Physics Resources for Study

Multiple Choice Questions (MCQs) on Moving Charges Concepts

Magnetic Field due to a Current Carrying Conductor

1. **The magnetic field at a distance r from a long straight conductor carrying a current I is:**
   - A) $\frac{\mu_0 I}{4\pi r}$
   - B) $\frac{\mu_0 I}{2\pi r}$
   - C) $\frac{\mu_0 I}{r}$
   - D) $\frac{\mu_0 I r}{2\pi}$
2. **According to the Biot-Savart law, the magnetic field $d\mathbf{B}$ at a point due to an infinitesimal current element $Id\mathbf{l}$ is proportional to:**
   - A) $\frac{Id\mathbf{l}}{r^2}$
   - B) $\frac{Id\mathbf{l}\times\hat{\mathbf{r}}}{r^2}$
   - C) $\frac{Id\mathbf{l}}{r}$
   - D) $\frac{Id\mathbf{l}\cdot\hat{\mathbf{r}}}{r^2}$
3. **The magnetic field at the center of a circular loop of radius R carrying a current I is:**
   - A) $\frac{\mu_0 I}{2R}$
   - B) $\frac{\mu_0 I R}{2}$
   - C) $\frac{\mu_0 I}{4\pi R}$
   - D) $\frac{\mu_0 I R}{4\pi}$

Force on a Current Carrying Conductor in a Magnetic Field

4. **The force per unit length between two parallel conductors separated by a distance d and carrying currents I_1 and I_2 is:**
   - A) $\frac{\mu_0 I_1 I_2}{2\pi d}$
   - B) $\frac{\mu_0 I_1 I_2}{4\pi d}$
   - C) $\frac{\mu_0 I_1 I_2 d}{2\pi}$
   - D) $\frac{\mu_0 I_1 I_2}{d}$
5. **A straight conductor of length L carrying current I is placed in a uniform magnetic field $\mathbf{B}$. The force experienced by the conductor is maximum when the angle between $\mathbf{L}$ and $\mathbf{B}$ is:**
   - A) 0 degrees
   - B) 45 degrees
   - C) 90 degrees
   - D) 180 degrees
6. **The magnitude of the force on a current-carrying conductor placed in a magnetic field depends on:**
   - A) The current in the conductor
   - B) The length of the conductor
   - C) The magnetic field strength
   - D) All of the above

Force on a Charge in an Electric and Magnetic Field

7. **The force on a charge q moving with velocity $\mathbf{v}$ in a magnetic field $\mathbf{B}$ is given by:**
   - A) $q(\mathbf{E} + \mathbf{v} \cdot \mathbf{B})$
   - B) $q(\mathbf{E} \times \mathbf{B})$
   - C) $q(\mathbf{v} \times \mathbf{B})$
   - D) $q(\mathbf{v} \cdot \mathbf{B})$
8. **A charged particle moving in a uniform magnetic field follows a path:**
   - A) Linear
   - B) Circular
   - C) Parabolic
   - D) Elliptical
9. **The radius of the circular path of a charged particle of charge q and mass m moving with velocity v perpendicular to a magnetic field B is:**
   - A) $\frac{mv}{qB}$
   - B) $\frac{qB}{mv}$
   - C) $\frac{mB}{qv}$
   - D) $\frac{qv}{mB}$

Ampere's Circuital Law

10. **Ampere's circuital law states that the line integral of the magnetic field around any closed path is equal to:**
    - A) μ_0 times the total electric flux through the path
    - B) μ_0 times the total charge enclosed by the path
    - C) μ_0 times the total current enclosed by the path
    - D) μ_0 times the total magnetic flux through the path
11. **The magnetic field inside an ideal solenoid is:**
    - A) Zero
    - B) Uniform
    - C) Varies with distance from the axis
    - D) Varies with the number of turns per unit length
12. **Ampere's law is particularly useful for calculating magnetic fields in:**
    - A) Irregular shapes
    - B) Complex circuits
    - C) Symmetric situations like solenoids and toroids
    - D) Moving charges

Magnetic Dipole Moment of Revolving Electron

13. **The magnetic dipole moment of an electron orbiting around the nucleus is given by:**
    - A) $\frac{eL}{m}$
    - B) $\frac{e}{2m}L$
    - C) $\frac{e^2L}{m^2}$
    - D) $\frac{eL^2}{2m}$
14. **The unit of the magnetic dipole moment is:**
    - A) Tesla
    - B) Weber

- C) Amperes per meter
- D) Amperes meter squared

15. **The Bohr magneton is defined as:**
    - A) $\frac{e\hbar}{m}$
    - B) $\frac{e\hbar}{2m}$
    - C) $\frac{e\hbar}{4m}$
    - D) $\frac{e^2\hbar}{2m}$

Answer Key

1. B
2. B
3. A
4. A
5. C
6. D
7. C
8. B
9. A
10. C
11. B
12. C
13. B
14. D
15. B