

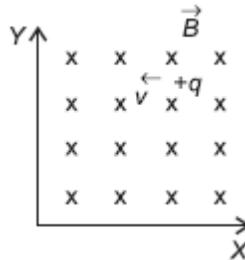
# O P JINDAL SCHOOL, SAVITRINAGAR

## CLASS TEST & PRACTICE

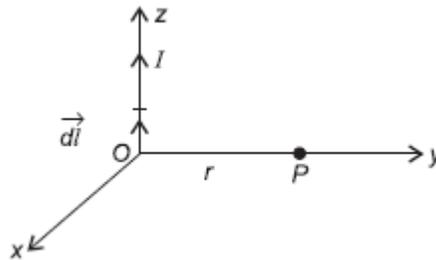
CLASS XII PHYSICS

TOPIC : MOVING CHARGES AND MAGNETISM

- 1 Show that the period of a revolution of an ion is independent of its speed and radius of the orbit. Write two important uses of a cyclotron. 2
  
- 2 A point charge is moving with a constant velocity perpendicular to a uniform magnetic field as shown in the figure. What should be the magnitude and direction of the electric field so that the particle moves undeviated along the same path?



- 3 A straight wire of length  $L$  is bent into a semicircular loop. Use Biot–Savart law to deduce an expression for the magnetic field at its centre due to the current  $I$  passing through it. 2
  
- 4 State Biot-Savart law. A current  $I$  flows in a conductor placed perpendicular to the plane of the paper. Indicate the direction of the magnetic field due to a small element  $d\vec{l}$  at point  $P$  situated at a distance  $r$  from the element as shown in the figure.



- 5 Two charged particles traverse identical helical paths in a completely opposite sense in a uniform magnetic field  $B = B_0 \hat{k}$ .
  - (a) They have equal z-components of momenta.
  - (b) They must have equal charges. 1
  - (c) They necessarily represent a particle-antiparticle pair.
  - (d) The charge to mass ratio satisfy: 
$$\left(\frac{e}{m}\right)_1 + \left(\frac{e}{m}\right)_2 = 0$$

- 6 Biot-Savart law indicates that the moving electrons (velocity  $v$ ) produce a magnetic field  $B$  such that 1

- (a)  $B \perp v$ .  
 (b)  $B \parallel v$ .  
 (c) it obeys inverse cube law.  
 (d) it is along the line joining the electron and point of observation.
- 7 A current carrying circular loop of radius  $R$  is placed in the  $x$ - $y$  plane with centre at the origin. Half of the loop with  $x > 0$  is now bent so that it now lies in the  $y$ - $z$  plane. [NCERT Exemplar]
- (a) The magnitude of magnetic moment now diminishes. 1  
 (b) The magnetic moment does not change.  
 (c) The magnitude of  $B$  at  $(0,0,z)$ ,  $z \gg R$  increases.  
 (d) The magnitude of  $B$  at  $(0,0,z)$ ,  $z \gg R$  is unchanged.
- 8 An electron is projected with uniform velocity along the axis of a current carrying long solenoid. Which of the following is true?
- (a) The electron will be accelerated along the axis. 1  
 (b) The electron path will be circular about the axis.  
 (c) The electron will experience a force at  $45^\circ$  to the axis and hence execute a helical path.  
 (d) The electron will continue to move with uniform velocity along the axis of the solenoid.
- 9 In a cyclotron, a charged particle
- (a) undergoes acceleration all the time.  
 (b) speeds up between the dees because of the magnetic field. 1  
 (c) speeds up in a dee.  
 (d) slows down within a dee and speeds up between dees.
- 10 A circular current loop of magnetic moment  $M$  is in an arbitrary orientation in an external magnetic field  $B$ . The work done to rotate the loop by  $30^\circ$  about an axis perpendicular to its plane is
- (a)  $MB$                       (b)  $\sqrt{3} \frac{MB}{2}$  1  
 (c)  $\frac{MB}{2}$                       (d) zero