Moving Charges Magnetism

MCQs on Magnetic Force

Force on a Moving Charge in a Magnetic Field (Lorentz Force)

1. **What is the expression for the magnetic force on a moving charge?**
   - A. $F = qE$
   - B. $F = qvB \sin\theta$
   - C. $F = qv$
   - D. $F = Bqv \cos\theta$
2. **If a charged particle moves parallel to a magnetic field, the magnetic force on it is:**
   - A. Maximum
   - B. Zero
   - C. Minimum but not zero
   - D. Depends on the magnitude of the charge
3. **Which of the following determines the direction of the magnetic force on a moving charge?**
   - A. Right-hand rule
   - B. Left-hand rule
   - C. Fleming's right-hand rule
   - D. Ampere’s circuital law
4. **What is the unit of the magnetic field (B)?**
   - A. Newton
   - B. Tesla
   - C. Joule
   - D. Coulomb
5. **A proton moves with velocity $\mathbf{v}$ in a uniform magnetic field $\mathbf{B}$. The force on the proton is zero when the angle between $\mathbf{v}$ and $\mathbf{B}$ is:**
   - A. 0 degrees
   - B. 45 degrees
   - C. 90 degrees
   - D. 180 degrees

Force on a Current-Carrying Conductor in a Magnetic Field

6. **The force on a straight current-carrying conductor in a uniform magnetic field is given by:**
   - A. $F = BIL \sin\theta$
   - B. $F = BIL \cos\theta$
   - C. $F = IL$
   - D. $F = BIL$
7. **If the length of the conductor is doubled while keeping the current and magnetic field constant, the force on the conductor:**
   - A. Is halved
   - B. Remains the same

- C. Is doubled
- D. Is quadrupled

8. **The direction of the force on a current-carrying conductor in a magnetic field is determined by:**
   - A. Right-hand thumb rule
   - B. Fleming's left-hand rule
   - C. Ampere's right-hand rule
   - D. Lenz's law
9. **Which of the following factors does not affect the magnitude of the force on a current-carrying conductor in a magnetic field?**
   - A. Length of the conductor
   - B. Current through the conductor
   - C. Magnetic field strength
   - D. Resistivity of the conductor
10. **For a current-carrying conductor placed perpendicular to the magnetic field, the angle θ in the force equation $F = BIL\sin\theta$ is:**
    - A. 0 degrees
    - B. 45 degrees
    - C. 90 degrees
    - D. 180 degrees

Force Between Two Parallel Current-Carrying Conductors

11. **Two parallel current-carrying conductors attract each other when the currents are:**
    - A. In opposite directions
    - B. Equal in magnitude
    - C. In the same direction
    - D. Perpendicular to each other
12. **The force per unit length between two parallel conductors carrying currents I_1 and I_2 separated by a distance d is:**
    - A. $\frac{\mu_0 I_1 I_2}{2\pi d}$
    - B. $\frac{\mu_0 I_1 I_2}{d}$
    - C. $\frac{\mu_0 I_1 I_2 d}{2\pi}$
    - D. $\frac{2\pi I_1 I_2}{\mu_0 d}$
13. **The unit of the force per unit length between two current-carrying conductors is:**
    - A. Newton
    - B. Newton per meter
    - C. Tesla per meter
    - D. Ampere per meter
14. **What happens to the force between two parallel current-carrying conductors if the distance between them is halved?**
    - A. It is halved
    - B. It is doubled
    - C. It is quadrupled
    - D. It remains the same

Definition of Ampere

15. **One ampere is defined as that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross-section, and placed one meter apart in vacuum, would produce between these conductors a force equal to:**
    - A. 2×10^{-7} newton per meter
    - B. 2×10^{-6} newton per meter
    - C. 2×10^{-8} newton per meter
    - D. 2×10^{-9} newton per meter

Torque on Current Loop: Magnetic Dipole

16. **The torque (τ) on a current-carrying loop in a uniform magnetic field is given by:**
    - A. $\tau = nIA$
    - B. $\tau = nIAB \sin\theta$
    - C. $\tau = nIB \cos\theta$
    - D. $\tau = nIAB \cos\theta$
17. **The magnetic dipole moment (m) of a current-carrying loop is given by:**
    - A. $m = nIA$
    - B. $m = nIB$
    - C. $m = nIAB$
    - D. $m = nI$
18. **A current-carrying loop placed in a uniform magnetic field experiences a torque which is maximum when the angle between the magnetic moment and the magnetic field is:**
    - A. 0 degrees
    - B. 45 degrees
    - C. 90 degrees
    - D. 180 degrees
19. **The SI unit of the magnetic dipole moment is:**
    - A. Tesla meter squared
    - B. Ampere meter squared
    - C. Joule per Tesla
    - D. Newton meter
20. **A rectangular loop of area A carries a current I and is placed in a uniform magnetic field B. The maximum torque experienced by the loop is:**
    - A. IAB
    - B. $IAB \sin\theta$
    - C. $IAB \cos\theta$
    - D. $IAB \tan\theta$

Answer Key

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