PHYSICS

BOOKS - CHETANA PHYSICS (MARATHI ENGLISH)

MAGNETISM

Exercise

1. What is magnetism?

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2. What is a magnetic field?

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3. What do you mean by uniform magnetic field?

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4. What is magnetic flux? State its SI unit

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5. Define Magnetic Induction at any point?

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6. What is the SI unit and dimension of magnetic Induction?

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7. Give the relation between SI and CGS unit of magnetic induction?

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8. What do you mean by magnetic lines of force?

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9. State the properties of magnetic lines of force?

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10. What is a Bar Magnet?

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11. What are magnetic poles?

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12. Define magnetic length (2l) for a magnetic dipole ?

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13. Define pole strength q_m) for a magnetic dipole?

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14. State SI unit and dimension of pole strength?

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15. Write the relation between Magnetic length (2l) and Geometric length?

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16. Define magnetic dipole moment (m) and state its SI unit and dimension?

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17. What happens if a bar magnet is cut into two pieces transverse to its length/along its length?

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18. . A short bar magnet has a magnetic moment of $2A - m^2$. If its magnetic length is 5cm, calculate its pole strength?

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19. A bar magnet of geometric length 18 cm has pole strength 100 A-m. Find the magnetic dipole moment of a bar magnet?

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20. Define magnetic axis and magnetic equator with respect to bar magnet?

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21. Derive an expression for magnetic field at an arbitrary point (r) due to a short bar magnet?

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22. Draw neat labelled diagrams to show magnetic field due to a bar magnet .

At an arial point

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23. Draw neat labelled diagrams to show magnetic field due to a bar magnet .

At an Equitorial point

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24. Write a formula for $B_{a\xi s}$ and $B_{equa \to r}$ for Bar magnet?

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25. Prove that $B_{a\xi s} = 2B_{equa \to r}$ for the same distances from centre of magnet.

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26. Show Electrostatic analogue between Electric and Magnetic field as suggested by Maxwell?

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27. A short magnetic dipole has magnetic moment $0.5Am^2$. Calculate its magnetic field at a distance of 20 cm from the centre of magnetic dipole on

(i) the axis (ii) the equatorial line.

$[\mu_o = 4\pi \times 10^{-7}$ SI units] ?

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28. Find the Magnetic Induction at an axial point 30 cm away from a short magnetic dipole of moment 15 $A - m^2$.

$[\mu_o = 4\pi \times 10^{-7}$ SI units]

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29. A magnetic pole of bar magnet with pole strength of 100 A-m is 20 cm away from the centre of a bar magnet. Bar magnet has pole strength of 200 A-m and has a length 5 cm. If the magnetic pole is on the axis of the bar magnet, find the force on the magnetic pole.

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30. Two small and similar bar magnets have magnetic dipole moment of 1.0 $A - m^2$ each.

They are kept in a plane in such a way that their axes are perpendicular to each other. A line drawn through the axis of one magnet passes through the centre. If the distance between their centres is 2m. Find the magnitude of magnetic field at the mid point of the line joining their centres.

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31. Calculate the magnetic Induction due to a short bar magnet at a point 20 cm from it on a

line making an angle of 30° with its axis. Magnetic moment of the magnet = $2.4A - m^2$

.

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32. State the Gauss's law for magnetic field?

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33. Explain the Gauss' law for Magnetic fields.

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34. What could be the equation for Gauss's law of magnetism if a monopole of pole strength P is enclosed by a surface?

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35. Draw the magnetic force lines of bar magnet?

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36. Draw the magnetic force lines of a current carrying finite solenoid?

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37. Write a short note on Earth's magnetic field?

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38. What do you mean by Terrestrial magnetism.

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39. What are magnetic maps of the Earth?

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40. What is a geographic meridian? How does the declination vary with latitude? Where is it

minimum?

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41. Define magnetic declination of Earth's magnetic field?

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42. Define magnetic inclination or angle of dip (ϕ)

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43. Write the values of Bv and angle of dip at equator?

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44. Define Isomagnetic charts.

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45. Define Isodynamic lines.

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46. Define Isogonic lines.

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47. Define Agonic lines.

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48. Define Isoclinic lines

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49. Define Aclinic lines.

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50. Derive an expression for thin prism.

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51. Define following terms with respect to Earth's magnetic field magnetic meridian.

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52. Define following terms with respect to Earth's magnetic field magnetic axis.

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53. Define following terms with respect to Earth's magnetic field magnetic equator.

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54. Draw a diagram to illustrate the magnetic lines of force between the south poles of two magnets.

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55. Two bar magnets are placed on a horizontal surface. Draw magnetic lines around them. Mark the position of any neutral points (points where there is no resultant magnetic field) on your diagram.

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56. The vertical and horizontal components of the earth's magnetic induction at a place are 2×10^{-5} T respectiveley. Calculate dip and

the magnitude of the earth's magnetic induction at that place.

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57. Earth's magnetic field at the equator is approximately 4×10^{-5} tesla, $R = 6.4 \times 10$ m,$\mu_o = 4\pi \times 10^{-7}$ SI unit. Calculate Earth's dipole moment.

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58. A magnet makes an angle of 45° with the horizontal in a vertical plane making an angle of 30° with the magnetic meridian. Find the true value of the dip angle at that place.

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59. In the magnetic meridian of a certain place, the horizontal component of earth magnetic field is 0.26×10^{-4} T and dip angle is 60°,

what is the magnetic field of the earth at this location?

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60. At a given place on the earth a bar magnet of magnetic moment $\overrightarrow{m}$ is kept horizontal in the East-West direction. P and Q are the two neutral points due to magnetic field of this magnet and $\overrightarrow{B_H}$ is the horizontal component of the Earth's magnetic field.

Calculate the angles between position vectors of P and Q with the direction of $\vec{m}$

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61. A bar magnet has pole strength of 10 A-m and a magnetic length of 5cm. Find the magnetic induction at a point 10 cm from either of its two poles [$\mu_o = 4\pi \times 10^{-7}$ XI unit].

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62. The magnetic induction at an axial point is equal to the magnetic induction at an equatorial point. Calculate the ratio of their distances from the centre of the dipole.

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63. Calculate the magnetic moment of a short magnet which produces magnetic induction of 10^{-3} T, at a point along its axis at a distance of 20 cm from its centre [$\mu_o = 4\pi \times 10^{-7}$ SI unit].

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64. A short magnetic dipole has magnetic moment 0.5 Am2. Calculate the magnetic induction at a distance of 20 cm from the centre of the magnetic dipole on the axis and the equitorial line

[$\mu_o = 4\pi \times 10^{-7}$ SI unit].

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65. Calculate the distance from the centre of a short bar magnet of moment 3 $A - m^2$ on the equatorial line where the magnitude of magnetic induction is 1.92×10^{-5} T [$\mu_O = 4\pi \times 10^{-7}$ SI unit].

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66. A short bar magnet has a magnetic moment of $2A - m^2$. If its geometric length is 6cm, calculate its pole strength.

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67. A magnetic needle free to rotate in a vertical plane parallel to the magnetic meridian, has its north tip pointing down at $21^{\circ}48^{1}$ with the horizontal. If the horizontal component of the earth's magnetic induction at that place is 3.5×10^{-5} T, determine the earth's magnetic induction at that place.

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68. A short bar magnet has magnetic moment 20 Am^2. The axis of the magnet is in the magnetic meridian with the south pole pointing north. The horizontal component of earth's magnetic field at that place is 3×10^{-5} T. Find the point on the axis of the magnet at which the resultant magnetic field is zero, [such a point is called a neutral point].

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69. Choose the corect options.

Let r be the distance of a point on the axis of a bar magnet from its centre. The magnetic field at r is always proportional to:

A. $1/r^2$

B. $1/r^3$

C. $1/r$

D. Not necessarily $1/r^3$ at all points

Answer:

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70. Choose the corect options.

Magnetic meridian isthe plane

A. perpendicular to the magnetic axis of the Earth

B. perpendicular to the geographic axis of the Earth

C. passing through the geographic axis

D. passing through the magnetic axis of the Earth

Answer:

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71. Choose the corect options.

The horizontal and vertical components of magnetic field of the Earth are same at some place on the surface of the Earth. The magnetic dip angle at this place will be:

A. 30°

B. 45°

C. 0°

D. 90°

Answer:

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72. Choose the corect options.

Inside a bar magnet, the magnetic field lines

A. are not present

B. are parallel to the crosssectional area of the magnet

C. are in the direction from N pole to S pole.

D. are in the direction from S pole to N pole

Answer:

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73. Choose the corect options.

A place where the vertical components of the earth's magnetic field is zero has the angle of dip equal to

A. 0°

B. 45^2

C. 60°

D. 90°

Answer:

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74. Choose the corect options.

A place where the horizontal component of Earth's magnetic is zero lies at

A. geographic equator

B. geomagnetic equator

C. one of the geographic poles

D. one of the geomagnetic poles

Answer:

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75. Choose the corect options.

A magnetic needle kept non-parallel to the magnetic field in a non-uniform magnetic field experiences

A. a force but not a torque

B. a torque but not a force

C. both a force and a torque

D. neither force nor a torque

A. a force but not a torque

B. a torque but not a force

C. both a force and a torque

D. neither force nor a torque

Answer:

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76. Choose the corect options.

Magnetic equator happens to pass through India near

A. Delhi

B. Mumbai

C. Surat

D. Thiruvananthapuram

Answer:

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77. Choose the corect options.

Who was the first scientist to systematically

investigate the phenomenon of magnetism using scientific method?

A. Gilbert

B. Newton

C. Maxwell

D. Oersted

Answer:

Watch Video Solution

78. Choose the corect options.

Who was the scientist who proved that electricity and magnetism represent different aspects of the same fundamental force field?

A. Maxwell

B. Oersted

C. Young

D. Einstein

Answer:

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79. A bar magnet has geometric length $4.8 \times 10^{-2} m$. The magnet moment of bar magnet, of pole strength 20 Am is?

A. $0.8 Am^2$

B. $0.6 Am^2$

C. $0.4 Am^2$

D. $1 Am^2$

Answer:

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80. Choose the corect options.

The lines of force of the earth's magnetic field will be perpendicular to earth's surface

A. at all positions

B. near the poles

C. near the equator

D. at the centre of the earth

Answer:

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81. Choose the corect options.

The magnetic induction due to short magnetic dipole of moment 0.1 Am^2 at equitorial point 1 cm away from the centre of dipole is ? [$\mu_o = 4\pi \times 10^{-7}$ Wb/Am]

A. 0.1 T

B. 0.01 T

C. 0.001 T

D. 0.0001 T

Answer:

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82. Choose the corect options.

The magnetic induction at apoint distance 15 cm on the axis of a short bar magnet moment 0.5 Am^2 is

A. $3 \times 10^{-11} Wb/m^2$

B. $3 \times 10^{-8} Wb/m^2$

C. $3 \times 10^{-11} Wb/m^2$

D. $3 \times 10^{-5} Wb/m^2$

A. $3 \times 10^{-11} W/m^2$

B. $3 \times 10^{-8} Wb/m^2$

C. $3 \times 10^{-11} Wb/m^2$

D. $4 \times 10^{-5} Wb/m^2$

Answer:

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83. Choose the corect options.

Magnetic lines of force are

A. continuous

B. discontinuous

C. always straight line

D. zig-zag lines

Answer:

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84. The vector sum of magnetic moments of all electrons inside the atom is the

A. magnetic moment of proton

B. magnetic moment of neutron

C. magnetic moment of atom

D. average magnetic moment of electron

Answer:

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85. Choose the corect options.

At a given place let angle of dp be 30° then the vertical component of earth's magnetic induction is

A. $\frac{\sqrt{3}}{2}B$

B. B

C. 0

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

Answer:

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86. Choose the corect options.

The magnetic induction due to a bar magnet of length 6×10^2 m and pole strength 5×10^{-3} Am at a point 0.1 m away from the centre and along the equator is

A. 3×10^{-9} N/Am, directed from N-pole to S-pole

B. 3×10^{-8} N/Am, directed from N-pole to S-pole

C. 3×10^{-8} T, directed from S-pole to N-pole

D. 3×10^{-9} T, directed from S-pole to N-pole

Answer:

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87. Choose the corect options.

If at a given place the earth's magnetic induction B is 5×10^{-4} tesla and the

horizontal component B_H is 3 gauss, the vertical component B is

A. 4×10^{-4} gauss

B. 5 gauss

C. 4×10^{-4} T

D. $3.5 \times 10 - 4$ T

Answer:

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88. The magnetic induction at a point on axis or equator is proportional to n" power of distance from centre where n is

A. 3

B. -3

C. -2

D. 2

Answer:

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89. The direction of earth's magnetic field is horizontal and vertical respectively at

A. magnetic equator, geographical poles

B. magnetic equator, magnetic poles

C. geographical equator, magnetic poles

D. geographical equator, geographical poles

Answer:

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90. The study of earth's magnetic field is called as

A. terrestrial

B. geomagnetism magnetism

C. both a and b

D. aquatic magnetism

Answer:

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91. Choose the corect options.

The magnetic length of a dipole is

A. $\frac{5}{6} \times$ geometric length

B. $\frac{1}{2} \times$ geometric length

C. $2 \times$ geometric length

D. $\frac{6}{5} \times$ geometric length

Answer:

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92. The magnetic fields at a distance 'd' from a short bar transverse positions, are in the ratio magnet in longitudinal and transverse positions, are in the ratio

A. $1:1$

B. $1:2$

C. $\grave{2}:1$

D. $3:1$

Answer:

93. Choose the corect options.

The magnetic field at a point A on the axis of a small bar magnet is equal to the field at a point B on the equator of same magnet. The ratio of distance of A and B from centre of magnet is

A. 2^3

B. $2^{-1/3}$

C. $2^{-2/3}$

D. $2^{1/3}$

A. 2^3

B. $2^{-1/3}$

C. $2^{-2/3}$

D. $2^{1/3}$

Answer:

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94. Choose the corect options.

When a bar magnet is placed in a uniform magnetic field, it experiences

A. Only force

B. only torque

C. both force and torque

D. no force, no torque

Answer:

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95. Choose the corect options.

The pole strength of a magnet is

A. vector quantity with SI unit A-m

B. scalar quantity with SI unit A/m

C. vector quantity with SI unit A/m

D. scalar quantity with SI unit A-m

Answer:

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96. Choose the corect options.

Magnetic flux is defined as number of magnetic lines of forces passing through a

given area such that angle between the lines of forces and surface is

A. 0°

B. 45°

C. 90°

D. 120°

Answer:

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97. Choose the corect options.

The angle of dip is zero at

A. magnetic equator

B. geographic equator

C. magnetic poles

D. geographic poles

Answer:

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98. Choose the corect options.

A thin rod of length L is magnetized and has magnetic moment M. The rod is then bent in a semicircular arc. The magnetic moment in this case is

A. $\frac{M}{L}$

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

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

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

A. $\frac{M}{L}$

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

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

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

Answer:

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99. Choose the corect options.

Let r be the distance of a point on the axis of a bar magnet from its centre. The magnetic field at r is always proportional to:

A. $1/r^2$

B. $1/r^3$

C. $1/r$

D. Not necessarily $1/r^3$ at all points

Answer:

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100. Choose the corect options.

A place where the vertical components of the

earth's magnetic field is zero has the angle of dip equal to

A. 0°

B. 45°

C. 60°

D. 90°

Answer:

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101. The magnetic fields at a distance 'd' from a short bar transverse positions, are in the ratio magnet in longitudinal and transverse positions, are in the ratio

A. $1:1$

B. $1:2$

C. $\grave{2}:1$

D. $3:1$

Answer:

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102. Choose the corect options.

The magnetic field at a point A on the axis of a small bar magnet is equal to the field at a point B on the equator of same magnet. The ratio of distance of A and B from centre of magnet is

A. 2^3

B. $2^{-1/3}$

C. $2^{-2/3}$

D. $2^{1/3}$

A. 23

B. $2-1/3$

C. $2-\ -2/3$

D. $21/3$

Answer:

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112. A magnet makes an angle of 45° with the horizontal in a vertical plane making an angle of 30° with the magnetic meridian. Find the true value of the dip angle at that place.

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113. Prove that B axis = 2B equator.

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114. Derive an expression for Earth magnetic field interns of its components.

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115. Derive an expression for magnetic field at an arbitrary point (r) due to a short bar

magnet?

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116. A short magnetic dipoles has magnetic moment 0.5 Am^2. Calculate its magnetic field at a distance of 20cm from the center of magnetic dipole on the axis.

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117. A short magnetic dipoles has magnetic moment 0.5 Am^2. Calculate its magnetic field at a distance of 20cm from the center of magnetic dipole on the equatorial line ($\mu_0 = 4\pi \times 10^{-7}$ SI unit).

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118. Earth's magnetic field at the equator is approximately 4×10^{-5} tesla, $R = 6.4 \times 10$

m,$\mu_o = 4\pi \times 10^{-7}$ SI unit. Calculate Earth's dipole moment.

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