



PHYSICS

BOOKS - JEEVITH PUBLICATIONS

PHYSICS (KANNADA ENGLISH)

MAGNETISM AND MATTER

One Mark Questions With Answers

1. What is a lodestone ?



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2. Mention any one country to have used this magnet for technology long ago.



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3. Is it possible to make magnets out of iron and its alloys ?



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4. Can the north or the south pole of a magnet be isolated ?



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5. Give any one cause for terrestrial magnetism.



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6. What does magnetic flux refer to ?



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7. Write the expression for magnetic dipole moment due to a current loop.



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8. Define the term magnetic moment with respect to a magnet.



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9. Write the SI unit of magnetic dipole moment .



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10. Give the SI unit of pole strength.



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11. Write the dimensional formula for $\frac{I}{mB}$

where symbols have their usual meaning.





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12. Does a bar magnet exert a torque on itself due to its own field?



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13. What is the pole named near the geographic north pole of the earth and near the geographic south pole of the earth?



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14. What is a geographic meridian ?



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15. What is ment by a magnetic meridian ?



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16. What is ment by magnetic declination ?



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17. What is meant by angle of dip or magnetic inclination ?



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18. Define intensity of magnetization.



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19. Write the unit of intensity of magnetisation.



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20. Define magnetic permeability of a substance.



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21. Mention the SI unit of magnetising field.



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22. Give the the expression for the magnetic field contributed by the material core.



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23. What are diamagnetic substances ?



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24. Give an example for a diamagnetic substance.



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25. What are paramagnetic substances ?



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26. Give an example for a paramagnetic substance .



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27. What are ferromagnetic substances ?



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28. Give an example for a ferromagnetic substance.



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29. How does magnetic susceptibility of a diamagnetic substance depend on the

absolute temperature?



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30. Mention the range of relative magnetic permeability of a diamagnetic substance.



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31. State Curie's law for a paramagnetic substance.



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32. Give the range of magnetic permeability for a paramagnetic substance .



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33. Give the range of magnetic permeability for a ferromagnetic substance .



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34. Define curie temperature .



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35. State Curie - Weiss law for a ferromagnetic substance.



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36. Define the term residual magnetism.



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37. Define the term retentivity or remanence.



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38. What is meant by a coercive field ?



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39. What is meant by coercivity ?



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40. What is hysteresis ?



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41. Suggest a material that can be used to make a permanent magnet.



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42. Name the material that can be used to make electromagnets.



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43. Why do diamagnetic substances repel away from a strong magnetic field.



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44. If a bar magnet is placed in a uniform magnetic field then what will be the net force experienced by it ?



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45. What is the value of P.E of a magnetic dipole whose orientation is 90° with respect to the magnetic flux density ?



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46. Mention the value of $\oint \vec{B} \cdot d\vec{S}$ through any closed loop or surface.



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47. How would you relate μ and μ_r ? (Where μ is magnetic permeability and μ_r relative magnetic permeability)



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48. How are magnetic susceptibility 'x' and relative magnetic permeability (μ_r) related ?



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49. Why do we say that diamagnetism is universal .



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50. What are ceramics?



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51. Would the maximum possible magnetisation of a paramagnetic substance be of the same order of magnitude as the magnetisation of a ferromagnet ?



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52. What is meant by magnetic equator ?



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53. Give the expression for magnetic field at a point on the axis of a short magnetic dipole.



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54. Give the expression for magnetic field at a point on the equatorial line of a magnetic dipole.



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55. Give a relation between magnetic field at a point on the axis and equatorial point of short magnetic dipole.



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56. What is meant by solar wind ?



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57. Name a device who shows the direction of horizontal component of a magnetic field.



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58. Draw magnetic field lines around a bar magnet.



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Two Marks Questions With Answers

1. What are electromagnets ?



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2. Write the relation between B_E , B_H and B_V along with an appropriate diagram .



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3. What do magnetic lines of force represent ?



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4. Why is that any two magnetic lines of force do not intersect with each other ?



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5. How are the magnetic lines of force aligned in an uniform magnetic field ?



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6. Say whether the magnetic dipole moment is a scalar or a vector quantity and give its direction.



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7. Give the expression for the magnitude of magnetic flux density along the axis of solenoid in terms of magnetic moment. Give the meaning of the symbols used.



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8. Give the expression for torque acting on a magnetic dipole placed in an uniform magnetic field and give the meaning of the symbols.



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9. Give the expression for magnetic potential energy and the meaning of the symbols.



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10. Give the expression for period of oscillation of a magnetic dipole (magnetic needle) in a uniform magnetic field and the meaning of the symbols.



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11. State Gauss's law in magnetism and write the same in the mathematical form.



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12. Magnetic field arises due to charges in motion. Can a system have magnetic moments even though its net charge is zero ? Explain.



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13. Give the location of earth's magnetic dipole.



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14. Define magnetic susceptibility of a substance. Mention the SI unit of susceptibility.



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15. Give the expression for total magnetic flux associated with the magnetic material subjected to the magnetising field.



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16. What are permanent magnets ? Give any one practical application of permanent magnets.



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17. What are magnetic elements of the Earth?



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18. Why does a paramagnetic sample display greater magnetisation (for the same magnetising field) when cooled ?



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19. What are horizontal and vertical components of earth's total magnetic field ?



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1. Mention the range of magnetic susceptibility for (a) Diamagnetic substances (DMS) (b) Paramagnetic substances (PMS) (c) Ferromagnetic substances (FMS).



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2. Explain the significance of narrow hysteresis loop.



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3. Give any three practical applications of electromagnets.



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4. If the horizontal component of Earth's magnetic field is 0.26 G, then find the total magnetic field at which the dip angle is 60° .



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5. If the total magnetic field at the place is 0.56 G, then calculate the vertical component of Earth's magnetic field at which the dip angle is 30° .



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6. Write any three known facts about magnetism.



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7. Write any three properties of magnetic field lines.



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8. State and explain Gauss's law in magnetism.



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9. Draw a neat diagram to show the angle of dip and angle of declination.





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10. Calculate the value of angle of dip corresponding to the place at which

$$B_V = B_E$$



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11. Calculate the value of angle of dip corresponding to the place at which

$$B_H = B_E.$$



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12. Distinguish between diamagnetic and paramagnetic substances.



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13. Distinguish between paramagnetic and ferromagnetic substances.



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Five Marks Questions With Answers

1. Explain briefly how bar magnets act as equivalent solenoids.



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2. Obtain an expression for magnetic potential energy of a magnetic dipole placed in an uniform magnetic field.



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Numericals With Solutions

1. For a short magnetic dipole of magnetic moment 0.5 Am^2 . Find the magnetic field at a point (a) 1 m on the axis and from the centre of the magnet (dipole) (b) 1 m on the equatorial line from the centre (c) at an angle of 60° w.r. to the line joining the point and the centre of the dipole at distance 1 m.



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2. A charge $2 \mu\text{ C}$ is moving at an angle of 60° with respect to the magnetic field 0.2 T at a speed of 10^4 ms^{-1} . If the electric field 10^3 Vm^{-1} is at right angles to the magnetic field then find the net field.



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3. A domain in a ferromagnetic substance is in the form of a cube of volume 10^{-18} m^3 .

Calculate the number of atoms present in the

given volume and a hypothetical dipole moment and magnetisation of the domain (given density of the substance $7.9 \times 10^3 \text{kgm}^{-3}$ molecular mass 55g / mole and dipole moment of each atom is $9.2 \times 10^{-24} \text{Am}^2$).



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4. A closely wound solenoid of 2000 turns and area of cross section $1.6 \times 10^{-4} \text{m}^2$, and carrying a current of 4.0 A, is suspended

through its centre allowing it to turn in a horizontal plane.

What is the the magnetic moment asociated with the solenoid ?



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5. A closely wound solenoid of 2000 turns and area of cross-section $1.6 \times 10^{-4} m^2$ carrying a current of 4.0 A. is suspended through its centre allowing it to turn in a horizontal plane.

(a) What is the magnetic moment associated

with the solenoid?

(b) What is the force and torque on the solenoid if a uniform horizontal magnetic field of $7.5 \times 10^{-2} T$ is set up at an angle of 30° with the axis of the solenoid?



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6. A circular coil of 16 turns and radius 10 cm carrying a current of 0.75 A, rests with its plane normal to an external field of magnitude $5.0 \times 10^{-2} T$. The coil is free to turn 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 2.0s^{-1} . What is the moment of inertia of the coil about its axis of rotation ?



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7. A long straight horizontal cable carries a current of 2.5 A in the direction 10° south of west to 10° north of east . The magnetic

meridian of the plane happens to be 10° west of the geographic meridian . The earth's magnetic field at the location is 0.33 G , and the angle of dip is zero. Locate the line of neutral points.



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8. A telephone cable at a place has four long straight horizontal wires carrying a current of 1.0 A in the same direction east to west. The earth's magnetic field at the place is 0.39 G ,

and the angle of dip 35° . The magnetic declination is nearly zero. What are the resultant magnetic fields at points 4.0 cm below the cable?



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9. A monoenergetic (18 keV) electron beam initially in the horizontal direction is subjected to a horizontal magnetic field of 0.04 G normal to the initial direction. Estimate the up or down deflection of the beam over a distance

of 30 cm ($m_e = 9.11 \times 10^{-31} \text{ kg}$). (Note: Data in this exercise are so chosen that the answer will give you an idea of the effect of earth's magnetic field on the motion of the electron beam from the electron gun to the screen in a TV set.]



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10. A sample of a paramagnetic salt contains 2.0×10^{24} atomic dipoles each of dipole moment $1.5 \times 10^{-23} \text{ JT}^{-1}$. The sample is

placed under a homogeneous magnetic field of 0.64 T and cooled to a temperature of 4.2 K. The degree of magnetic saturation achieved is equal to 15%. What is the total dipole moment of the sample for a magnetic field of 0.98 T and a temperature of 2.8 K ? (Assume Curie's law)



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11. A magnetic needle has a magnetic moment $5 \times 10^{-2} \text{ Am}^2$. If the moment of inertia of a

magnet about an axis passing through the centre and perpendicular to the length of a magnet is $1.0 \times 10^{-7} \text{kgm}^2$ then calculate the magnitude of the magnetic field which sets the magnet into oscillation at a frequency of 2 Hz.



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12. If the magnetic moment of a solenoid carrying current 2A and having area of

crosssection $1.0 \times 10^{-4} m^2$ is 0.050 Am^2 then
calculate the number of turns in the solenoid.



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