PHYSICS

QUESTIONS

MAGNETIC EFFECT OF CURRENT & MAGNETISM

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VERY SHORT ANSWER QUESTIONS

1. How is magnetic field produced?
2. Define relative permeability.
3. Write the expression for magnetic field at the centre of a circular arc subtending an angle θ at its centre.
4. Write the expression for magnetic force on a current carrying conductor when placed in a magnetic field.
5. Write the expression for magnetic force on a moving charge.
6. Start Fleming's left hand rule.
7. Define unit of current (amp) in S.I. system.
8. What is the relation of gauss with tesla?
9. A charged particle enters a uniform magnetic field in a direction perpendicular to $\vec{B}$. Why does it follow a circular path?
10. What is the work done by a uniform magnetic field on a charged particle moving through it?
    [**Ans :** Zero]
11. Define angle of dip.
12. Define angle of declination.
13. What are the values of an angle of dip at (i) magnetic equator (ii) magnetic poles ?
14. A diamagnetic substance is carried an a strong magnetic field. Will it be attracted or repelled?
15. What do you mean by neutral point?
16. State the location of neutral points when a short magnet is placed (i) such that its N-pole faces geographical north (ii) its north pole faces geographical south.
17. State the resonance condition of a cyclotron ?
18. Does a charged particle in a cyclotron really get energy from the magnetic field applied?
19. Why electrons cannot be accelerated by a cyclotron?
20. Define magnetic moment.
21. Can you isolate magnetic north and south poles of a magnet by cutting it?
22. Write one property of a diamagnetic substance.
23. What is the nature of susceptibility of a magnetic field and current enclosed.
24. Name the rule which relates the line integral of magnetic field and current enclosed.
    [**Ans :** Ampere's Circuit rule]
25. Why does a voltmeter have a high resistance?
26. Why are the pole pieces of a magnet in a moving coil galvanometer made cylindrical?
27. Will the rectangular coil shows in fig. be attracted or repelled by a current carrying wire?
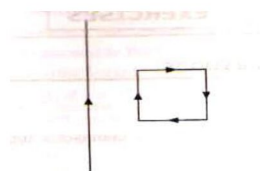
28. Under what condition an electron moving through a magnetic field experiences (i) no force (ii) maximum force?
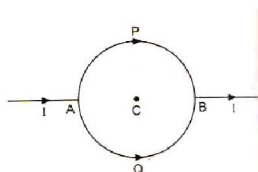
29. What is the value of magnetic field at the centre (C) of a circular loop containing two semicircles APB and electromagnet.

30. State two characteristic of a material suitable for making (i) a permanent magnet and (ii) an electromagnet .

31. What do you mean by a shunt?

32. How much force is exerted by a uniform magnetic field on a magnetic dipole?

33. An electric is flowing due north along a power line . What is the direction of the magnetic field (i) above it and (ii) below it ?

34. Write the expression for current sensitivity of a moving coil galvanometer.

35. How can you increase the sensitivity of a moving coil galvanometer?

36. What is the principle of a moving coil galvanometer?

37. Which has higher resistance : ammeter or voltmeter ?

38. Which has higher resistance : ammeter or milliammeter ?

39. Which has higher resistance : voltmeter or millivoltmeter ?

40. Write one difference between a diamagnetic and a paramagnetic substance.

41. What is curie temperature?

42. Which substances obey Curie law?

43. Write mathematical form a Biot Savart law.

44. In a certain arrangement a proton does not get deflected while passing through a region of magnetic field. State the condition of its possibility.

45. Give one example each of diamagnetic , paramagnetic and ferromagnetic substances.

SHORT ANSWER QUESTIONS

1. State and explain Biot Savart law.

2. State the conditions under which the path of a charged particle in uniform magnetic field becomes (i) Circle (ii) helix.

3. How will you covert a galvanometer into an ammeter? What will be the resistance of the voltmeter formed?

4. How will you convert a galvanometer into a voltmeter ? What will be the resistance of the voltmeter formed?

5. Out of an ammeter and voltmeter , which must have higher resistance and why?

6. Explain why two parallel wires carrying current in (i) the same direction attract each other and (ii) in opposite direction repel each other?

7. What do you mean by crossed electric and magnetic fields ? Under what condition a charged particle entering a crossed electrical and magnetic fields passes undeflected?

8. State the principle and limitations of a cyclotron.

9. Show that the magnetic energy density is $\dfrac{B^2}{2\mu_0}$.

10. Define angle of declination and angle of dip.

11. Express angle of dip in items of horizontal and vertical components.

12. Express total magnetic field of earth in terms of its horizontal and vertical components.

13. State two characteristic of (i) diamagnetic (ii) paramagnetic (iii) ferromagnetic substances.

14. A stream of electrons travelling with a speed V at right angles to uniform magnetic field B is deflected in a circular path of radius r. Prove that $\dfrac{e}{m} = \dfrac{V}{rB}$.

15. What is the source of earth's magnetic field ? Explain.

16. State the principle of a moving coil galvanometer.

17. State and prove Ampere's circuital law.

18. Use Ampere's law to find the magnetic field inside a long current carrying solenoid.

19. What do you mean by potential energy of a magnetic dipole in the magnetic field .

20. Derive an expression for the potential energy of a magnetic dipole in a uniform magnetic field at θ.

21. How will you prefer to magnetise and demagnetise an iron bar?

22. Define coercivity and rentivity . On this basis how will you distinguish between soft iron and steel .

23. Write a rule to find the magnetic field due to a current element.

24. A charged particle , having a charge q, is moving with speed V along the X-axis . It enters a region in space where an electric field $\vec{E}(= E\,\hat{j})$ and a magnetic field $\vec{B}$ both are present . The particle on emerging from this region is observed to be moving along X-axis only . Obtain the expression for $\vec{B}$ with its direction.

[**Ans :** $\vec{B} = \dfrac{E}{V}\,k$]

LONG ANSWER QUESTIONS

1. State Biot Savart law. Derive expression for magnetic field due to a current carrying long straight wire.

2. Derive expression for magnetic field due to circular current carrying coil (i) at its centre and (ii) at its axis.

3. State Ampere's circuit law. Use it to find an expression for magnetic field due to a long solenoid.

4. State Ampere's circuit law. Use it to find the magnetic field due to toroid.

5. What is magnetic force on a charged particle moving in a magnetic field . Use it to find the magnetic force on a current carrying straight conductor.

6. Derive an expression for torque on a current carrying rectangular loop. When is this torque maximum?

7. Describe the construction and working of moving coil galvanometer. Derive the necessary substances.

8. What are dia , para and ferromagnetic substances. Given at least four points of distinction of these substances.

9. Derive expression for magnetic field due to a short magnetic dipole at (i) axial point and (ii) equatorial point.

10. What is the effect of temperature on diamagnetic , paramagnetic and ferromagnetic substances? Explain.

11. Name three elements required to specify the earth's magnetic field at a given place. Draw a labeled diagram to define these elements . Explain briefly how these elements are determined to find out the magnetic field at a given place on the surface of the earth.

12. Name the three types of magnetic material which behave differently when planed in a non- uniform magnetic field. Given two properties of each.

NUMERICAL QUESTIONS

1. A long straight wire carries a current of 10 A . What is the value of magnetic field at a point 20 cm from the wire.
   [**Ans :** 10^{-5} T]

2. How much current should be passed through a long wire so as to produce a magnetic field of 0.5×10^{-4} T at a distance of 10 cm from it.
   [**Ans :** 25 A]

3. Find the magnetic field strength at the centre of a circular loop of radius 6.28 cm carrying a current of 2A.
   [**Ans :** 2×10^{-5} T]

4. In Bhor Model of hydrogen atom , the electron circulates around the nucleus in a circular orbit of radius 0.51 A^0 at a frequency of 6.8×10^{15} rev/sec. What is the magnetic field produced at the centre?
   [**Ans :** 13.4 T]

5. Two parallel wires at separation 10 cm carry current of 10 A and 20 A respectively in the same direction. Calculate the force of interaction per unit length. Is this force attractive or repulsive ?
   [**Ans :** 4×10^{-4} N/m , attractive]

6. A long straight conductor PQ ,carrying a current of 60 A fixed horizontally . Another long conductor XY is kept parallel to PQ at distance of 4 mm in air . Conductor XY free to move and carries a current I for which the magnetic repulsion just balance the weight of conductor XY. Mass per unit length of conductor XY is 10^{-2} kg/m.
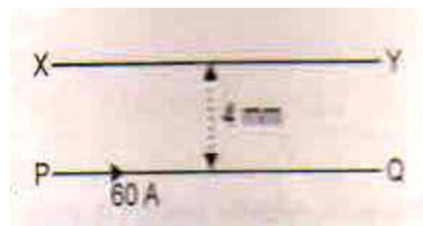
[**Ans :** 32.7 A opposite to current in PQ]

7. A galvanometer has a current range 15 mA and voltage range 750 mV .How will you convert it into an ammeter of range 25 A.

[**Ans :** We shall use a shunt 25 A.]

8. An electron travels in a circular path of radius 10 cm in a magnetic field of 2 x 10^{-5} T. Calculate the speed of electron.

[Ans : 3.5 x 10^{7} m/s]

9. A bean of protons enters a uniform magnetic field of 0.3 T with a velocity of 4 x 10^{5} m/s at an angle of 60^{0} to the magnetic field. Find the radius of the helical path taken by the beam .Also find the pitch of the helix.

[Mass of proton = 1.67 x 10^{-27} kg]

[**Ans :** 1.2 cm , 4.35 cm]

10. A long wire is bent as shown in fig. What is the value of magnetic field at centre O.
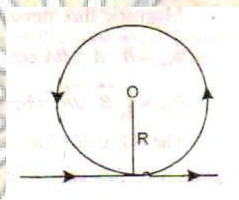
[**Ans :** $\dfrac{\mu_0 I}{2\pi R}(\pi+1)\,Wb/m^2$]

11. A straight wire of length $\dfrac{\pi}{2}$ metre is bent into a circular shape. If the wire were to carry a current of 5A , calculate the magnetic field due to it before bending , at a point distant 0.01 times the radius of circle formed from it. Also calculate the magnetic field at the centre of the circular loop formed , for the same value of the current.

12. Calculate the value of resistance needed to convert a galvanometer of resistance 100Ω with a full scale deflection of current of 5 mA , (i) into a voltmeter of range 0 – 10 V . (ii) into an ammeter of range 0 – 1 A.

13. The frequency of r.f. voltage source applied across the cyclotron Dees is 10 MHz . What should be the value of the operating magnetic field ? if the radius of the Dees be 0.60 m , what is the maximum kinetic energy (in MeV) of beam of protons accelerated in cyclotron. Given m_p =1.67 x 10^{-27} m.

14. Deuteron ($q=1.6 \times 10^{-19}$ C , $m=3.3 \times 10^{-27}$ kg) are being accelerated by cyclotron .
    (i)   What is cyclotron frequency if magnetic field used has a strength 1.5 T?
    (ii)   The P.d. across the gap of Dees is 59 kV . If K.E. attained is 20 MeV, calculate the number of revolutions of deuterons of deuterons inside   the Dees.
    [**Ans :** 2×10^{-2} H]

Note : if any mistake on this, kindly inform on the mail id :
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Your Observation! Our Correction !!