ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION

SOLUTION TO WORK SHEET 21

Subject : PHYSICS

23.6.20

CLASS : XII

Chapter : Electromagnetism

Topic : Magnetic force is a work less force, circular motion of a charged particle in uniform **B**, Cyclotron, velocity selector.

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

1. Magnetic force is a no work force because,

   (a) $\vec{F} \perp \vec{v}$ (b) $\vec{F}.\vec{S} \neq O$ (c) $P = F \times v$ (d) none of the above

   Ans. : (a) $\vec{F} \perp \vec{v}$

2. Work done by the magnetic force on a charged particle moving in the magnetic field is zero. So,

   (a) K.E of a charged particle is not affected (b) speed of particle is zero

   (c) speed of the particle is variable (d) none of the above

   Ans. (a) K.E of a charged particle is not affected

3. In C.G.S, force on a moving charge in a magnetic field is given by

   (a) $\vec{F} = q\vec{v} \times \vec{B}$ (b) $\vec{F} = \frac{q}{c}\vec{v} \times \vec{B}$ (c) $F = Bqv$ (d) $\vec{F} = \vec{B} \times \frac{q}{c}\vec{v}$

   Ans. (b) $\vec{F} = \frac{q}{c}\vec{v} \times \vec{B}$

4. A charged particle enters a magnetic field $\vec{B}$ perpendicularly with velocity v and keeps rotating along a circular path of radius r. What will happen if the magnitude of $\vec{B}$ is increased?

   (a) v will increase (b) v will decrease (c) r will increase (d) r will decrease

   Ans. (d) r will decrease

5. The radius of the circular path described by a charged particle in a magnetic field is

   (a) directly proportional to the momentum of the particle

   (b) directly proportional to the kinetic energy of the particle

   (c) directly proportional to the amount of charge of the particle

   (d) directly proportional to the strength of the magnetic field

   Ans. (a) directly proportional to the momentum of the particle

6. The magnitude of an electric field along x-axis $1 Vm^{-1}$ and in the same region the magnitude of a magnetic field along y-axis is 10^{-6}T. What should be the velocity of an electron in that region so that it will continue to move with uniform velocity along z-axis without suffering any deviation?

   (a) 10^6 m.s^{-1} (b) 10^{-6} m.s^{-1} (c) 2 x 10^6 m.s^{-1} (d) 2 x 10^{-6} m.s^{-1}

   Ans. (a) 10^6 m.s^{-1}

7. A moving electron and a moving proton enter a uniform magnetic field in a direction perpendicular to that of the field. If the radii of their circular orbits are equal, they have the same

(a) velocity (b) momentum (c) kinetic energy (d) charge to mass ratio

Ans. (b) momentum

8. In α-particle and a proton having same momentum enter into a region of uniform magnetic field and move in circular paths. The ratio of the radii of curvature of their circular paths r_a/r_p in the field is

(a) 1 (b) 1/4 (c) 1/2 (d) 4

Ans. : (c) 1/2

9. A proton, deuteron and α-particle are accelerated by same potential and then enter a uniform magnetic field perpendicularly. The ratio of radii of circular path will be

(a) $1:\sqrt{2}:\sqrt{2}$ (b) 2 : 2 : 1 (c) 1 : 2 : 1 (d) 1 : 1 : 1

Ans. (a) $1:\sqrt{2}:\sqrt{2}$

10. S.I unit of magnetic flux density

(a) Wb/m^2 (b) W/(Am) (c) Wb/m (d) Wb

Ans. (a) Wb/m^2

11. Magnetic permeability of vacuum in $Wb(Am)^{-1}$ unit

(a) $\frac{1}{4\pi}\times10^{7}$ (b) $\frac{1}{4\pi}\times10^{-7}$ (c) $4\pi\times10^{-7}$ (d) $4\pi\times10^{7}$

Ans. (c) $4\pi\times10^{-7}$

12. A charged particle is moving in a circle of radius *r* inside a magnetic field of flux density B. Suddenly the magnetic flux density decreases to B/2.What will be the radius of the circular path?

(a) $\frac{r}{2}$ (b) $\frac{r}{4}$ (c) $2r$ (d) $4r$

Ans. (c) $2r$

13. Cyclotron frequency is independent of

(a) velocity of the particle (b) radius of the circular path

(c) mass of the particle (d) none of the above

Ans. (a) velocity of the particle

14. A charged particle, when enters a magnetic field obliquely, it follows a

(a) helical path (b) circular path (c) parabolic path (d) straight path

Ans. : (a) helical path

15. The principle of velocity selector of a charged particle passing through a cross-fields is

(a) $v=\frac{E}{B}$ (b) $F_e=qE$ (c) $F_m=Bqv$ (d) $v=\frac{B}{E}$

Ans. (a) $v=\frac{E}{B}$

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