Moving Charges and Magnetism

CHAPTER 4

TRY YOURSELF

ANSWERS

1. $\because \vec{F} \perp \vec{B} \therefore \vec{a} \perp \vec{B} \Rightarrow \vec{a} \cdot \vec{B} = 0$

Hence, $(x\hat{i} + 2\hat{j}) \cdot (-3\hat{i} - 2\hat{j} + 4\hat{k}) = 0$

or $-3x - 4 = 0 \Rightarrow x = -4/3$

2. As, $B = \dfrac{F}{qv\sin\theta}$

$\therefore$ Dimensions of $B = \dfrac{[MLT^{-2}]}{[AT][LT^{-1}]} = [MA^{-1}T^{-2}]$

3. As $F = qvB\sin\theta \Rightarrow F = q(\vec{v} \times \vec{B})$ *i.e.* force $\vec{F}$ is perpendicular to the plane containing $\vec{v}$ and $\vec{B}$.

Hence, the required pairs of vector are $\vec{F}, \vec{v}$ and $\vec{F}, \vec{B}$.

4. Velocity selector finds its application in mass spectrometer used to determine the mass of charged particles.

5. Magnetic lines of force are in the form of concentric circles with the conductor as centre, lying in the plane perpendicular to the straight conductor.

6. TmA^{-1}

7. Magnetic field induction at a point at distance r due to current element of length dl carrying current i is given as follows.

$$d\vec{B} = \frac{i(d\vec{l} \times \vec{r})}{r^3}$$

8. Magnetic field induction at the centre of current carrying semicircular loop is

$$\frac{\mu_0}{4\pi}\frac{I(\pi R)}{R^2} = \frac{\mu_0 I}{4R}$$

9. Right hand thumb rule.

10. Ampere's law is applicable both whether path of integration lies inside or outside the conductor.

11. For an amperian loop, magnetic field inside the tube, current enclosed is zero. Hence, according to ampere's law magnetic field will also be zero.

12. The magnetic moment associated with a current (I) carrying circular coil of radius r having N towns, is given by, $M = NI\,A = NI\pi r^2$.

13. It depend upon number of turns of the coil, cross-sectional area of the coil and current flowing in the coil.

14. A moving coil galvanometer is an instrument which is used to measure electric current. It is a sensitive electromagnetic device which can measure low currents even of the order of a microampere.

15. No, current loop placed in non-uniform magnetic field experience net force and torque.

16. A shunt is a low resistance wire which when connected in parallel to the galvanometer, protects it from the strong current. The SI unit of shunt is ohm.

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