PHYSICS

BOOKS - CENGAGE PHYSICS (HINGLISH)

Magnetism and Matter

Question Bank

1. A closely wound solenoid of 3000 turns and area of cross-section $2 \times 10^{-4} m^2$, carrying a current of $6A$, is suspended through its center allowing it to turn in a horizontal plane. The magnetic moment (in $(J)(T)^{-1}$) associated with the solenoid is

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2. At a given place on the earth's surface, the horizontal component of earth's magnetic field is $2 \times 10^{-9} T$ and resultant magnetic field is $4 \times 10^{-5} T$. The angle of dip (in degree) at this place is

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3. At a certain place, the horizontal component of the earth's magnetic field is B_0 and the angle of dip is 45°. If the total intensity of the field at that place is $\sqrt{\alpha} B_0$, then find α

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4. At a certain location in Africa, compass point 12° west of geographic north. The north tip of magnetic needle of a dip circle placed in the plane of magnetic meridian points 60° above the horizontal. The horizontal component of the earth's field is measured to be $0.16(G)$. The magnitude of the earth's field at the location is

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5. A dipole of magnetic moment $\vec{m} = (30f)(A)(m)^2$ is placed along the y-axis in a, uniform magnetic field $\vec{B} = \left(2\hat{i} + 5\hat{j}\right).(T)$. The torque acting 'on it is $\left(-\alpha\hat{k}\right)$. Calculate α.

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6. A vibration magnetometer placed in magnetic meridian has a small bar magnet. The magnet executes oscillations with a time period of 2s in the earth's horizontal magnetic field of $24\mu T$. When a horizontal field of $18\mu T$ is produced opposite to the earth's field by placing a current carrying wire, the new time period of the magnet will be

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7. A bar magnet is hung by a thin cotton thread in a uniform horizontal magnetic field and is in' equilibrium state. The energy required to rotate

it by 60° is W. Now the torque required to keep the magnet in this new: position is $\sqrt{k}W$. Find k.

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8. The magnetic moment of a magnet of mass 75 g is $9 \times 10^{-3} Am^2$. If the density of the material of magnet is $7.5 \times 10^3 k \frac{g}{m^3}$, then intensity of magnetization (in (A/ m^2) will be

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9. The susceptibility of magnesium at $300 Kis$1.2 xx 10^(-5) . $At\hat{w}temperature(\in kelv \in)willitssusceptibilitybeequal \rightarrow$ 1.44 xx 10^(-5) ?`

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10. A circular coil of 25 turns and radius of $20cm$ carrying a current of $1A$ rests with its plane normal to an external field of magnitude $5.0 \times 10^{-2}T$. The coil is free to tum about-an axis in its plane perpendicular to the field direction. When the coil is turned slightly and released, it oscillates about its stable equilibrium with a frequency of $2s^{-1}$. The moment of inertia of the coil about its axis of rotation is $\frac{x \times 10^{-2}}{16\pi} kgm^2$. Find x

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11. A short bar magnet has a magnetic moment of 0.4 JT^{-1} The magnitude of the magnetic field (in gauss) produced by the magnet at a distance of $20cm$ from the center of the magnet on the equatorial line of the magnet is

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12. Two identical magnetic dipoles of magnetic moment $2Am^2$ are placed at a separation of $2m$ with their axes perpendicular to each other in air. The resultant magnetic field at a midpoint between the dipoles is $x\sqrt{y} \times 10^{-7}T$. $F \in d$(x+y)`.

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13. A permanent magnet in the shape of a thin cylinder of length $10cm$ has magnetization $M = 10^6 Am^{-1}$. Its magnetization current is 7 ampere, Find $\frac{I_M}{100}$.

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14. The magnetic susceptibility of a paramagnetic substance at $-173^\circ C$ is 1.5×10^{-2}. If its value at $-73^\circ (C)$ is $b \times 10^{-3}$ then find b.

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15. The absolute magnetic permeability μ of a specimen of magnetic material is related to magnetic intensity H according to the relation as $\mu = \frac{0.6}{H} + 8.0 \times 10^{-4} TAm^{-1}$. Find the value of H (in Am^{-1}) for which magnetic induction of $0.22T$ can be produced.

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16. The area of $B - H$ loop for a ferromagnetic material is $540 jm^{-3}$. $Ifthe|o|lutepermeabilityofeespaceis$4 pi xx 10^(-7) A^(-1)m^(-1) and $theareaofthe$I-Hl$\infty pofthe ferromag \neq ticmaterialis$(n)/(4 pi xx 10^(-7)) A^2 m^(-2), $thencalcaten$`.

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17. A tangent galvanometer has a coil of 50 turns and a radius of 20cm. The horizontal component of the earth's magnetic field is $B_H = 3 \times 10^{-5} T$. Find the current which gives a diflection of 45°).

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18. Relation between permeability' μ and magnetizing field H for a sample of iron is $\mu = \leq ft\left(\frac{0.4}{H} + 12 \times 10^{-4} right\right)$ henery! meter, where unit of H is (Am). Find value of $H\left((\in)\frac{A}{m}\right)$ for which magnetic induction of 1.0. $\frac{Wb}{(m)^2}$ can, be produced.

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19. When arod of magnetic material of size $10cm \times 0.5cm \times \ 0, 2cm$ is located in magnetizing field of $0.5 \times 10^4 \frac{A}{m}$ then a magnetic moment of 5Am^(2) is induced in it. Find out the magnetic induction (in. $\frac{Wb}{(m)^2}$) in the rod.

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20. A solenoid has 10^3 turns per unit length. On passing a current of 2A, magnetic induction is measured to be $4\pi \frac{Wb}{(m)^2}$. Calculate the magnetic

susceptibility of the core.

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21. A bar magnet of magnetic moment M and moment of inertia I (about center and perpendicular to length) is cat into two equal pieces, perpendicular to its length. Let T be the period of oscillations of the original magnet about an axis through the mid-point, perpendicular to length, in a magnetic field $\vec{B}$. If the similar period T for each piece is $\frac{T}{n}$, then calculate (n).

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22. A magnet makes 40 oscillations per minute at a place having magnetic field of $0.1 \times 10^{-5} T$. At another place, " it take $2.5s$ to complete one vibration. If the value of the earth's horizontal field at that place is $y \times 10^{-6} T$. then find y.

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23. A puramagnetic sample shows a net magnetization of '8 A m^(-1) $when placed \in an external mag \neq tio field of$ 0.6 T $at a temperature of$ 4K , $When the same samp \leq is \pi aced \in an extermal magnctic field of 0.2 Tatat$ 16 K, $the mag \neq tization will be$ (alpha)/(beta) (A) (m)^(-1). $F \in d$ (alpha+beta)`.

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24. A solenoid of 500 turns /m is carrying a current of $3A$. Relative permeability of the core material of the solenoid is 5000 . If the ratio of the magnetization and the magnetic field inside the core is $\frac{m}{n} \times 10^4$, then find the value of $(m \pm n$). Answer should be minimum positive integer. Take $\pi = 3)$

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25. A rod of magnetic material of cross section $0.25cm^2$ is located in $4000\frac{A}{m}\Big)$ magnetizing field. Magnetic flax passes through the rod is 25×10^6 Wb. Find out magnetic susceptibility for the rod

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26. Magnetic field of the earth is $0.3G$. A magnet is oscillating with the rate of 5 oscillations/min. How much the magnetic field of the earth is increased, so that the number of oscillations becomes 10 per minute?

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27. A magnetic dipole is under the influence of two magnetic fields. The angle between the field directions is 60° and one of the fields has a magnitude of $1.2 \times 10^{-1}T$. If the dipole comes to stable equilibrium at an angle of 30° with this field, then the magnitude of the field (in tesla) is $x \times 10^2 T$. Find x,

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28. The area of hysteresis loop. of a material is equivalent to $250\frac{J}{m^2}$. When $10kg$ material is magnetized by an alternating field of 50 Hz then energy lost in one hour will be beta joule. Find $\frac{\beta}{I000}\Big)$. (Density of material is $\frac{7.5}{c}m^2$)

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29. Density of iron is *[Math Processing Error]* and induced 'nagnetic field in iron is1T. The magnetic dipole tnoment of each iron atom is $y \leq x10^{-34}\left(Am^2\right)$.Calculate $\bar{y}$.

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37. The magnetic moment of a magnet of mass 150 g is $18 \times 10^{-3} Am^2$. If the density of the material of magnet is $15 \times 10^3 k \frac{g}{m^3}$, then intensity of magnetization (in (A/ m^2) will be

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