PHYSICS

BOOKS - BITSAT GUIDE PHYSICS (HINGLISH)

MAGNETOSTATICS

Practice Exercise

1. Calculate the force acting between two small magnets, placed in end on position $0.1m$

apart from their centres. (Given, magnetic moment of each magnet is $5Am^2$).

A. 0.6 N

B. 0.8 N

C. 0.15 N

D. 0.2 N

Answer: C

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2. Two similar equal magnetic poles when separated by a distance of $1m$,

A. $10Am$

B. 20 Am

C. 50 Am

D. 100 Am

Answer: D

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3. Three similar magnetic south poles each of streright $10Am$ are placed at the corners of an equallateral triangle of side $20cm$. Find the magnetic force on one of the pole.

A. $0.25 \times 10^{-3}N$

B. $10^{-3}N$

C. $10 \times 10^{-3}N$

D. None of these

Answer: D

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4. Six s imilar magnetic poles are placed on six corners of a regular hexagon of side $10cm$. A south pole of strength $10Am$ is placed at the centre of hexagon. Find the magnetic force on the south pole.

A. Zero

B. $4\pi \times 10^{-4}N$

C. 10 N

D. None of these

Answer: A

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5. A magnetic wire of dipole moment $4\pi Am^2$ is bent in the form of semicircle. The new magnetic moment is

A. $4\pi Am^2$

B. $8\pi Am^2$

C. $8Am^2$

D. None of these

Answer: C

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6. A current I flows in a conducting wire of lenth L. If we bent it in a circular form, then calculate its magnetic dipole moment.

A. $\frac{ll}{4\pi}$

B. $\frac{l^2 l}{4\pi}$

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

D. $\frac{l^2 l^2}{4\pi}$

Answer: B

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7. The magnetic induction inside a solenoid is $6.5 \times 10^{-4} T$. When it is filled with iron medium, then the induction becomes $1.4T$. The relative permeability of iron will be

A. 1578

B. 2355

C. 1836

D. 2154

Answer: D

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8. If a magnetising field of $1600A/m$ produces a magnetic flux of $14 \times 10^{-5} Wb$ in an iron bar of cross-sectional area $0.2cm^2$. Then,

A. magnetic permeability of iron rod is around 1000

B. magnetic susceptibility is very larger than unity

C. magnetic susceptibility is 340

D. None of the above

Answer: C

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9. Two dissimilar poles of strength $xmWb$ and $2mWb$ are sparated by a distance $12cm$. If the

null point is at a distance of a $4cm$ fro $2mWb$, then calculate x.

A. 5 mWb

B. 6 mWb

C. 7 mWb

D. 8 mWb

Answer: D

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10. Two small magnets of each of magnetic moment M_0 is placed parallel to each other (show in figure). The magnetic field at point O is

A. zero

B. $4 \times 10^{-4} N$

C. $2 \times 10^{-4} N$

D. None of these

Answer: A

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11. Two short magnets of magnetic moment $2Am^2$ and $5Am^2$ are placed along two lines drawn at right angle to each other on the sheet of paper as shown in the figure. What is the magnetic field at the point of intersection of their axis?

A. $2.15 \times 10^{-5}T$

B. $215 \times 10^{-5}T$

C. $2.15 \times 10^{-3} T$

D. $21.5 \times 10^{-5} T$

Answer: A

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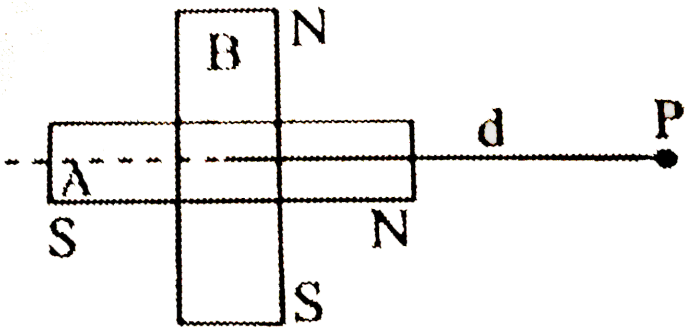
12. Calculate the magnetic induction at P, for the arrangement shown in figure, when two similar short magnets of magnetic moment M are joined at the middle. So that they are

mutually perpendicular -



A. $\frac{\mu_0}{4\pi}\frac{M\sqrt{3}}{d^3}$

B. $\frac{\mu_0}{4\pi}\frac{2M}{d^3}$

C. $\frac{\mu_0 M\sqrt{5}}{4\pi d^3}$

D. $\frac{\mu_0 2M}{4\pi d^3}$

Answer: C

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13. A small magnet of dipole moment M is kept on the arm of a deflection magentometer set in tan A position at a distance of $0.2m$. If the deflection is 60°, find the value of $P\left(B_H = 0.4 \times 10^{-4}T\right)$.

A. $2.77Am^2$

B. $8Am^2$

C. $0.2Am^2$

D. None of these

Answer: A

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14. A short bar magnet of moment $0 \cdot 32JT^{-1}$ is placed in a uniform external magnetic field of $0 \cdot 15T$, if the bar is free to rotate in the plane of the field, which orientations would correspond to its, (i) stable and (ii) unstable equilibrium? What is the potential energy of the magnet in each case?

A. when m is anti-parallel to B, U $= 4.8 \times 10^{-2} J$

B. when m is perpendicular to B, U = 0

C. when m is perpendicular to B, U = $4.8 \times 10^{-2} J$

D. None of the above

Answer: A

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15. A magnet of dipole moment $2Am^2$ is deflected through 30° from magnetic meridian. The required deflecting torque is $\left(B_H = 0.4 \times 10^{-4}T\right)$

A. $0.4 \times 10^{-4}Nm$

B. 0.4 Nm

C. $0.2 \times 10^{-4}Nm$

D. None of these

Answer: A

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16. If the areas under the $I - H$ hysteresis loop and B_H hysteresis loop are denoted by A_1 and A_2, then

A. $A_2 = \mu_0 A_1$

B. $A_2 = A_1$

C. $A_2 = \frac{A_1}{\mu_0}$

D. $A_2 = \mu_0^2 A_1$

Answer: A

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17. Consider the plane S formed by the dipole axis and the axis of earth. Let P be point on the magnetic equator and in S. Let Q be the point of intersection of the geographical and magnetic equators Obtain the declination and dip angles at P and Q.

A. 0° and 11.3°

B. 0° and 0°

C. 113° and 6.5°

D. 11.3° and 11.3°

Answer: A

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18. A magnet of length $14cm$ and magnetic moment μ is broken into two parts of length 6 cm and 8 cm. They are put at right angles to each other with the opposite poles togather. The magnetic dipole moment of the combination is:

A. M/10

B. M

C. M/1.4

D. 2.8 M

Answer: C

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19. A uniform magnetic needle of strength of each pole is $98.1 amp, cm$, is suspended from its centre by a thread. When a mass of $50 mg$ is

loaded to its upper end, the needle becomes horizontal, then the vertical component of earth's magnetic induction is $(g = 981 cm / s^2)$

A. 0.50 gauss

B. 0.25 gauss

C. 0.05 gauss

D. 0.005 gauss

Answer: B

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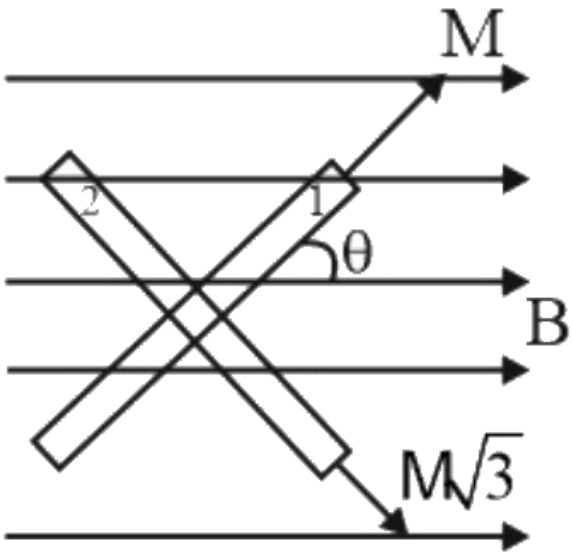
20. Two short bar magnets of dipole moments M and $M\sqrt{3}$ are joined at right angles to form a cross as depicted in the figure . The value of θ for which the system remains in equilibrium in a uniform external magnetic field B, is



A. $\theta = 30^\circ$

B. $\theta = 45^\circ$

C. $\theta = 60^\circ$

D. $\theta = 15^\circ$

Answer: C

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21. The couple acting on a magnet of length 10cm and pole strength 15A-m, kept in a field of $B = 2 \times 10^{-5}$, at an anlge of 30° is

A. $1.5 \times 10^{-5} Nm$

B. $1.5 \times 10^{-3} Nm$

C. $1.5 \times 10^{-2} Nm$

D. $1.5 \times 10^{-6} Nm$

Answer: A

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22. A bar magnet has a magnetic moment $2.5 JT^{-1}$ and is placed in a magnetic field of $0.2T$. Calculate the work done in turning the

magnet from parallel to antiparallel position relative to field direction.

A. 1 J

B. 2 J

C. 3 J

D. 4 J

Answer: A

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23. Two like poles of strengths m_1 and m_2 are at far distance apart. The energy repuired to bring them r_0 distance apart is

A. $\frac{\mu_0 m_1 m_2}{4\pi r_0}$

B. $\frac{\mu_0 m_1 m_2}{8\pi r_0}$

C. $\frac{\mu_0 m_1 m_2}{16\pi r_0}$

D. None of these

Answer: A

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24. Calculate the work done in deflecting a small magnet of magnetic moment $10Am^2$ through 180° from a uniform magnetic field of strength $0.4 \times 10^{-4}T$.

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

B. zero

C. $4 \times 10^{-4}J$

D. None of these

Answer: A

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25. At a place the value of B_H and B_V are $0.4 \times 10^{-4}T$ and $0.3 \times 10^{-4}T$ respectively. The resultant earth's magnetic field is

A. $0.5 \times 10^{-4}T$

B. $10^{-4}T$

C. $2 \times 10^{-4}T$

D. None of these

Answer: A

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26. In previous problem, the angle of dip is

A. $\tan^{-1}(0.75)$

B. $\tan^{-1}(0.5)$

C. $\tan^{-1}(0.8)$

D. None of these

Answer: A

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27. The real angle of dip, if a magnet is suspended at an angle of 30° to the magnetic meridian and the dip needle makes an angle of 45° with horizontal, is:

A. $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

B. $\tan^{-1}(\sqrt{3})$

C. $\tan^{-1}\left(\frac{\sqrt{3}}{\sqrt{2}}\right)$

D. $\tan^{-1}\left(\frac{2}{\sqrt{3}}\right)$

Answer: A

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28. A magnet is cut in three equal parts by cutting it perpendicular to its length. The time period of original magnet is T_0 in a uniform magnetic field B. Then, the time period of each part in the same magnetic field is

A. $\frac{T_0}{2}$

B. $\frac{T_0}{3}$

C. $\frac{T_0}{4}$

D. None of these

Answer: B

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29. A magnet is cut in three equal parts by cutting it perpendicular to its length. The time period of original magnet is T_0 in a uniform magnetic field B. Then, the time period of each part in the same magnetic field is

A. $\frac{T_0}{\sqrt{2}}$

B. $\frac{T_0}{2}$

C. $\frac{T_0}{4}$

D. $4T_0$

Answer: A

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30. The current on the winding of a toroid is 2 A. It has 400 turns and mean circumferential length is 40 cm. With the help of search coil and charge measuring instrument the

magnetic field is found to be 1 T. The susceptibility is

A. 100

B. 290

C. 398

D. 397

Answer: D

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31. The magnetic needle of a tangent galvanometer is deflected at an angle 30° due to a magnet. The hoeizontal component of earth's magnetic field $0.34 \times 10^{-4}T$ is along the plane of the coil. The magnetic intensity is

A. $1.96 \times 10^{-4}T$

B. $1.96 \times 10^{4}T$

C. $1.96 \times 10^{-5}T$

D. $1.96 \times 10^{5}T$

Answer: C

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32. Calculate the angle of dip, if a dip needle oscillating in a vertical plane makes 40 oscillations per minute in a magnetic meridian and 30 oscillations per minute in a vertical plane at right angle to the magnetic meridian.

A. $\theta = \tan^{-1}(0.5625)$

B. $\theta = \tan^{-1}(0.325)$

C. $\theta = \tan^{-1}(0.425)$

D. $\theta = \tan^{-1}(0.235)$

Answer: A

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33. Inside a long solenoid wounded with 300 turns/m, an iron rod is placed. An iron rod is 0.2 m long, 10 mm in diameter and of permeability 10^3. Calculate the magnetic moment of the rod, if 0.5 A of current is passed through the rod.

A. 2.356 Sl units

B. 1.335 Sl units

C. 3.664 Sl units

D. 1.664 Sl units

Answer: A

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34. An iron rod is subjected to cycles of magnetisation at the rate of $50Hz$. Given the density of the rod is $8 \times 10^3 kg/m^3$ and

specific heat is $0.11 \times 10^{-3} cal \times kg^{\circ} C$. The rise in temperature per minute, if the area enclosed by the $B - H$ loop corresponds to energy of $10^{-2} J$ is (Assume there is no radiation losses)

A. $78^{\circ} C$

B. $88^{\circ} C$

C. $8.1^{\circ} C$

D. None of these

Answer: C

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1. The susceptibility of magnesium at $300K$ is 1.2×10^{-5}. At what temperature will the susceptibility increase to 1.8×10^{-5}?

A. 150 K

B. 200 K

C. 250 K

D. 20 K

Answer: B

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2. Magnetic moment of bar magnet is M. The work done to turn the magnet by 90° of magnet in direction of magnetic field B will be

A. zero

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

C. MB

D. MB

Answer: D

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3. If m is magnetic moment and B is the magnetic field, then the torque is given by

A. M. B

B. $\frac{|M|}{|B|}$

C. $M \times B$

D. $|M||B|$

Answer: C

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4. At the magnetic north pole of the earth, the value of horizontal component of earth's magnetic field and angle of dip are, respectively

A. zero, maximum

B. maximum, minimum

C. maximum, maximum

D. minimum, minimum

Answer: A

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5. With a standard rectangular bar magnet, the time period in the uniform magnetic field is $4\,\mathrm{sec}$. The bar magnet is cut parallel to its length into 4 equal pieces. The time period in the uniform magnetic field when the piece is used (in sec) (bar magnet breadth is small)

A. 16

B. 8

C. 4

D. 2

Answer: C

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6. A magnetised wire of magnetic moment $'M'$ and length $'l'$ is bent in the form of a

semicircle of radius $'r'$. The new magnetic moment is

A. $\frac{2M}{\pi}$

B. 2M

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

D. zero

Answer: A

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7. Susceptibility of ferromagnetic substance is

A. > 1

B. < 1

C. zero

D. 1

Answer: A

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8. Among the following properties describing diamagnetism, identify the property that is wrongly stated.

A. Diamagnetic material do not have permanent magnetic moment

B. Diamagnetism is explained in terms of electromagnetic induction

C. Diamagnetic materials have a small positive susceptibility

D. The magnetic moment of individual electrons neutralise each other

Answer: C

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