

ASSIGNMENT : MAGNETIC EFFECT OF CURRENT
& MAGNETISM

Q:1 Describe Oersted's experiment and explain the law by which direction of magnetic field produced can be accounted.

Q:2 What do you understand by magnetic field? Define its strength and S.I. unit and give its dimensional formula.

Q:3 What is the force acting on a moving charge in a uniform magnetic field? Discuss the cases when the force is maximum and minimum and define the unit of magnetic field.

Q:4 Define magnetic field induction in terms of force on moving charge, after establishing the relation for that force and give its dimensional formula.

Q:5 State Biot Savart's law for the magnetic field produced at a point due to current element. How will you find the direction of magnetic field?

Q:6 What is Ampere's circuital law? Derive an expression for magnetic field induction due to current in a toroid.

Q:7 Explain Biot Savart's law. Obtain an expression for the magnetic field induction at a point situated at distance of x meters from the centre of a circular coil of n turns and r radius carrying a current of I amperes.

Q:8 Derive an expression for magnetic field strength B at a point P due to current flowing through a straight conductor using Biot Savart's law.

Q:9 State and explain Ampere's circuital law and by applying it find the magnetic field at a point well inside the solenoid carrying current.

Q:10 A current of 10A is flowing east to west in a long wire kept in the east-west direction. Find the magnetic field in horizontal plane at a distance of (i) 10 cm. north (ii) 20 cm south from the wire, and in a vertical plane at a distance of (iii) 40 cm downwards, (iv) 50 cm upwards.

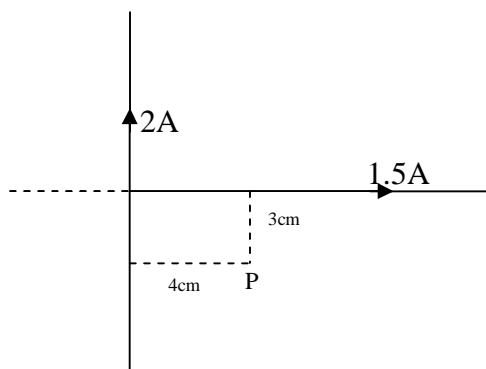
(Ans: (i) 2×10^{-5} T, vertically downwards, (ii) 10^{-5} T, vertically upwards (iii) 5×10^{-6} T, horizontally pointing south (iv) 4×10^{-6} T, horizontally pointing north.)

Q:11 A wire placed along north-south direction carries a current of 5A from south to north. Find the magnetic field due to a 1 cm piece of wire at a point 200 cm north east from the piece.

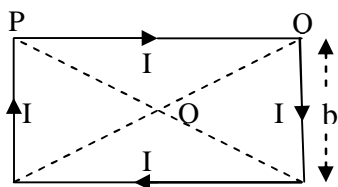
(Ans: 8.8×10^{-10} T, acting vertically downwards)

Q12 Two insulating wires of infinite length are lying mutually at right angles to each other as shown in the fig. Currents of 2A and 1.5A respectively are flowing in them. Find the magnetic field induction at P.

(Ans: $2 \times 10^{-5} T$)

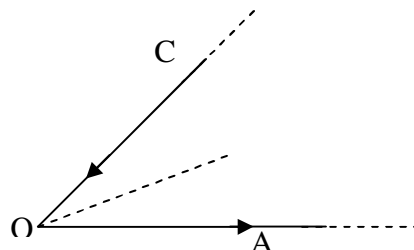


Q13 A rectangular loop of conductor of length a , breadth b carrying current I as shown in Fig. Find the magnetic field induction at the centre O of the loop.



14 Two wires CS and OA carry equal current I as shown in fig. One end of both the wires extends in infinity.

Given $\angle AOC = \theta$. What is the magnitude of magnetic field induction at a point P at a distance r from O lying on the bisector of angle θ .



MAGNETISM

Q1: Define the terms:-

- (i) Pole strength (ii) Magnetic moment
- (iii) Magnetic induction

Q2: A steel wire has magnetic moment m . What will be its magnetic moment if it is bent into a circular arc?

Q3: What are magnetic lines of forces? Discuss properties.

Q4: Derive an expression of magnetic field at a point on:-

- (i) Axial line of magnetic dipole.
- (ii) Equatorial line of magnetic dipole.

Q5: Deduce an expression of Torque when it is placed in magnetic field.

Q6: Deduce an expression of potential energy of magnetic dipole.

Q7: Define the following terms:

- (i) magnetic meridian
- (ii) geographical meridian
- (iii) declination (θ)
- (iv) Inclination or angle of dip.
- (v) Apparent dip

Q8: Define the following terms:

- (i) Intensity of magnetizing field(H) or magnetic intensity
- (ii) Intensity of magnetization
- (iii) Magnetic susceptibility
- (iv) Magnetic permeability
- (v) Relative permeability

Q9: Explain with properties:

- (i) Diamagnetic substance
- (ii) Paramagnetic substance
- (iii) Ferro magnetic substance

Q10: Explain Hysteric's loop (B-H curve)

Q11: Two identical dipoles each of magnetic moments 1.0Am^2 are placed at a separation of 2m with their axis

perpendicular to each other. What is magnetic field at mid-way between the dipoles? ([Ans: $\sqrt{5} \times 10^{-7} \text{ T}$]

$$\phi = 26.6^\circ)$$

Q12: A bar magnet has a magnetic moment 2.5 JT^{-1} and is placed in a magnetic field of 0.2T, calculate the work done in turning the magnet from parallel to anti parallel position relative to field direction. (Ans: 1J)

Q13: At a given place if ϕ_1 and ϕ_2 are two different values of apparent dip and ϕ be true value of dip. Then prove

$$\text{that } \cot^2 \phi = \cot^2 \phi_1 + \cot^2 \phi_2$$

Q14: What happen to the pole strength and magnetic moment of a magnet if it is cut in two equal halves?

- (a) Parallel to length
- (b) Perpendicular to length