto T^2$

Answer: C

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63. Statement 1: A direct uniformly distributed current flows through a solid long metallic cylinder along its length. It produces magnetic field only outside the cylinder.

Statement 2: A thin long cylindrical tube carrying uniformly distributed current along its length does not produce a magnetic field inside it. Moreover, a solid cylinder can be supposed to be made up of many thin cylinderical tubes.

A. Statement-1 is true, Statement-2: is true, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is true, Statement-2: is true, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is true but statement-2 is false

D. Statement-1 is false, Statement-2 is true

Answer: D

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64. Statement 1: A charged particle undergoes non-rectilinear motion in a constant magnetic field. The only force acting on the particle is the magnetic force. Then kinetic energy of this particle remains constant but momentum of the particle does not remains constant.

Statement 2: A force that always acts on the particle in direction perpendicular to its velocity does no work on the particle. But whenever a force acts on the particle,

momentum of the particle does not remains constant.

A. Statement-1 is true, Statement-2: is true, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is true, Statement-2: is true, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is true but statement-2 is false

D. Statement-1 is false, Statement-2 is true

Answer: A

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