JEE MAIN : CHAPTER WISE TEST-4

SUBJECT :- PHYSICS **DATE.....**

CLASS :- 12th **NAME.....**

CHAPTER :- MAGNETIC EFFECT OF CURRENT **SECTION.....**

(SECTION A)

1. An α particle is moving along a circle of radius R with a constant angular velocity ω. Point A lies in the same plane at a distance 2R from the centre. Point A records magnetic field produced by α particle, if the minimum time interval between two successive times at which A records zero magnetic field is 't' the angular speed ω, in terms of t is :

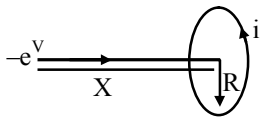
(A) $\frac{2\pi}{t}$ (B) $\frac{2\pi}{3t}$ (C) $\frac{\pi}{3t}$ (D) $\frac{\pi}{t}$

2. An electron of charge e moves in a circular orbit of radius r around the nucleus at a frequency ν. The magnetic moment associated the orbital motion of the electron is –

(A) $\pi \nu e r^2$ (B) $\frac{\pi \nu r^2}{e}$

(C) $\frac{\pi \nu e}{r}$ (D) $\frac{\pi e r^2}{\nu}$

3. An electron moving with velocity v along the axis approaches a circular current carrying loop as shown in the figure. The magnitude of magnetic force on electron at this instant is-



(A) $\frac{\mu_0}{Z} \frac{eviR^2X}{(X^2+R^2)^{3/2}}$

(B) $\mu_0 \frac{eviR^2X}{(X^2+R^2)^{3/2}}$

(C) $\frac{\mu_0}{4\pi} \frac{eviR^2X}{(X^2+R^2)^{3/2}}$

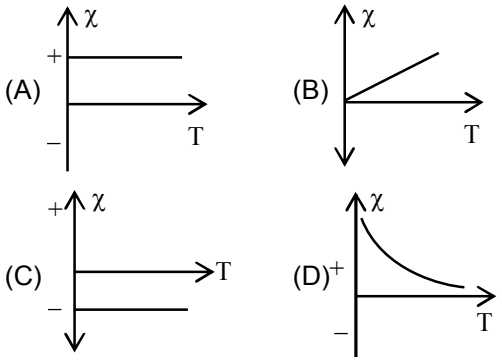
(D) 0

4. IF a uniformly charged spherical shell of radius 10 cm has potential v at a point distant 5 cm from its center, then the potential at a point distant 15 cm from the center will be.

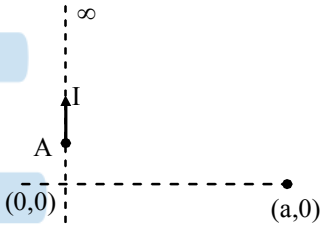
(A) v/3 (B) $\frac{2v}{3}$

(C) $\frac{3v}{3}$ (D) 3v

5. Which one of the following graphs represents the behaviour of magnetic susuptibility (χ) of the paramagnetic substance with the temperature T ?



6. An infintely long wire carrying current I is along y-axis such that its one end is at point A(0, b) while the wire extends upto + ∞. The magnitude of magnetic field strength at point (a, 0).



(A) $\frac{\mu_0 I}{4\pi a}\left(1+\frac{b}{\sqrt{a^2+b^2}}\right)$

(B) $\frac{\mu_0 I}{4\pi a}\left(1-\frac{b}{\sqrt{a^2+b^2}}\right)$

(C) $\frac{\mu_0 I}{4\pi a}\left(\frac{b}{\sqrt{a^2+b^2}}\right)$

(D) None of these

7. A charged particle is released from rest in a region of steady and uniform electric and magnetic field which are parallel to each other. The particle will move in a -

(A) straight line (B) circle

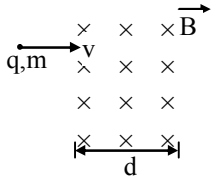
(C) helix (D) cycloid

8. Two circular coils made of similar wires but of radius 20 cm and 40 cm are connected in parallel. The ratio of magnetic fields at their centre is -

(A) 4 : 1 (B) 1 : 4

(C) 2 : 1 (D) 1 : 2

9. A charged particle of mass m and charge q is projected into a uniform magnetic field of induction B with speed v which is perpendicular to B. The width of the magnetic field is d. The impulse imparted to the particle by the field is ($d << \frac{mv}{qB}$) :



(A) qBv (B) $\frac{mv}{qB}$

(C) qBd (D) $\frac{2mv^2}{qB}$

10. The value of intensity of magnetic field at a point due to a current carrying conductor depends -
(A) Only on the value of current
(B) Only on a small part of length of conductor
(C) On angle between the line joining the given point to the mid point of small length and the distance between the small length of the point
(D) On all and the above

11. Along the direction of current carrying wire, the value of magnetic field is ?
(A) zero
(B) infinity
(C) depends on the length of the wire
(D) uncertain

12. Value of Tesla in gauss is -
(A) 10^3 (B) 10^6
(C) 10^4 (D) 10^2

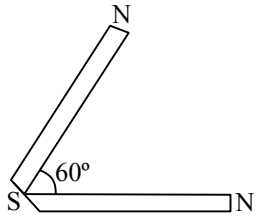
13. The vector form of Biot-Savart law is -

(A) $d\vec{B} = \frac{kid\vec{\ell}\times\vec{r}}{r^2}$ (B) $d\vec{B} = \frac{kid\vec{\ell}\times\vec{r}}{r^3}$

(C) $d\vec{B} = \frac{kid\vec{\ell}\times\vec{r}}{r}$ (D) $d\vec{B} = \frac{kid\vec{\ell}\times\hat{r}}{r}$

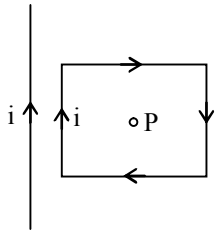
14. The diameter of a circular coil is 0.16m and it has 100 turns. If a current of 5 ampere is passed through the coil, then the intensity of magnetic field at a point on the axis at a distance 0.06 m from its centre will be -
(A) 2×10^{-3} Wb/m^2
(B) 2×10^{-2} Wb/m^2
(C) 2×10^{3} Wb/m^2
(D) 2×10^{2} Wb/m^2

15. The net magnetic moment of two identical magnets each of magnetic moment M_0, inclined at 60º with each other is –



(A) M_0 (B) $\sqrt{2}\,M_0$
(C) $\sqrt{3}\,M_0$ (D) $2\,M_0$

16. A wire is kept parallel to a square coil. Both carry current of same amount. If the magnetic field due to the wire at any point P with in the coil is B_1, then the total magnetic induction B at P will be -



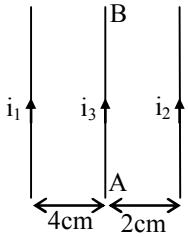
(A) B = 0 (B) $B > B_1$
(C) $B < B_1$ (D) $B = B_1$

17. An electric current i is flowing in a circular coil of radius a. At what distant from the centre of the axis of the coil will the magnetic field be $\frac{1}{8}$th of its value at the centre?

(A) 3a (B) $\sqrt{3}$ a

(C) $\frac{a}{3}$ (D) $\frac{a}{\sqrt{3}}$

18. There are three long and parallel current carrying conductors shown in figure. If force per unit length at the conductor AB is zero, then $\frac{i_1}{i_2}$ will be -



(A) 1 : 1 (B) 1 : 2
(C) 2 : 1 (D) 4 : 1

19. **Assertion :** If a charged particle is moving perpendicular to a uniform magnetic field , no work is done.

Reason : Displacement of the particle is zero.

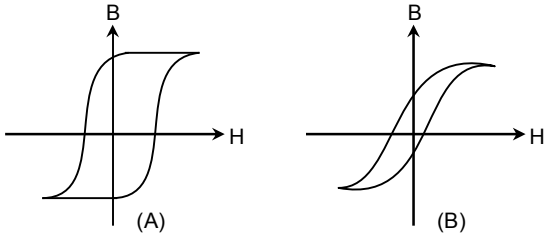
(A) If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

(B) If both Assertion and Reason are true but Reason is not correct explanation of the Assertion.

(C) If Assertion is true but the Reason is false.

(D) If Assertion is false but Reason is true

20. Hysteresis loops for two magnetic materials A and B are given below :



These materials are used to make magnets for electric generators, transformer core and electromagnet core. Then it is proper to use :

(A) A for electromgnets and B for electric generators.

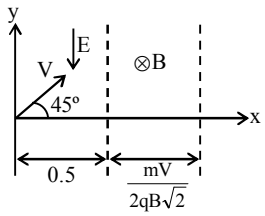
(B) A for transformers and B for electric generators.

(C) B for electromgnets and transformers.

(D) A for electric generators and transformers.

(SECTION B)

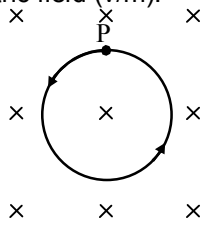
21. A charge particle of charge q and mass m is projected in a region which contains electric and magnetic field as shown in figure with velocity V at an angle 45° with x-direction. If $V = \sqrt{\frac{qE}{m}}$, then net deviation in particle motion will be (neglect the effect of gravity) in clockwise direction approx in radian …….. .



22. A charged particle is accelerated through a potential difference of 12 kV and acquires a speed of 10^6 ms^{-1}. It is injected perpendicularly into the magnetic field of strength 0.2 T. Find the radius of circle described by it.

23. The two rails of a railway track, insulated from each other and the ground, are connected to millivoltmeter. What is the reading of the millivoltmeter when a train passes at a speed of 180 km/hr along the track, given that the vertical component of earth's magnetic field is 0.2 × 10^{-4} wb/m^2 and rails are separated by 1 metre -

24. A particle have a charge 20 μC and mass 20 μg moves along a circle of radius 5 cm under the action of a magnetic field B = 0.1 T. When the particle is at P, a uniform transverse electric field is switched on and it is found that the particle continues on the tangent with a uniform velocity. Find the electric field (v/m).



25. With a standard rectangular bar magnet the time period of a vibration magnetometer is 4 s. The bar magnet is cut parallel to its length into four equal pieces. The time period of vibration magnetometer when one piece is used (in second) (bar magnet breadth is small) is -

26. flux ϕ (in weber) in a closed circuit of resistance 10 ohm varies with time t (in sec) according to the equation :

$\phi = 6t^2 - 5t + 1$

What is the magnitude of the induced current (Amp) at t = 0.25 sec ?

27. The magnetic field B due to a current carrying circular loop of radius 12 cm at its centre is 0.5 × 10^{-4} T. The magnetic field $x \times 10^{-5}$ T due to this loop at a point on the axis at a distance of 5 cm from the centre find the value of x-

28. A particle of charge q = 4 μC and mass m = 10 mg starts moving from the origin under the action of an electric field $\vec{E} = 4\hat{i}$ and magnetic field $\vec{B} = (0.2T)\hat{k}$. Its velocity at (x, 3, 0) is $(4\vec{i} + 3\vec{j})$. The value of x is $\frac{P}{Q}$. Volue the P + Q = ?

29. A magnetic needle of magnetic moment 6.7×10^{-2} Am^2 and moment of inertia 7.5×10^{-6} kg m^2 is performing simple harmonic oscillations in a magnetic field of 0.01 T. Time(sec.) taken for 10 complete oscillations is :

30. Alpha particles (m = 6.7×10^{-27} kg, q = +2e) are. Accelerated from rest through a potential difference of 6.7 kV. Then, they enter a magnetic field B = 0.2 T Perpendicular to them direction of their motion. The radius of the path described of their motion. The radius of the path described by them is.