PHYSICS

BOOKS - NN GHOSH PHYSICS (HINGLISH)

MAGNETIC DIPOLE

Examples

1. Find the value of the potential at a point situated on a line passing through the middle

point of a short magnet of moment $0.3Am^2$ at an angle of 60° with its axis at a distance of $0.05m$ from the mid-point of the magnet.

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2. A short magnet of magnetic moment $2Am^2$ is placed in the east-west direction. Find the position of the neutral point. (Earth's horizontal induction $= 3.6 \times 10^{-5}$ tesla)

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Exercises

1. A very short magnet is placed at a point O with its axis horizontal and perpendicular to the magnetic meridian. If P is a neutral point, show that tha angle between OP and the axis (SN direction) of the magnet is $\tan^{-1}\sqrt{2}$.

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2. Find the magnitude and direction of the magnetic field due to a small bar magnet of

moment 0.03 joule per tesla at a point situated on a line through the centre of the magnet and at an angle of 60° with its axis, the point being at a distance of 0.05m from the centre of the magnet.

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3. Find the potential due to a magnet at a point on its axis at a distance of 0.09 m from its centre in the end-on position. The length of

the magnet is 0.02m and its pole strength 9 Am.

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4. Two magnetic dipoles of moments 0.108 and $0.122Am^2$ are placed along two lines drawn on the table at right angles to each other. Find the intensity at the point of intersection of their axes, their centres being 0.3 and 0.4m, respectively from the point of intersection.

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5. Calculate the work done in transferring a unit magnetic pole from a point on the axis of a dipole of moment 0.3 joule per tesla, at a distance of 10 cm from its centre to a point on a line a an inclination 60° with the axis, at the same distance from the magnet.

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6. Find the locus of the points where the intensity of the magnetic field due to a

magnetic dipole will be perpendicular to its axis.

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7. Two bar magnets are in line. One has a magnetic length of $0.08m$ and pole strength of 5Am and the other has a magnetic length of $0.04m$ and pole strength of 4Am, their midpoints being 0.16m apart. Find the work done in turning one of these magnets over end for end.

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8. The earth may be considered to be a big dipole of moment $6.4 \times 10^{12} Am$ placed at its centre with its axis in the SN direction. The radius of the earth is 6000 km. Calculate the horizontal and vertical components of the earth's magnetic field at a place whose lattitude is $22^{\circ} N$.

[Hint: $B_r = \frac{\mu_0}{4\pi} \frac{2m \cos\theta}{r^3}$ and $B_\theta = \frac{\mu_0}{4\pi} \frac{m \sin\theta}{r^3}$, here $\theta = 90^{\circ} + 22^{\circ} = 112^{\circ}$]

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9. A point lies on a line making an angle of 30° with the axis (SN direction) of a magnetic dipole. If the

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10. A pivoted small magnetic needle of moment m is placed at a distance r along the

axis of a short bar magnet of moment M. Find the force on the pivot of the needle.

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