MAGNETISM – II

1. "An electric current is always accompanied by a magnetic field" was discovered by

(a) Kelvin (b) Fleming

(c) Oersted (d) Ampere

2. The magnetic field of induction at a point 4 cm from a long current carrying wire is 10^{-3} T. The field of induction at a distance of 1.0 cm from the same current will be

(a) 2×10^{-4} T (b) 3×10^{-4}

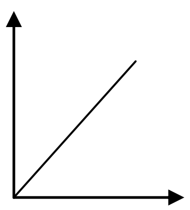
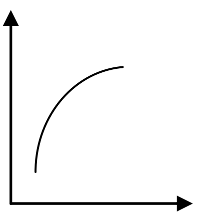
(c) 4×10^{-4} (d) 1.11×10^{-4}

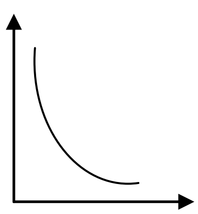
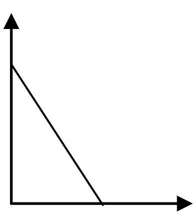
3. If B_1 is the magnetic field induction at a point on the axis of a circular coil of radius R situated at a distance $R\sqrt{3}$ and B_2 is the magnetic filed at the centre of the coil, then ratio of B_1/B_2 is equal to

(a) 1/3 (b) 1/8

(c) ¼ (d) ½

4. Which of the following graph represents the variation of magnetic flux density B with distance r for a straight long wire carrying an electric current ?

(a)  **(b)** 

(c)  **(d)** 

5. A helium nucleus makes a full rotation in a circle of radius 0.8 meter in 2 sec. The value of the magnetic field induction B in tesla at the centre of circle will be

(a) $2 \times 10^{-19}\mu_0$ (b) $10^{-19} / \mu_0$

(c) $10^{-19}\mu_0$ (d) $2 \times 10^{-20}\mu_0$

6. A solenoid of length 1.5 m and 4 cm diameter possesses 10 turns per cm. A current of 5 A is flowing through it. The magnetic induction at axis inside the solenoid is

($\mu_0 = 4\pi \times 10^{-7}$ weber amp^{-1} m^{-1})

(a) $4\pi \times 10^{-7}$ gauss (b) $2\pi \times 10^{-5}$ gauss

(c) $4\pi \times 10^{-5}$ tesla (d) $2\pi \times 10^{-5}$ tesla

7. Two straight long wires are set parallel to each other with a distance of 2r between them. If each wire carries a current I in the same direction, the intensity of magnetic field at a distance r between the two wires is

(a) zero (b) 4 I / r

(c) 2 I/r (d) I/r

8. The magnetic field at distance r from a long wire carrying current I is 0.4 T. The magnetic field at a distance 2r is

(a) 0.5 T (b) 1.6 T

(c) 0.2 T (d) 0.8 T

9. A current carrying power line carries current from west to east. The direction of magnetic field 1 m above the power line will be

(a) east to west (b) west to east

(c) south to north (d) north to south

10. I tesla is equal to

(a) Nam (b) NA^{-1} m

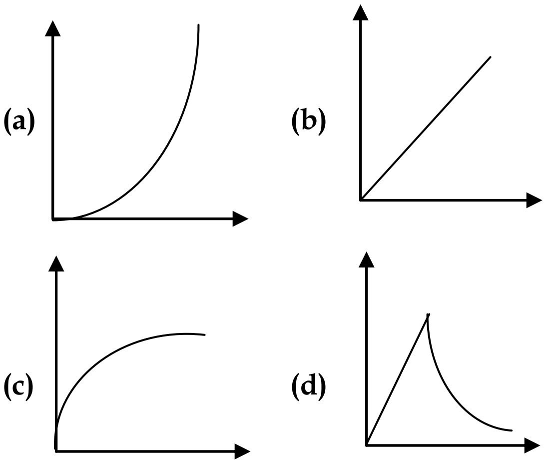
(c) Nam^{-1} (d) NA^{-1}m^{-1}

11. The orbital speed of electron orbiting around a nucleus in a circular orbit of radius 50 pm is 2.2×10^6 ms^{-1}. Then the magnetic dipole moment of an electron is

(a) 1.6×10^{-19} Am^2 (b) 5.3×10^{-21} Am^2

(c) 8.8×10^{-24} Am^2 (d) 8.8×10^{-26} Am^2

12. The magnetic flux density B at a distance r from a long straight rod carrying a steady current varies with r as shown in fig.



13. The magnetic moment of atomic neon is equal to

(a) zero (b) $\frac{1}{2}\mu B$

(c) μB (d) $\frac{3}{2}\mu B$

14. A current i ampere flows along eh inner conductor of a coaxial cable, and returns along the outer conductor of the cable then the magnetic induction at a distance r metre from the axis is

(a) ∞ (b) zero

(c) $\frac{2\mu_0 i}{4\pi r}$ tesla (d) $\frac{\mu_0 i_0}{2r}$ tesla

15. In hydrogen atom, the electron is making 6.6×10^{15} rev/sec around the nucleus of radius of 53 Å. The magnetic field produced at the centre of the orbit is nearly

(a) 0.14 weber / m^2 (b) 1.4 weber /m^2

(c) 14 weber/m^2 (d) 140 weber/m^2

16. The force due to magnetic field inside a hollow circular metal tube in which a d.c current flows from one end to the other is

(a) proportional to the strength of the current

(b) proportional to the square of the strength of the current

(c) proportional to the distance from the axis of the tube

(d) zero

17. A coil carrying a heavy current and having large number of turns is mounted in a N–S vertical plane. A current flows in the clockwise direction. A small magnetic needle at its centre will have its north pole in

(a) east–north direction

(b) west–north direction

(c) east–south direction

(d) west–south direction.

18. A solenoid of 1.5 metre length and 4.0 cm diameter possesses 10 turn per cm. A current of 5 ampere is flowing through it. The magnetic induction at axis inside the solenoid is

(a) $2\pi \times 10^{-3}$ tesla (b) $2\pi \times 10^{-5}$

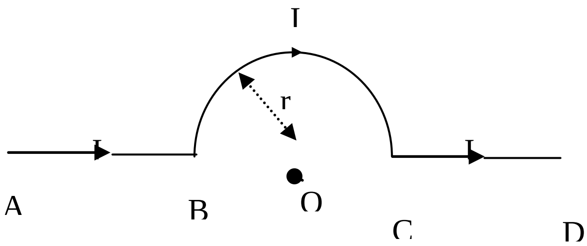
(c) $2\pi \times 10^{-2}$ gauss (d) $2\pi \times 10^{-5}$

19. (Weber × ampere)/metre is equal to

(a) joule (b) Newton

(c) henry (d) watt.

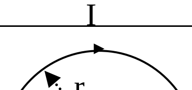
20. In fig., the magnetic filed induction at the centre O of the arc due to current in portion CD will be



(a) $\mu_0 I$ (b) $\mu_0 I/2r$

(c) $\mu_0 I/4r$ (d) zero

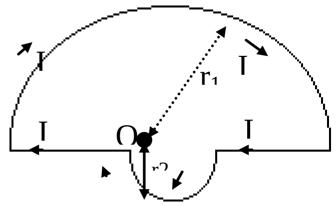
21. The magnetic field induction at centre O due to whole length of the conductor is



(a) $\mu_0\, i/r$ (b) $\mu_0 i/2r$

(c) $\mu_0 i/4r$ (d) zero

22. In the fig., there are two semicircles of radii r1 and r2 in which a current I is flowing. The magnetic field induction at the centre O will be



(a) $\frac{\mu_0 I}{4}(r_1 + r_2)$ (b) $\frac{\mu_0 I}{4}(r_1 - r_2)$

(c) $\frac{\mu_0 I}{4}\left(\frac{r_1 + r_2}{r_1 r_2}\right)$ (d) $\frac{\mu_0 I}{4}\left(\frac{r_1 - r_2}{r_1 r_2}\right)$

23. A positively charged particle moving with velocity $\vec{v}$ in a magnetic field of induction $\vec{B}$. The particle will experience the largest deflecting force when the angel between the vector $\vec{v}$ and $\vec{B}$ is

(a) 45^0 (b) 90^0

(c) 180^0 (d) 30^0

24. Two beams of electrons travelling in the same direction

(a) attract each other

(b) repel each other

(c) spin in same direction

(d) either 'a' or 'c'

25. An electron (mass = 9×10^{-31} kg, charge = 1.6×10^{-19} (C) moving with a velocity of 10^6 m/s enters a magnetic field. If it describes a circle of radius 0.1 m, then strength of magnetic field must be

(a) 4.5×10^{-5} (b) 1.4×10^{-5} T

(c) 5.5×10^{-5}T (d) 2.6×10^{-5} T

26. The frequency of charged particle, moving at right angle to the magnetic field, is independent of

(a) the radius of circular trajectory

(b) the speed of particle

(c) both 'a' and 'b'

(d) the magnetic induction B.

27. There is no force on moving charge, in magnetic field, when its direction of motion is

(a) parallel to the direction of magnetic field

(b) at an angle of 45^0 to the magnetic field

(c) at an angle of 30^0 to the magnetic field

(d) perpendicular to the magnetic field.

28. An electron moving with kinetic energy 6×10^{-16} joules enters a field of magnetic induction 6×10^{-3} weber/m^2 at right angle to its motion. The radius of its path is

(a) 3.42 cm (b) 4.23 cm

(c) 5.17 cm (d) 7.7 cm

29. A uniform electric field and a uniform magnetic field are pointed in the same direction. If an electron is projected in the same direction, the electron

(a) velocity will increase in magnitude

(b) velocity will decrease in magnitude

(c) will turn to its left

(d) will turn to its right

30. A deutron of kinetic energy 50 kev is describing a circular orbit of radius 0.5 m, in a plane perpendicular to magnetic field B. The kinetic energy of a proton that describes a circular orbit of radius 0.5 m in the same plane with the same magnetic field B is

(a) 200 kev (b) 50 kev

(c) 100 kev (d) 25 kev

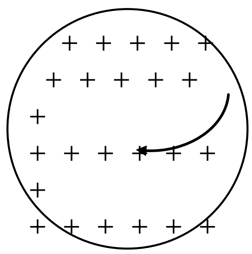
31. A proton moving in a straight line enters a strong magnetic field along the field direction. How will the path and velocity change

(a) path is circular but speed constant
(b) path is same but velocity increases
(c) path is same but velocity increases
(d) path is same motion is retarded.

32. A charged particle moving in a uniform magnetic field penetrates a layer of lead and thereby loses one half of its kinetic energy. How does the radius of curvature of its path change ?

(a) The radius increases to r $\sqrt{2}$
(b) The radius reduces to $\frac{r}{\sqrt{2}}$
(c) The radius remains the same
(d) The radius becomes r/2

33. There is a magnetic field acting in a plane downward perpendicular to sheet of paper. Particles in vacuum move in the plane of paper from left to right. The path indicated by a particle could be travelled by



(a) proton (b) neutron
(c) electron (d) α particle

34. A helium ion and a Hydrogen ion are accelerated from rest through a potential difference of V to velocities of U_{He} and U_H respectively. If the helium ion loses one electron, what will be the ratio of U_{He} to U_H.

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$
(c) $\sqrt{2}$ (d) 2

35. A proton, a deutron and an α–particle enter a magnetic field perpendicular to field with same velocity. What is the ratio of the radii of circular paths.

(a) 1 : 2 : 2 (b) 2 : 2 : 1
(c) 1 : 2 : 1 (d) 1 : 2 : 1

36. A charged particle of charge q moving with velocity v enters along he axis of a current carrying solenoid. The magnetic force on the particle is

(a) 0 (b) q v B
(c) finite but not q v B (d) infinite

37. The velocity of two α–particles A and B in a uniform magnetic field is in the ratio of 1 : 3. They move in different circular orbits in the magnetic field. The ratio of radius of curvatures of their paths is

(a) 1 : 2 (b) 1 : 3
(c) 3 : 1 (d) 2 : 1

38. A wire of length l in formed into a circular loop of one turn only and is suspended in a magnetic field B. When a current I is passed through the loop, the torque experienced by it is

(a) $(1/4\pi)\ 8Il$ (b) $(1/4\pi)\ l^2 IB$
(c) $(1/4\pi)B^2\ Il$ (d) $(1/4\pi)\ BI^2l$

39. Two free parallel wires carrying currents in the opposite directions

(a) attract each other
(b) repel each other
(c) neither 'b' or 'c'
(d) nothing can be said.

40. If the distance between two current carrying wires is doubled the force between them becomes

(a) 4 times (b) 2 times

(c) ½ times (d) ¼ times

41. Through two parallel wires A and B, 10A and 2A of currents are passed respectively in opposite directions. If the wire A is infinitely long and the length of the wire B is 2m, then force on the conductor B, which is situated at 10 cm distance from A, will be

(a) 8×10^{-7} N (b) 8×10^{-5} N

(c) 4×10^{-7} N (d) 4×10^{-5} N

42. A conducting circular loop of radius r carries a constant current i. It is placed in a uniform magnetic field B such that ab is perpendicular to the plane of loop. The magnetic force acting on the loop is

(a) Bir (b) 2πirB

(c) 0 (d) πirB

43. In Nebrakrka the horizontal component of earth's field is 0.2 G. If a vertical wire carries a current of 30 A upward there. What is the magnitude and direction of the force on 1 m of wire (1G = 10^{-4}T)

(a) 6 N to W (b) 6×10^{-3} N to W

(c) 6×10^{-3} N to W (d) 6×10^{-4} N to W.

44. Which has greater resistance ?

(a) Ammeter has more resistance

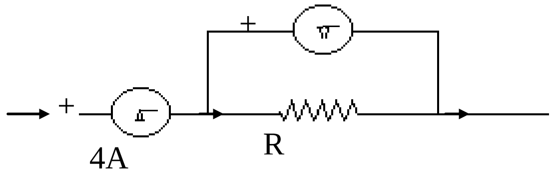
(b) Milliammeter has more resistance

(c) Both have equal resistance

(d) Depends on size of meter.

45. A candidate connects a moving coil ammeter A and a moving coil voltmeter V and a resistance R as shown.

20 V



If the voltmeter reads 20 volt and the ammeter reads 4 ampere, then R is

(a) equal to 5 ohms

(b) greater than 5 ohms

(c) less than 5 ohms

(d) greater or less than 5 ohms depending upon its material.

46. An ammeter has are resistance of G ohm and a range of i ampere. The value of resistance used in parallel to convert it into an ammeter of range **ni** ampere is

(a) n G (b) (n–1) G

(c) $\frac{G}{n}$ (d) $\frac{G}{n-1}$

47. A voltmeter has a resistance of G ohm and range of V volt. The value of resistance used in series to convert it into a voltmeter of range n V volt is

(a) n G (b) (n–1) G

(c) $\frac{G}{n}$ (d) $\frac{G}{n-1}$

48. A milliammeter of resistance 5 ohms gives a full scale deflection for a current of 15 mA. If the milliammeter is to be used to measure currents upto 1.5 A the size of the resistance that must be attached to the milliammeter is

(a) 0.0505 ohm (b) 0.505 ohm

(c) 5.05 ohm (d) 505 ohm

49. The deflection in a galvanometer falls from 50 division to 20 when a 12 ohm shunt is applied. The galvanometer resistance is

(a) 18 ohms (b) 36 ohms

(c) 24 ohms (d) 30 ohms

50. Of the following an ideal voltmeter is

(a) Moving coil voltmeter

(b) Voltameter

(c) An electrometer

(d) Hot wire voltmeter.

51. In a moving coil galvanometer, the turning effect on the coil is proportional to

(a) $I^{1/2}$ (b) I

(c) I^2 (d) I^3

52. The force between two parallel wires is 2×10^{-7} N/m, spaced 1 m apart to each another in vacuum. The electric current flowing through the wires is

(a) Unit ampere (b) zero

(c) 5×10^6 (d) 2×10^{-7}

53. A $5 \times 10^3\ \Omega$ is used to measure voltage in a circuit. To increase its range to 3 times, the additional resistance to be put in series is

(a) $9 \times 10^6\ \Omega$ (b) $10^5\ \Omega$

(c) $1.5 \times 10^5\ \Omega$ (d) $9 \times 10^5\ \Omega$

54. An ammeter has a resistance R_0 and range I. Which of the following resistances can be connected in series with it to decrease its range to I/n

(a) R_0/n (b) R_0 (n–1)

(c) R_0 / (n + 1) (d) none of the above

55. A galvanometer of resistance 100 Ω gives a full scale deflection for a current of 10^{-5} A. To convert it into a ammeter capable of measuring upto 1 A, we should connect a resistance of

(a) 1Ω in parallel (b) $10^{-3}\ \Omega$ in parallel

(c) $10^5\ \Omega$ in series (d) 100 Ωin series.

56. The resistance of an ideal voltmeters

(a) zero (b) high

(c) infinite (d) low

57. A power line lies along the east–west direction and carries a current of 10 ampere. The force per metre due to earth's magnetic field of 10^{-4} tesla is

(a) 10^{-5} N (b) 10^{-4} N

(c) 10^{-3} N (d) 10^{-2} N

58. The magnetic field at a distance 'r' from a long wire carrying current 'i' is 0.4 tesla. The magnetic field at a distance '2r' is

(a) 0.2 tesla (b) 0.8 tesla

(c) 0.1 tesla (d) 1.6 tesla

59. A current carrying coil is subjected to a uniform magnetic field. The coil will orient so that its plane becomes

(a) inclined at 45^0 to the magnetic field

(b) inclined at any arbitrary angle to the magnetic field

(c) parallel to the magnetic field

(d) perpendicular to the magnetic field

60. The magnetic field B within the solenoid having n turns per metre length and carrying a current of I ampere is given by

(a) nI (b) μ_0 n I

(c) 4 $\pi\mu_0$ n I (d) μ_0 n I /e

61. The path executed by a charged particle whose motion is perpendicular to magnetic field is

(a) a straight line (b) an ellipse

(c) a helix (d) a circle

62. A conducting circular loop of radius r carries a constant current i. It is placed in a uniform magnetic field $\vec{B}$ such that $\vec{B}$ is a perpendicular to the plane of the loop. The magnetic force acting on the loop is

(a) zero (b) π i r B

(c) 2 π r i B (d) i r B.

63. An electron enters a region where magnetic $(\vec{B})$ and electric $(\vec{E})$ fields are mutually perpendicular to one another then

(a) it will always move in the direction of $\vec{B}$

(b) it will always move in the direction of $\vec{E}$

(c) it always possesses circular motion

(d) it can go undeflected also.

64. A current of 0.1 A circulates around a coil of 100 turns and having a radius equal to 5 cm. The magnetic field set up at the centre of the coil is

(a) $4\pi \times 10^{-5}$ T (b) $8\pi \times 10^{-5}$ T

(c) 4×10^{-5} T (d) 2×10^{-5} T

65. The magnetic field induction due to infinitely long straight wire carrying a current i at a distance from the wire is given by

(a) $[\vec{B}] = \frac{\mu_0}{4\pi}\frac{2i}{r}$ (b) $[\vec{B}] = \frac{\mu_0}{4\pi}\frac{r}{2i}$

(c) $[\vec{B}] = \frac{4\pi}{\mu_0}\frac{2i}{r}$ (d) $[\vec{B}] = \frac{4\pi}{\mu_0}\frac{r}{2i}$