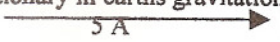
Boys wing of Sharjah Indian School

## MAGNETIC EFFECTS OF CURRENT - Worksheet - class XII

1. A current carrying loop , free in turn is placed in a uniform magnetic field B . What will be its orientation relative to B in the equilibrium state ?
2. The force F experienced by a particle of charge q moving with a velocity v in a magnetic field B is given by $F = q ( v \times B )$ . Which pair of vectors is always at right angles to each other ?
3. Under what condition, an electron moving through a magnetic field experiences maximum force ?
4. A current is set up in a long copper pipe. Is there a magnetic field i ) inside ii ) outside the pipe ?
5. In a certain arrangement a proton does not get deflected while passing through a magnetic field region . Under what condition is it possible ?
6. An electron and a proton moving with the same speed enter the same magnetic field region at right angles to the direction of the field. For which of the two particles will the radius of circular path be smaller ?
7. What is the magnitude of force on a wire of length 0.04 m placed inside a solenoid near its centre making an angle 30 with its axis ? The wire carries a current of 12 A and the magnetic field due to the solenoid has a magnitude of 0.25 T.
8. A horizontal wire 0.1 m long carries a current of 5 A as shown. Find the magnitude and direction of magnetic field which can hold the wire stationary in earths gravitational field. The mass per unit length of the wire is $3 \times 10^{-3}$ kg/m.




9. A beam of alpha particles and protons of the same velocity v , enter a uniform magnetic field at right angles to the field lines. The particles describe circular paths. What is the ratio of the radii of these two circles ?
10. Explain why two straight parallel wires carrying current opposite directions repel each other.?
11. Is any work done by a magnetic field on a moving charge ? why ?
12. An electron moving with a speed of $10^8$ m/s enters a magnetic field of $5 \times 10^{-3}$ T in a direction perpendicular to the field . Calculate i ) radius of the path, ii ) frequency of revolution of electron.
13. An electron being accelerated through 100V enters a uniform magnetic field of 0.004T perpendicular to the direction of motion . Calculate radius of the path described by electron.
14. A current of 7A is flowing in a plane circular coil of radius 1 cm having number of turns 100. The coil is placed in a uniform magnetic field of 0.2 T . If the coil is free to rotate , which orientation would correspond to i) stable equilibrium ii ) unstable equilibrium ? Calculate P.E .in two cases ?
15. A galvanometer with a coil of resistance 12 ohms shows full scale deflection for a current of 50 mA. How will you convert the galvanometer into (a ) an ammeter of range 0 to 0.5 A ? ( b ) a voltmeter of range 0 to 10 V ?
16. A proton and an alpha particle of the same kinetic energy in turn move through a uniform magnetic field B , in a plane normal to the field. Compare the radii of the paths of the two particles.
17. A 50 cm long solenoid has 200 turns of radius 1 cm each . Find the magnitude of the magnetic field at the centre of the solenoid
18. A long straight wire carries a current of 2.5 A. An electron travels with a velocity $5 \times 10^5$ m/s parallel to the wire 0.2 m away from it and in a direction opposite to the current. What force does the magnetic field of the current exert on the electron ?
19. Compare the current sensitivity and voltage sensitivity in the following moving coil galvanometers.
    Meter A : N = 30 , $A = 1.5 \times 10^{-3}$ m$^2$, B = 0.25 T , R = 20 ohms.
    Meter B : N = 35 , $A = 2.0 \times 10^{-3}$ m$^2$, B = 0.25 T , R = 30 ohms.
    You are given that the springs in the two meters have the same torsional constants.
20. A cyclotron in which the magnetic flux density of 1.4 T is used to accelerate protons . With what frequency the electric field between the dees should be reversed?Given mass of proton=$1.67 \times 10^{-27}$kg.

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**Sharjah Indian school, Sharjah.**

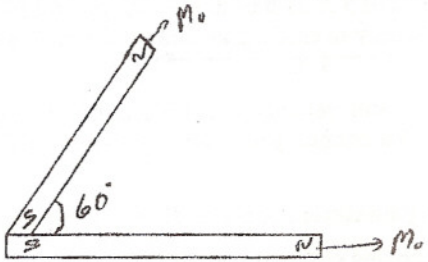
MAGNETISM Class:12 (B.S)

1. A short bar magnet of moment 0.9 J/T, is placed with its axis at $45^0$ to a uniform magnetic field. If it experiences a torque of 0.63J, (i) calculate the magnitude of the magnetic field and (ii) what orientation of the bar magnet corresponds to the stable equilibrium in the magnetic field?

2. A magnetic needle lying parallel to a magnetic field requires 'W' unit of work to turn through $60^o$. What is the torque needed to maintain the needle in this position?

3. A short magnet of moment 6.75 $Am^2$ produces a neutral point on its axis. If the horizontal component of earth's field is $5 \times 10^{-5}$ Wb / $m^2$, what is the distance to the neutral point?

4. Find the net magnetic moment of two identical magnets, each of magnetic moment $M_0$ inclined at $60^o$ with each other as shown below:




5. The vertical component of earth's magnetic field at a place is $1/\sqrt{3}$ times the horizontal component. What is the value of angle of dip at this place?

6. A bar magnet of moment 1.5 J/T lies aligned with the direction of a uniform magnetic field of 0.22T. Calculate the amount of work done to turn the magnet so as to align its magnetic moment, (i) normal to the field direction and ii) opposite to the field direction.

7. If the ratio of the horizontal component of earth's magnetic field to the resultant magnetic field at a place is $1/\sqrt{2}$ , what is the angle of dip at that place ?

8. What happens if a bar magnet is cut into two pieces a) perpendicular to its length, and b) along its length ?

9. A magnetic dipole is under the influence of two magnetic fields $B_1 = 1.2 \times 10^{-2}$ T and $B_2 = 4.4 \times 10^{-3}$ T inclined to each other at an angle of $60^o$. Find the position of the stable equilibrium of the dipole.

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