# MAGNETIC EFFECT OF CURRENT AND MAGNETISM

**MINIMUM LEVEL OF LEARNING**

**ONE MARK QUESTIONS**

**Q1) State Biot Savart's Law.**

**A1)** It states that magnetic field due to a small conductor of length *dl*, carrying a current I ,at a point at distance *r,* is given by,

$dB = \mu o/4\pi . I dl \sin\Theta/r^2$

where Θ is the angle between the direction of flow of current and the line joining the small conductor to the observation point.

**Q2) Write the dimensional formula of $\mu_0$.**

**A2)** The dimensional formula of $\mu_0$ is $[M\ L\ T^{-2}A^{-2}]$

**Q3) What is the effect of increasing the number of turns on magnetic field produced to a circular coil?**

**A3)** The magnetic field produced by a coil of *n* turns is *n* times the magnetic field produced by a coil of single turn.

**Q4) An electric charge enters in an electric field at right angles to the direction of electric field. What is the nature of the path followed?**

**A4)** The electric charge will move along a parabolic path.

**Q5) An electron beam projected along +X- axis experiences a force due to a magnetic field along the +Y- axis. What is the direction of magnetic field?**

**A5)** The electron (a negatively charged particle) moving along + X- axis experiences force along +Y- axis, then the magnetic field must be directed along **–Z- axis.**

**Q6) Write an expression for the force experienced by a charged particle moving in a uniform magnetic field B.**

**A.6)**

The magnitude of force is given by

$F_m = B\ q\ v \sin\Theta$

**Q7) Under which condition, an electron moving through a magnetic field experiences maximum force?**

**A7)** An electron moving through a magnetic field experiences maximum force, when it moves perpendicular to the direction of magnetic field .

**Q8) What is the work done by magnetic field on a moving charge and why?**

**A8)** Work done by magnetic field on a moving charge is zero. It is because , force on the charge due to magnetic field is perpendicular to its path.

**Q9) What is the nature of force, when the two parallel conductors carry currents in the (i) same direction (ii) opposite direction?**

**A9) i)** Force is attractive. **ii)** Force is repulsive.

**Q10) A circular coil of radius R carries a current I. Write the expression for the magnetic field due to this coil at centre.**

**A10)** $B= \mu_0 I/2R$

**Q11) What is the angle of dip at the magnetic equator?**

**A11)** $0^\circ$

1. **A jet plane is traveling west at 450m/s. If horizontal component of earths magnetic field at that place is $4X10^{-4}$ T and angle of dip is $30^o$, find emf induced between ends of wings having a span of 30m.**

**Ans: v= 450m/s, l= 30m, $B=4X10^{-4}T$**

**e =Bvlsinθ**

**$=4X10^{-4}TX450m/sX\ 30mXsin30^o$**

**$= 5.4Volt$**

2. **Give expression of magnetic field due to circular coil (at its centre) and due to long straight wire, when these are carrying current.**

**A)** The magnetic field due to circular coil at its centre,

$B=\mu o\backslash 4\pi\ .\ 2\ \pi\ n\ I\ a^2/(a^2 + x^2)^{3/2}$

And magnetic field due to a long straight wire,

$B=\mu o\backslash 4\pi\ .2I/a$

**Q3) What is the nature of force, when the two parallel conductors carry currents in the (i) same direction (ii) opposite direction?**

**A3) i)** Force is attractive. **ii)** Force is repulsive.

**Q4) Give two factors by which the current sensitivity of a moving coil galvanometer can be increased.**

**A4)** Current sensitivity= n B A/k,

Where the letters have their usual meanings.Since *n* and A cannot be increased beyond a limit, the current sensitivity may be increased by **(i)** by increasing B **(ii)** by decreasing k.

**Q5) Give two factors by which voltage sensitivity of a moving coil galvanometer can be increased.**

**Q1) Using Biot Savart Law, derive an expression for the magnetic field at the centre of a circular coil of radius R, number of turns N, carrying current I.**

**A1)** Derivation.

Derive the expression using diagram.

$B= \mu_0 I/2R$

**Q2) Using Ampere's circuit Law, obtain an expression for the magnetic field along the axis of a current solenoid of length L carrying current I and having N number of turns**.

**A2)** Derivation.

Derive the expression using diagram.

$B=\mu_0 NI/L$

Q 3) **Desribe qualitatively, the path of a charged particle moving in a uniform electrostatic field with initial velocity (i)parallel to the field (ii) perpendicular to the field,(iii)at an arbitrary angle with the field direction.**

**A3)** (i) The force due to uniform electrostatic field will act along the direction of the field and hence path will be a straight line.

(ii)It will follow a parabolic path, as the force acts along a direction perpendicular to initial velocity.

(iii)It will follow parabolic path. The velocity of the charged particle may be resolved into two components.

**4)** Write three magnetic elements of earth. Define them

Ans Definition of angle of dip , angle of declination , Earths horizontal component

**5)** Which of the following will describe the smaller circular path and when projected with same velocity perpendicular to magnetic field and why

Ans $r=mv/qB$

**Q5) Give two factors by which voltage sensitivity of a moving coil galvanometer can be increased.**

**A5)**Voltage sensitivity= $n$ B A/$k$R,

Where the letters have their usual meanings. For higher voltage sensitivity; $n$ B and A should be large, while $k$ and R should be small. Since $n$ and A cannot be increased beyond a limit, the voltage sensitivity may be increased by **(i)**increasing B **(ii)**decreasing $k$ and **(iii)**decreasing R.

**Q6) Steel is preferred for making permanent magnet whereas soft iron is preferred for making electromagnets. Give one reason.**

**A6)** High retentivity and high coercivity in case of steel.

Low retentivity and low coercivity in case of soft iron.