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REVISION TEST -09 **Total Marks -30**

12th Physics – Magnetism and Matter

Multiple Choice Questions 5x1 =5

1. A bar magnet of magnetic moment 1.5 J/T lies aligned with the direction of a uniform magnetic field of 0.22 T. What is the amount of work required by an external torque to turn the magnet so as to align its magnetic moment opposite to the field direction?
   a. 0.66J
   b. 0.86J
   c. 0.56J
   d. 0.76J nC
2. Correct unit of Bohr magneton is
   a. T/J
   b. T
   c. J
   d. J/T
3. A toroidal solenoid with 500 turns is wound on a ring with a mean radius of 2.90 cm. Find the current in the winding that is required to set up a magnetic field of 0.350 T in the ring if the ring is made of silicon steel of relative permeability, $\mu_r = 5200$
   a. 19.5mA
   b. 21.5mA
   c. 23.5mA
   d. 22.5mA
4. Permeability of a paramagnetic material is expected to decrease with increasing temperature because
   a. random thermal motion reduces magnetic moment alignment
   b. random thermal motion increases magnetic moment alignment
   c. electrons stop moving
   d. electrons go into forbidden gap
5. A bar magnet of magnetic moment M, is placed in a magnetic field B. The torque exerted on it is:
   a. $\vec{M} \times \vec{B}$
   b. $\vec{M} \cdot \vec{B}$

c. $-\vec{B} \cdot \vec{M}$

d. $-\vec{M} \cdot \vec{B}$

Short Type 1 Questions 4 x2 =8

6. Does the earth's magnetic field at a point vary with time? Is this variation appreciable?
7. The susceptibility of a magnetic material is 1.9×10^{-5}. Name the type of magnetic material, it represents.
8. In what way is the behaviour of a diamagnetic material different from that of a paramagnetic, when kept in an external magnetic field?
9. A short bar magnet placed with its axis at 30° with a uniform exernal magnetic field of 0.25 T experiences a torque of magnitude equal to $4.5 \times 10^{-2} J$. What is the magnitude of magnetic moment of the magnet?

Short Type 2 Questions 3 x3 =9

10. A small compass needle of magnetic moment M and moment of inertia I is free to oscillate in a magnetic field B. It is slightly disturbed from its equilibrium position and then released. Show that it executes simple harmonic motion. Hence, write the expression for its time period.
11. Define magnetic dipole moment of a magnet and write its unit by taking into consideration the torque acting on it, when placed in magnetic field. Is it a vector or a scalar?
12. What do you understand by the terms magnetic length and geometric length of the magnet? How are the two related to each other?

Long Type Questions 2 x4 =8

13. Explain the sense in which the solenoid acts like a bar magnet. What is its associated magnetic moment?
14. A short bar magnet of magnetic moment $5.25 \times 10^{-2} JT^{-1}$ is placed with its axis perpendicular to earth's field direction. At what distance from the centre of the magnet, is the resultant field inclined at 45° with earth's field on
    i. its normal bisector.
    ii. its axis? Magnitude of earth's field at the place 0.42 G. Ignore the length of the magnet in comparison to the distances involved.