ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION

SOLUTION TO WORK SHEET 25

Subject : PHYSICS

30.6.20

CLASS : XII

Topic: $\vec{B}$ at any position, $\vec{B}$ at the centre of a circulating electro magnetic moment, Bohr magnaton.

Chapter : Magnetic properties of materials

Multiple Choice Questions : **1x 15 = 15**

1. The result magnetic intensity at a point P (r, θ) due to a dipole is

   (a) $B = \frac{\mu_o}{4\pi} \cdot \frac{M}{r^3}\sqrt{1 + 3\cos^2\theta}$ (b) $B = \frac{\mu_o}{4\pi} \cdot \frac{M}{r^3}$

   (c) $B = \frac{\mu_o}{4\pi} \cdot \frac{M}{r^3}\sqrt{1 + 3\sin^2\theta}$ (d) $B = 0$

   Ans. (a) $B = \frac{\mu_o}{4\pi} \cdot \frac{M}{r^3}\sqrt{1 + 3\cos^2\theta}$

2. For the above question, P is an axial point with respect to

   (a) M_r (b) M_θ (c) neither M_r nor M_θ (d) $M_r = M_\theta$

   Ans. (a) M_r

3. For question no : (1), P is a broadside - on position with respect to

   (a) M_r (b) M_θ (c) neither M_r nor M_θ (d) $M_r = M_\theta$

   Ans. (b) M_θ

4. Magnetic intensity at any point P (r, θ) due to a short bar magnet or dipole denotes

   (a) intensity on end - on position, when $\theta = 0^0$
   (b) intensity on the broadside - on position, when $\theta = 90^0$
   (c) both (a) and (b)
   (d) none of the above

   Ans. (c) both (a) and (b)

5. From θ : 3, $M_r = M\cos\theta$ and $M_\theta = M\sin\theta$, where

   (a) $M_r \perp M_\theta$ (b) $M_r \parallel M_\theta$ (c) $M_r = M_\theta$ (d) $M_r = 2M_\theta$

   Ans. (a) $M_r \perp M_\theta$

6. The electron of mass m and charge e is revolving in the orbit of radius r in anti - clockwise direction. So the equivalent current is

   (a) clockwise (b) anti - clockwise (c) zero (d) none of the above

   Ans. (a) clockwise

7. Magnetic moment of the electron orbit

   (a) $M = \frac{I}{A}$ (b) $M = IA$ (c) $M = \frac{IA}{2}$ (d) $M = \frac{A}{I}$

   Ans. (b) $M = IA$

8. Angular momentum of an electron rotating in a circular orbit

(a) $L = \frac{mv}{r}$ (b) $L = \frac{r}{mv}$ (c) $L = mr^2\omega$ (d) $L = \frac{\omega}{Lr}$

Ans. (c) $L = mr^2\omega$

9. The ratio of magnetic moment to the angular momentum of an orbiting electron is

(a) $M = \frac{2m}{e}L$ (b) $L = \frac{eL}{2m}$ (c) $M = mLe$ (d) $L = \frac{e}{2m}L$

Ans. (d) $L = \frac{e}{2m}L$

10. Vector form of magnetic moment of an orbiting electron in a circular orbit

(a) $\vec{M} = -\frac{e}{2m}\vec{L}$ (b) $\vec{M} = \frac{e}{2m}\vec{L}$ (c) $\vec{M} = \frac{e}{m}\vec{L}$ (d) none of the above

Ans. (a) $\vec{M} = -\frac{e}{2m}\vec{L}$

11. According to Bohr's theory, in a stable orbit angular moment of the electron is

(a) $L = n\frac{h}{2\pi}$ (b) $L = \frac{h}{2\pi}$ (c) $L = \frac{2\pi}{h}$ (d) $L = 0$

Ans. (a) $L = n\frac{h}{2\pi}$

12. Minimum value of magnetic moment of an electron rotating in a circular orbit

(a) $M = \frac{eh}{2\pi th}$ (b) $M = \frac{eh}{4\pi m}$ (c) $M = \frac{eh}{\pi m}$ (d) $M = \frac{4\pi th}{eh}$

Ans. (b) $M = \frac{eh}{4\pi m}$

13. Magnetic moment of the electron due to its orbital motion is given by

(a) $M = \frac{neh}{\pi m}$ (b) $M = \frac{4\pi m}{neh}$ (c) $M = n\left(\frac{eh}{4\pi m}\right)$ (d) $M = \frac{eh}{4\pi m}$

Ans. (c) $M = n\left(\frac{eh}{4\pi m}\right)$

14. Bohr magneton is

(a) minimum value of the orbital magnetic moment
(b) maximum value of the orbital magnetic moment
(c) neither (a) nor (b)
(d) a megnet

Ans. (a) minimum value of the orbital magnetic moment

15. 1 Bohr magneton is

(a) 9.00×10^{-24} Am^2 (b) 9.27×10^{-24} Am^2
(c) 92.7×10^{-24} Am^2 (d) 927×10^{-24} Am^2

Ans. (b) 9.27×10^{-24} Am^2

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