	INDIAN SCHOOL AL WADI AL KABIR	
Class: XII	**Department: SCIENCE 2023-24** **SUBJECT : PHYSICS**	**Date of submission: 05.06.2023**
Worksheet No: 04 WITH ANSWERS	**CHAPTER: MAGNETIC EFFECT OF CURRENT**	**Note: A4 FILE FORMAT**
Name of the student:	**Class & Sec:**	**Roll No:**

SECTION – A
MCQ BASED QUESTIONS

[1] A straight wire carrying Current I is turned into a circular loop. If the magnitude of magnetic moment associated with it is M, Find the length of the wire

[a] $\sqrt{\frac{2\pi M}{I}}$

[b.] $\sqrt{\frac{4\pi M}{I}}$

[b] $\sqrt{\frac{\pi M}{I}}$

Ans.[b]

[2] Two particles of equal charge after being accelerated through the same potential difference enter a uniform transverse magnetic field and describe circular path of radii R1 and R2 respectively. Find the ratio of their masses

[a] $[\frac{R1}{R2}]^2$

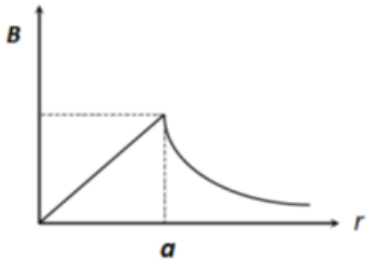
[b] $\frac{R1}{R2}$

[c] $[\frac{R2}{R1}]^2$

Ans. a

[3]Plot the variation of magnetic field due to a straight conductor of uniform cross section of radius ‘a’ and carrying steady current with distance ‘r’ ,in the region r $< a \; and \; r > a$

[a]



[b]

Ans. a

[4] Name the physical quantity having unit A m^2

[a] magnetic flux

[b] magnetic dipole moment

[c] intensity of magnetic field

Ans. [b]

[5] A galvanometer is first converted into a voltmeter of range 0-3V and then into a voltmeter of range

0-6V. In which case the resistance would be higher.

[a] 0-6v

[b] 0-3V

[c] cant predicted

Ans.[a]

[6] An ammeter of resistance 0.8 ohm can measure current up to 1A.What must be the value of shunt resistance to enable the ammeter to measure current upto 5A?

[a] 0.1A

[b] 0.2A

[c] 0.3A

Ans. [b]

[7] A straight conductor of length L carrying a current I stays suspended horizontally in mid air in a region where there is uniform magnetic field B. The linear mass density of the wire is λ. Then the magnitude of the magnetic field is

[a] B = $\frac{\lambda g}{L}$ perpendicular to the wire

[b] B = 2 $\frac{\lambda g}{L}$ perpendicular to the wire

[c] B = $\frac{\lambda g}{2L}$ perpendicular to the wire

Ans.[a]

[8] Name the physical quantity having unit Am

[a] magnetic dipole moment

[b] intensity of magnetic field

[c] pole strength

Ans.[c]

[9] An electron moving with a velocity 10m/s enters a uniform magnetic field of 0.5 T ,along a direction parallel to the field. Then the force acting on the charge is

[a] 20 N

[b] 10N

[c] zero

Ans.[c]

[10] An electron moving with a velocity 10m/s enters a uniform magnetic field of 0.5 T, along a direction parallel to the field. Then the trajectory of this electron is

[a] ellipse

[b] circular

[c] straight

Ans.[c]

SECTION – B
ASSERTION AND REASON TYPE QUESTIONS

For question numbers 11, 12, 13 and 14, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.
a) Both A and R are true and R is the correct explanation of A
b) Both A and R are true but R is NOT the correct explanation of A
c) A is true but R is false
d) A is false and R is also false

Assertion(A):
To convert a galvanometer in to ammeter a small resistance (shunt) is connected in parallel to the coil of galvanometer.
Reason(R):
An ideal ammeter has infinite resistance.

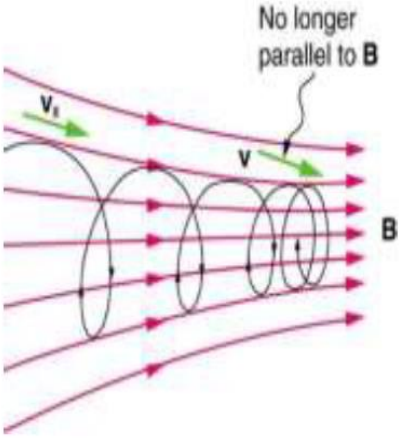
Ans.[c]

Assertion: A current-carrying conductor experiences a force in a magnetic field.
Reason: The force acting on a current-carrying conductor in a magnetic field is due to interaction between magnetic field produced by the current-carrying conductor and external magnetic field in which the conductor is placed.

Ans.[a]

Questions 15 and 16 are Case Study based questions and are compulsory. Attempt any 4 sub parts from each question. Each question carries 1 mark.

5. **Bubble Chamber:** Trails of bubbles are produced by high-energy charged particles moving through the superheated liquid hydrogen in this artist's rendition of a bubble chamber. There is a strong magnetic field perpendicular to the page that causes the curved paths of the particles. The radius of the path can be used to find the mass, charge, and energy of the particle.



Magnetic forces can cause charged particles to move in circular or spiral paths. Particle accelerators keep protons following circular paths with magnetic force. Cosmic rays will follow spiral paths when encountering the magnetic field of astrophysical objects or planets (one example being Earth's magnetic field). The bubble chamber photograph in the figure below shows charged particles moving in such curved paths.

The curved paths of charged particles in magnetic fields are the basis of a number of phenomena and can even be used analytically, such as in a mass spectrometer. shows the path traced by particles in a bubble chamber.

(i) When a charged particle moves perpendicular to a uniform electric field, it follows-

(a) circular path (b) parabolic path

(c) translational path (d) helical path

(ii) A charged particle moving with velocity v in X direction is subjected to a magnetic field B in negative X direction. As a result, the charge will

(a) retard along X-axis

(b) start moving in a circular path in YZ plane

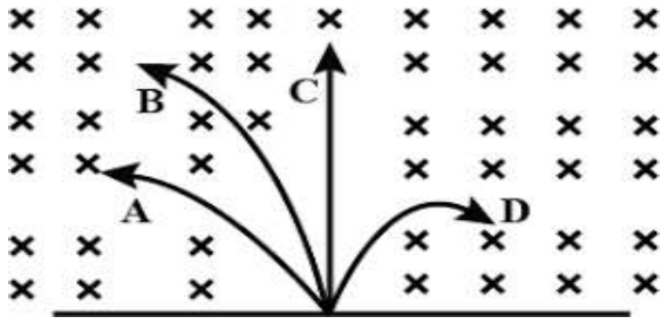
(c) remains unaffected

(d) move in a helical path around X-axis

(iii) An α- particle and proton having same momentum enter into a region of uniform magnetic field and move in a circular path. The ratio of the radii of curvature of their paths

(a) 1 (b) ¼ (c) ½ (d) 4

(iv) A neutron, a proton, an electron and an α- particle enter in a region of uniform magnetic field with equal velocities. The magnetic field is perpendicular and directed into the paper. The tracks of the particles are shown in figure. The electron will follow the track-



(a) A (b) B (c) C (d) D

(v) If magnetic force experienced by the charged particle is perpendicular to the velocity of the particle, then work done is-

(a) zero (b) maximum (c) minimum (d) none of these

Ans- (i) option B
(ii) option C
(iii) option C
(iv) option D
(v) option A

SECTION B(2 MARKS QUESTIONS)

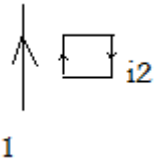
[17] How will the magnetic field intensity at the centre of a circular coil carrying current change ,if the current through the coil is doubled and radius of the coil is halved?

Use direct formula to find B

increases 4 times

[18]. An electron travels in a circular path of radius 20cm in a magnetic field of 20 rnT. Calculate the speed of the electron. What is the potential difference through which the electron must be accelerated to acquire this speed?
[r = mv/qB]
Ans.7 x 10^7m/s
[19] A long straight wire carries a current of 2A.An electron travels with a speed of 4 x 10^4 m/s parallel to the wire at a distance of 0.1m from it in the direction opposite to the electric current. what force does the M.F of the current exert on the moving electron
F = q vB sinϴ

F = 2.56 x 10^{-20} N
[20] In the figure, the straight wire AB is fixed while the loop is free to move under the influence of the electric currents flowing in them. In which direction does the loop begin to move?



[20] attraction

SECTION C(3 MARKS QUESTIONS)

. [21] What is the radius of the path of an electron moving at a speed of 3x10^7 m/s in a magnetic field of 6x10^{-4} T perpendicular to it? What is its frequency? Calculate its energy in Kev[mass = 9x10^{-31}kg and charge = 1.6 x10^{-19} C
[42] r = mv/qB

$f = 2 \times 10^6$ Hz

K.E = ½ mv^2 = 2.5Kev

[22] A straight wire of length π/2 meter is bent into a circular shape. If the wire were to carry a current of 5A,calculate the M.F due to it before bending at a point distant 0.01 times the radius of the circle formed from it .Also Calculate the M.F at the centre of the circular loop formed, for the same value of current.

[i]$B = \frac{\mu_0 I}{2\pi r} = 0.4 \times 10^{-3}$ T

[ii] $B = \frac{\mu_0 IN}{2a} = 1.26 \times 10^{-5}$ T

[23] A galvanometer with a coil resistance of 12 ohm shows full scale deflection for a current of 50mA.How will you convert the galvanometer into a [i] an ammeter of range 0- 0.5A[ii] a voltmeter of range 0-10V?

[31] Shunt = $\mathbf{\frac{I_g \times G}{I - I_g}}$

[s = 1.33ohm]

$R = \frac{V}{I_g} - G$ = 188ohm

SECTION D(5 MARKS QUESTIONS)

[24] [i] With the help of diagram, explain the principle and working of a moving coil galvanometer.[ii] What is the function of uniform radial field and how is it produced ?[iii] Define current sensitivity of a galvanometer. How is current sensitivity increased ?

[1]Refer notes

[25] Write any 2 important points of similarities and differences each between Coulomb's law for the electrostatic field and Biot -Savart's law for the magnetic field. Use Biot-Savart's law to find the expression for the magnetic field due to a circular loop of radius 'r' carrying current I at the centre.

[5] refer notes

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