O P JINDAL SCHOOL, SAVITRINAGAR

CLASS TEST & PRACTICE

ANSWER KEY

CLASS XII PHYSICS TOPIC : MOVING CHARGES AND MAGNETISM

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1 What is the advantage of using radial magnetic field in a moving coil galvanometer? 1

ANS: (i) Maximum torque is experienced.
(ii) Current is directly proportional to the deflection.
(iii) The plane of the coil is parallel to the direction of magnetic field.

2 Why is it necessary for voltmeter to have a high resistance? 1

ANS: Since voltmeter is to be connected across two ends of a conductor in parallel, if it has high resistance, then only a very small part of current will pass through, and it will not affect the actual potential difference to be measured.

3 What is figure of merit of a galvanometer? 1

ANS: Figure of merit is defined as the amount of current which produces unit deflection in the galvanometer.

4 Define gyromagnetic ratio. 1

ANS: It is the ratio of the magnetic dipole moment to the angular momentum of the electron revolving round the nucleus.

5 Can we decrease the range of an ammeter? 1

ANS: No. If $I < I_g$, shunt $S = \frac{IgG}{I - Ig}$ will become negative, which is not possible.

6 Why can a galvanometer not be used as such to measure current in a given circuit? Write two reasons. 1

ANS: (i) A galvanometer is a sensitive device and can measure up to few microampere. hence may get damaged, if strong current is passed through it.
(ii) A galvanometer has larger resistance than an ammeter. Therefore, when it is connected in series with the circuit, the current in the circuit decreases.

7 An electron does not suffer any deflection while passing through a region of uniform magnetic field. What is the direction of the magnetic field? 1

ANS: Magnetic field will be in the line of the velocity of electron.

8 What is the direction of the force acting on a charged particle *q*, moving with a velocity $\vec{v}$ in 1

a uniform magnetic field $\vec{B}$?

ANS: Perpendicular to the plane having $\vec{v}$ and $\vec{B}$. Alternative
As $\vec{F} = q(\vec{v} \times \vec{B})$
Force is perpendicular to both $\vec{v}$ and $\vec{B}$.

9 A proton is moving along + ve x-axis in the presence of uniform magnetic field along + ve y-axis. What is the direction of the force acting on it? 1

ANS: Positive (+ve) z-axis.

10 When a charged particle moving with velocity $\vec{v}$ is subjected to magnetic field $\vec{B}$, the force acting on it is non-zero. Would the particle gain any energy? 1

ANS: Non-zero force on the charge particle shows that the initial velocity of charge particle is perpendicular to the magnetic field. So $q = 90° \Rightarrow F = qvB \sin 90 = qvB$ Since, this force acts perpendicular to both $\vec{v}$ and $\vec{B}$, the particle moves along a circular path with constant speed. Hence, the kinetic energy will not change and therefore, the particle will not gain any energy.

11 Write two properties of a material used as a suspension wire in a moving coil galvanometer. 1

ANS: (i) Low value of k (tortional constant).
(ii) High conductivity.

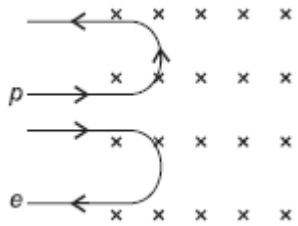
12 Two protons moving with velocities v and $2v$ enter with the same magnetic field $\vec{B}$ perpendicularly. Compare the radii of their paths and the time periods. 1

ANS: $\because T = 2\pi \frac{m}{Bq}$ is independent of the velocities. $\therefore \frac{T_2}{T_1} = \frac{1}{1}$ and $r = \frac{mv}{Bq} \propto v$

$\therefore \frac{r_2}{r_1} = \frac{2v}{v} = \frac{2}{1}$

13 An electron and a proton, moving parallel to each other in the same direction with equal momenta, enter into a uniform magnetic field which is at right angles to their velocities. Trace their trajectories in the magnetic field. 1

ANS: $\because qvB = \frac{mv^2}{r} \Rightarrow r = \frac{mv}{qB}$ They follow the circular tracks of equal radii, electrons revolving in clockwise and proton in anticlockwise inward normal to the plane of paper.



14 Under what conditions will the force exerted by the magnetic field on a charged particle be (i) maximum and (ii) minimum? 1

ANS: (i) When a charged particle is moving perpendicular to the magnetic field.
(ii) When a charged particle is moving parallel or anti-parallel to the magnetic field.

15 Which one of the following will experience maximum force, when projected with the same velocity ‘v’ perpendicular to the magnetic field ‘B’: (i) α-particle, and (ii) β-particle? 1

ANS: As $F = qvB$, α-particle will experience more force.