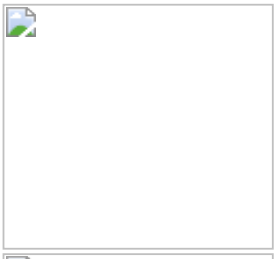
Ravi Maths Tuition Centre

Time : 1 Mins **MAGNETISM 1** **Marks : 668**

1. Domain formation is the necessary feature of
   a) diamagnetism. b) Paramagnetism. c) ferromagnetism d) all of these.
2. The magnetic susceptibility of an ideal diamagnetic substance is
   a) +1 b) 0 c) -1 d) ∞
3. Nickel shows the ferromagnetic property at room temperature. If the temperature is increased beyond Curie temperature, then it will show _____.
   a) antiferromagnetism b) no magnetic property c) diamagnetism d) paramagnetism
4. A bar magnet of magnetic moment M is placed in a magnetic field of induction B. The torque exerted on it is _____.
   a) M.B b) -M.B c) M x B d) -M x B
5. The variation of magnetic susceptibility (x) with temperature for a diamagnetic substance is best represented by figure

   a)  b)  c) 

   d) 
6. Diamagnetic material in a magnetic field moves _____.
   a) perpendicular to the field b) from stronger to the weaker parts of the field
   c) from weaker to the stronger parts of the field d) in none of the above directions
7. Curie temperature is the temperature above which _____.
   a) ferromagnetic material becomes paramagnetic material
   b) paramagnetic material becomes diamagnetic material
   c) paramagnetic material becomes ferromagnetic material
   d) ferromagnetic material becomes diamagnetic material.
8. A magnet can be completely demagnetised by
   a) breaking the magnet into small pieces b) heating it slightly
   c) dropping it into ice cold water d) a reverse field of appropriate strength
9. If M is magnetic moment and B is magnetic field intensity, then the torque is given by

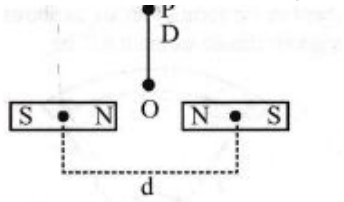
a) $\overline{\mathbf{M}} \cdot \overline{\mathbf{B}}$ b) $\frac{|\overline{\mathbf{M}}|}{|\overline{\mathbf{B}}|}$ c) $\overline{\mathbf{M}} \times \overline{\mathbf{B}}$ d) MB

10. Gauss's law for magnetism is
    a) the net magnetic flux through any closed surface is B. $\triangle$S
    b) the net magnetic flux through any closed surface is E. $\triangle$S
    c) the net magnetic flux through any closed surface is zero d) Both (a) and (c)
11. Curie temperature is the temperature above which
    a) a ferromagnetic material becomes paramagnetic.
    b) a ferromagnetic material becomes diamagnetic
    c) a paramagnetic material becomes diamagnetic
    d) a paramagnetic material becomes ferromagnetic
12. Three needles N_1,N_2 and N_3 are made of a ferromagnetic, a paramagnetic and a diamagnetic substance respectively. A magnet, when brought close to them, will
    a) attract N_1 strongly, but repel N_2 and N_3 weakly. b) attract all three of them.
    c) attract N_1 and N_2 strongly but repel N_3
    d) attract N_1 strongly, N_2 weakly and repel N_3 weakly
13. A bar magnet having a magnetic moment of 2 x 10^4 JT^{-1} is free to rotate in a horizontal plane. A horizontal magnetic field B = 6 x 10^{-4} T exists in the space. The work done in taking the magnet slowly from a direction parallel to the field to a direction 60° from the field is _____.
    a) 12J b) 6J c) 2J d) 0.6J
14. A magnetic needle is kept in a non-uniform magnetic field. It experiences
    a) a torque but not a force b) neither a force nor a torque c) a force and a torque
    d) a force but not a torque
15. Two magnets have the same length and the same pole strength. But one of the magnets has a small hole at its centre. Then,
    a) both have equal magnetic moment b) one with hole has small magnetic moment
    c) one with hole has large magnetic moment
    d) one with hole loses magnetism through the hole
16. At a certain place, horizontal component is $1/\sqrt{3}$ times the vertical component. The angle of dip at this place is
    a) zero b) $\pi/3$ c) $\pi/6$ d) None of these
17. A large magnet is broken into two pieces so that their lengths are in the ratio 2 : 1. The pole strengths of the two pieces will have ratio.
    a) 2: 1 b) 1: 2 c) 4: 1 d) 1: 1
18. At a point on the right bisector of a magnetic dipole, the magnetic
    a) potential varies as $\frac{1}{r^2}$ b) potential is zero at aU points on the right bisector.
    c) field varies as r^3 d) field is perpendicular to the axis of dipole
19. A magnetic needle suspended parallel to a magnetic field requires $\sqrt{3}$ J of work to turn it through 60°. The torque needed to maintain the needle in this position will be
    a) $2\sqrt{3}$ J b) 3 J c) $\sqrt{3}$ J d) $\frac{3}{2}$ J
20. At a certain place on earth, $\boldsymbol{B_H = \frac{1}{\sqrt{3}} B_V}$ angle of dip at this place is

a) 60° b) 30° c) 45° d) 90°

21. A bar magnet is oscillating in the earth's magnetic field with a period T. What happens to its period of motion, if its mass is quadrupled?
    a) Motion remains simple harmonic with new period = T/2
    b) Motion remains simple harmonic with new period = 2T
    c) Motion remains simple harmonic and the period = 4T
    d) Motion remains simple harmonic and the period stays nearly constant
22. A bar magnet of length 3 cm has points A and B along axis at a distance of 24 cm and 48 cm on the opposite ends. Ratio of magnetic fields at these points will be

    a) 8 b) 3 c) 4 d) 1/2 $\sqrt{2}$
23. Ferromagnetism show their properties due to
    a) filled inner subshells b) vacant inner subshells c) partially filled inner subshells
    d) all the subshells equally filled
24. Two identical bar magnets are fixed with their centres at a distance d apart. A stationary charge Q is placed at P in between the gap of the two magnets at a distance D from the centre O as shown in the figure

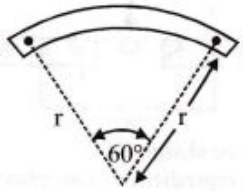


    The force on the charge Q is
    a) directed perpendicular to the plane of paper b) zero c) directed along OP
    d) directed along PO
25. In a permanent magnet at room temperature,
    a) magnetic moment of each molecule is zero
    b) the individual molecules have non-zero magnetic moment which are all perfectly aligned
    c) domains are partially aligned d) domains are all perfectly aligned
26. Essential difference between electrostatic shielding by a conducting shell and magnetostatic shielding is due to
    a) electrostatic field lines cannot end on charges and conductors do not have free charges.
    b) lines of B can also end but conductors cannot end them.
    c) lines of B cannot end on any material and perfect shielding is not possible.
    d)
    shells of high permeability materials cannot be used to divert lines of B from the interior region.
27. To make electromagnet, substance should be of
    a) high permeability and high susceptibility b) low permeability and high susceptibility
    c) high permeability and low susceptibility d) low permeability and low susceptibility

28. The magnetic field of Earth can be modelled by that of a point dipole placed at the centre of the Earth. The dipole axis makes an angle of 11.3° with the axis of Earth. At Mumbai, declination is nearly zero. Then,
    a) the declination varies between 11.3° W to 11.3° E b) the least declination is 0°.
    c) the plane defined by dipole axis and Earth axis passes through Greenwich
    d) declination averaged over Earth must be always negative.
29. The material suitable for making electromagnets should have
    a) high retentivity and high coercivity b) low retentivity and low coercivity
    c) high retentivity and low coercivity d) low retentivity and high coercivity
30. The magnetic moment of a diamagnetic atom is _____.
    a) equal to zero b) much greater than one c) 1 d) between zero and one
31. The relative permeability of a substance is 0.9999. The nature of substance will be
    a) diamagnetic b) paramagnetic c) magnetic moment d) intensity of magnetic field
32. A 800 turn coil of effective area 0.05 m^2 is kept perpendicular to a magnetic field 5 x 10^{-5} T. When the plane of the coil is rotated by 90^o around any of its coplanar axis in 0.1 s, the emf induced in the coil will be: _____ .
    a) 0.2 V b) 2 x 10^{-3} V c) 0.02 V d) 2 V
33. The earth's magnetic field at the equator is approximately 0.4 G, the earth's dipole moment is
    a) 1 x 10^{23} Am^2 b) 1.05 x 10^{23} Am^2 c) 8 x 10^{22} Am^2 d) 4 x 10^2 Am^2
34. Electromagnets are made of soft iron because soft iron has _____.
    a) low retentivify ancl high coercive force b) high retentivity and high coercive force
    c) low retentivity and low coercive force d) high retentivity and low coercive force
35. An electron of charge e moves in a circular orbit of radius r around orbital motion of the electron is
    a) π ver^2 b) $\frac{\pi v r^2}{e}$ c) $\frac{\pi v e}{r}$ d) $\frac{\pi e r^2}{v}$
36. If the magnetising field on a ferromagnetic material is increased, its permeability
    a) is decreased b) is increased c) is unaffected d) may be increased or decreased
37. The universal property among all substances is
    a) diamagnetism. b) paramagnetism. c) ferromagnetism. d) all of these
38. A bar magnet of magnetic moment M is placed at right angles to a magnetic induction B. If a force Fis experienced by each pole of the magnet, the length of the magnet will be _____.
    a) F/MB b) MB/F c) BF/M d) MF/B
39. There are four lightweight rod samples A, B, C, D separately suspended by threads. A bar magnet is slowly brought near each sample and the following observations are noted
    (i) A is feebly repelled
    (Il) B is feebly attracted
    (iii)C is strongly attracted
    (Iv) D remains unaffected
    Which one of the following is true?
    a) B is of a paramagnetic material b) C is of a diamagnetic material
    c) D is of a ferromagnetic material d) A is of a non-magnetic material
40. The best material for the ore of a transformer is

a) stainless steel b) mild steel c) hard steel d) soft iron

41. A bar magnet of length 'ℓ ', and magnetic dipole moment 'M' is bent in the form of an arc as shown in figure. The new magnetic dipole moment will be _____.



a) $\frac{3}{\pi}M$ b) $\frac{2}{\pi}M$ c) $\frac{M}{2}$ d) M

42. The intensity of magnetic field at a point X on the axis of a small magnet is equal to the field intensity at another point Y on equatorial axis. The ratio of distance of X and Y from the centre of the magnet will be
a) $(2)^{-3}$ b) $(2)^{-1/3}$ c) 2^{3} d) $2^{1/3}$

43. The relative permeability of a substance X is slightly less than unity and that of substance Y is slightly more than unity, then
a) X is paramagnetic and Y is ferromagnetic b) X is diamagnetic and Y is ferromagnetic
c) X and Y both are paramagnetic d) X is diamagnetic and Y is paramagnetic

44. A compass needle which is allowed to move in a horizontal plane is taken to a geomagnetic pole, It: _____.
a) will become rigid showing no movement b) will stay in any position
c) will stay in north-south direction only d) will stay in east-west direction only

45. The magnetic lines of force inside a bar magnet
a) are from north-pole to south-pole of the magnet b) do not exist.
c) depend upon the area of cross-section of the bar magnet.
d) are from south-pole to north-pole of the magnet

46. A 25 cm long solenoid has radius 2 ern and 500 total number of turns. It carries a current of 15 A. If it is equivalent to a magnet of the same size and magnetisation $\overline{\mathbf{M}}$, $\text{then } |\overline{\mathbf{M}}| \text{ is}$
a) $3\pi\mathbf{Am}^{-1}$ b) $\mathbf{30000}\pi\mathbf{Am}^{-1}$ c) 300 Am^{-1} d) 30000 Am^{-1}

47. The value of angle of dip is zero at the magnetic equator because on it
a) V and Hare equal b) the values of V and Hare zero c) the value of V is zero
d) the value ofH is zero

48. A short bar magnet of magnetic moment 0.4JT^{-1} is placed in a uniform magnetic field of 0.16 T. The magnet is in stable equilibrium when the potential energy is _____.
a) -0.64J b) Zero c) -0.0.82J d) -0.064J

49. If a diamagnetic substance is brought near the north or the south pole of a bar magnet. it is: _____.
a) repelled by the north pole and attracted by the south pole
b) attracted by the north pole and repelled by the south pole c) attracted by both the poles
d) repelled by both the poles

50. At a place angle of dip is 30°. If horizontal component of earth's magnetic field is H, then the total intensity of magnetic field will be
a) H / 2 b) 2H / $\sqrt{3}$ c) H $\sqrt{3/2}$ d) 2 H

51. The primary origines) of magnetism lies in

a) Pauli exclusion principle. b) polar nature of molecules c) intrinsic spin of electron.
d) None of these

52. Two magnets of magnetic moments M and 2M are placed in a vibration magnetometer, with the identical poles in the same direction. The time period of vibration is T_l. If the magnets are placed with opposite poles together and vibrate with time period T_2, then _____.
a) T_2 is infinite b) $T_2 = T_l$ c) $T_2 > T_1$ d) $T_2 < T_1$

53. Angle of dip is 90° at
a) poles. b) equator. c) both at equator and poles. d) tropic of cancer.

54. A paramagnetic sample shows a net magnetisation of S Am^{-1} when placed in an external magnetic field of 0.6 T at a temperature of 4 K. When the same sample is placed in an external magnetic field of 0.2 T at a temperature of 16K, the magnetisation will be
a) $\frac{32}{3}\mathrm{Am}^{-1}$ b) $\frac{2}{3}\mathrm{Am}^{-1}$ c) 6 Am^{-1} d) 2.4 Am^{-1}

55. Work done in rotating a bar magnet from 0 to angle 120° is
a) $\frac{1}{2}$ MB b) $\frac{3}{2}$ MB c) MB d) $\frac{2}{3}$ MB

56. S is the surface of a lump of magnetic material.
a) Lines of B are not necessarily continuous across S.
b) Some lines of B must be discontinuous across S.
c) Lines of H are necessarily continuous across S.
d) Lines of H cannot all be continuous across S.

57. If a ferromagnetic material is inserted in a current carrying solenoid, the magnetic field of solenoid
a) largely increases b) slightly increases. c) largely decreases d) slightly decreases

58. Current I is flowing in a coil of area A and number of turns N, then magnetic moment of the coil, M _____.
a) NiA b) $\frac{Ni}{A}$ c) $\frac{Ni}{\sqrt{A}}$ d) N^2Ai

59. Let the magnetic field on earth be modelled by that of a point magnetic dipole at the centre of earth. The angle of dip at a point on the geographical equator
a) is always zero. b) can be zero at specific points. c) cannot be positive or negative
d) is not bounded.

60. Above Curie temperature _____.
a) a paramagnetic substance becomes diamagnetic
b) a diamagnetic substance becomes paramagnetic
c) a paramagnetic substance becomes ferromagnetic
d) a ferromagnetic substance becomes paramagnetic

61. A diamagnetic substance is brought near a strong magnet, then it is _____.
a) attracted by a magnet b) repelled by a magnet
c) repelled by North pole and attracted by South pole
d) attracted by North pole and attracted by South pole

62. In which type of material the magnetic susceptibility does not depend on temperature
a) Diamagnetic b) Paramagnetic c) Ferromagnetic d) Ferrite

63. Cutting a bar magnet in half is like cutting a solenoid, such that we get two smaller solenoids with

a) weaker magnetic properties b) strong magnetic properties
c) constant magnetic properties d) Both (a) and (b)

64. A short bar magnet placed with its axis at 30° with an external field of 800 G experiences a torque of 0.016 Nm. The magnetic moment of the magnet is
a) 4 Am^2 b) 0.5 Am^2 c) 2 Am^2 d) 0.40 Am^2

65. A long solenoid has 1000 turns per metre and carries a current of 1 A. It has a soft iron core of μ_r = 1000. The core is heated beyond the Curie temperature, T_c.
a) The H field in the solenoid is (nearly) unchanged but the B field decreases drastically
b) The Hand B fields in the solenoid are nearly unchanged.
c) The magnetisation in the core reverses direction.
d) The magnetisation in the core does not diminishes

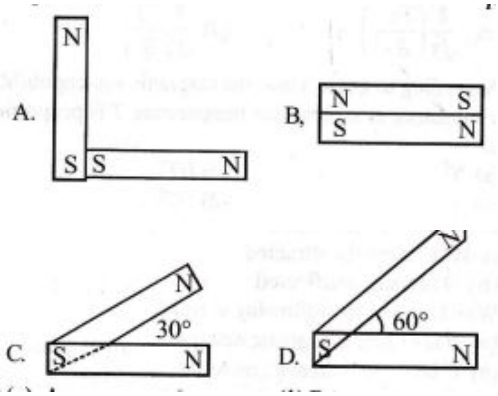
66. A toroid of n turns, mean radius R and cross-sectional radius a carries current I.It is placed on a horizontal table taken as x-y plane. Its magnetic moment m.
a) is non-zero and points in the z-direction by symmetry.
b) points along the axis of the tortoid (m = mΦ).
c) is zero, otherwise there would be a field falling as $\frac{1}{r^3}$ at large distances outside the toroid.
d) is pointing radially outwards,

67. Hysteresis loss is minimised by using
a) alloy of steel b) shell type of core c) thick wire which has low resistance d) metal

68. If the magnetic dipole moment of an atom of diamagnetic material, paramagnetic material and ferromagnetic material are denoted by m_d, m_p and m_f respectively, then _____.
a) $\mu_d = 0 \text{ and } \mu_p \neq 0$ b) $\mu_d \neq 0 \text{ and } \mu_p = 0$ c) $\mu_p = 0 \text{ and } \mu_f \neq 0$ d) $\mu_d \neq 0 \text{ and } \mu_f \neq 0$

69. For protecting a sensitive equipment from the external magnetic field, it should be _____.
a) placed inside an aluminum can b) placed inside an iron
c) require less kinetic energy to reach the equator than the poles
d) Surrounded with fine copper sheet

70. Following figures show the arrangement of bar magnets in different configurations. Each magnet has magnet dipole moment m. Which configuration has highest net magnetic dipole moment?



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

71. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 Am^{-1}. The permeability of the material of the rod is: _____.
a) 2.4 p x 10^{-7} T mA^{-1} b) 2.4 p x 10^{-4} T mA^{-1} c) 8 x 10^{-5} T mA^{-1} d) 2.4 p x 10^{-5} T mA^{-1}

72. Lines of force, due to earth's horizontal magnetic field, are

a) elliptical b) curved lines c) concentric circles d) parallel and straight

73. Consider the two idealized systems: (i) a parallel plate capacitor with large plates and small separation and (ii) a long solenoid of length L >> R, radius of cross-section. In (i) E is ideally treated as a constant between plates and zero outside. In (ii) magnetic field is constant inside the solenoid and zero outside. These idealised assumptions, however, contradict fundamental laws as below.
    a) case (i) contradicts Gauss's law for electrostatic fields.
    b) case (ii) contradicts Gauss's law for magnetic fields. c) case (i) agrees with $\int E.dl = 0$.
    d) case (ii) contradicts $\int \boldsymbol{H}.dl = I_{en}$

74. A coil in the shape of an equilateral triangle of side l is suspended between the pole pieces of a permanent magnet such that $\vec{B}$ is in the plane of the coil. If due to a current i in the triangle a torque t acts on it, the side l of the triangle is _____.
    a) $\frac{2}{\sqrt{3}}\left(\frac{\tau}{B \cdot i}\right)^{\frac{1}{2}}$ b) $2\left(\frac{\tau}{\sqrt{3}B \cdot i}\right)^{\frac{1}{2}}$ c) $\frac{2}{\sqrt{3}}\left(\frac{\tau}{B \cdot i}\right)$ d) $\frac{1}{\sqrt{3}}\frac{\tau}{B \cdot i}$

75. Due to the earth's magnetic field, charged cosmic ray particle _____.
    a) can never reach the poles b) can never reach the equator
    c) require less kinetic energy to reach the equator than the poles
    d) require greater kinetic energy to reach the equator than the poles

76. A vibration magnetometer placed in magnetic meridian has a small bar magnet. The magnet executes oscillations with a time period of 2 sec in earth's horizontal magnetic field of 24 microtesla. When a horizontal field of 18 microtesla is produced opposite to the earth's field by placing a current carrying wire, the new time period of magnet will be _____ .
    a) 1s b) 2s c) 3s d) 4s

77. A diamagnetic material in a magnetic field moves
    a) perpendicular to the field b) from weaker to stronger parts
    c) from stronger to weaker parts. d) in random direction.

78. A magnet of dipole moment M is aligned in equilibrium position in a magnetic field of intensity B. The work done to rotate it through an angle θ with the magnetic field is
    a) MB sin θ b) MB cos θ c) MB (1 - cos θ) d) MB(l - sin θ)

79. A magnetic needle suspended parallel to a magnetic field requires $\sqrt{3}$J of work to turn it through 60°. The torque needed to maintain the needle in this position will be: _____.
    a) $2\sqrt{3}$ J b) 3J c) $\sqrt{3}$ J d) $\frac{3}{2}J$

80. If a diamagnetic substance is brought near the North or the South-pole of a bar magnet, then it is
    a) attracted by the both poles b) repelled by both the poles
    c) repelled by the North-pole and attracted by the South-pole
    d) attracted by the North-pole and repelled by the South-pole

81. A bar magnet is hung by a thin cotton thread in a uniform horizontal magnetic field and is in equilibrium state. The energy required to rotate it by 60° is W. Now the torque required to keep the magnet in this new position is _____.
    a) $\frac{W}{\sqrt{3}}$ b) $\sqrt{3}W$ c) $\frac{\sqrt{3}W}{2}$ d) $\frac{2W}{\sqrt{3}}$

82. According to Curie's law, the magnetic susceptibility of a substance at an absolute temperature T is proportional to _____.
a) T^2 b) 1/T c) T d) $1/T^2$

83. At a point A on the earth's surface the angle of dip, d = $+25^o$. At a point B on the earth's surface the angle of dip, d = -25^o. We can interpret that _____.
a) A is located in the southern hemisphere and B is located in the northern hemisphere.
b) A is located in the northern hemisphere and B is located in the southern hemisphere.
c) A and B are both located in the southern hemisphere.
d) A and B are both located in the northern hemisphere

84. The work done in turning a magnet of magnetic moment M by an angle of 90^0 from the meridian, is n times the corresponding work done to turn it through an angle of 60^0. The value of n is given by _____ .
a) 2 b) 1 c) 0.5 d) 0.25

85. Curie law XT = constant, relating magnetic susceptibility (X) and absolute temperature (T) of magnetic substance is obeyed by
a) all magnetic substances. b) paramagnetic substances. c) diamagnetic substances.
d) ferromagnetic substances.

86. A current of 5 A is flowing through a circular coil of diameter 14 cm having 100 turns. The magnetic dipole moment associated with this coil is :
a) $0.077Am^2$ b) $0.77Am^2$ c) $7.7Am^2$ d) $77Am^2$

87. The maximum current that can be measured by a galvanometer of resistance 40 Ω is 10 mA. It is converted into voltmeter that can read upto 50 V. The resistance to be connected in the series with the galvanometer is
a) 2010 Ω b) 4050 Ω c) 5040 Ω d) 4960 Ω

88. A galvanometer of resistance 25 Ωshows full scale deflection for current of 10 mA. To convert it into 100 V range voltmeter, the required series resistance is
a) 9975 Ω b) 10025 Ω c) 10000 Ω d) 975 Ω

89. Proton, Deuteron and alpha particle of the same kinetic energy are moving in circular trajectories in a constant magnetic field. The radii of proton, deuteron and alpha particle are respectively $r_p, r_d \quad and \quad r_\alpha$. Which one of the following relations is correct?
a) $r_\alpha = r_p = r_d$ b) $r_\alpha = r_p < r_d$ c) $r_\alpha > r_d > r_p$ d) $r_\alpha = r_d > r_p$

90. The wire which connects the battery of a car to its starter motor carries current of 300 A during starting. Force per unit length between wires (wires are 0.7 m long and 0.015 m distant apart) is
a) 1.2 Nm^{-1} repulsive b) 1.2 Nm^{-1} attractive c) 2.4 Nm^{-1} repulsive
d) 2.4 Nm^{-1}attractive

91. Consider a wire carrying a steady current, I placed in a uniform magnetic field B perpendicular to its length. Consider the charges inside the wire. It is known that magnetic forces do not work. This implies that,
a)
motion of charges inside the conductor is unaffected by B, since they do not absorb energy.
b) Some charges inside the wire move to the surface as a result of B.

c) if the wire moves under the influence of B, no work is done by the force.
d)
If the wire moves under the influence of B, no work is done by the electric force on the ions, assumed fixed within the wire.

92. If the beams of electrons and protons move parallel to each other in the same direction, then they
a) attract each other b) repel each other. c) no relation. d) neither attract nor repel

93. A magnetic needle lying parallel to a magnetic field requires W units of work to turn it through 60°. The torque required to keep the needle in this position will be
a) 2 W b) W c) $\frac{W}{\sqrt{2}}$ d) $\frac{W}{\sqrt{3}}$ e) $\sqrt{3}W$

94. The magnetic force acting on a charged particle of charge $-2\mu C$ in a magnetic field of 2 T acting in y-direction, when the particle velocity is $\left(2\hat{i}+3\hat{j}\right)\times 10^6 ms^{-1}$ is
a) 8 N in z-direction b) 8 N in -z-direction c) 4 N in z-direction d) 8 N in y-direction

95. The area of a circular ring is 1 cm^2 and current of 10 A is passing through it. If a magnetic field of intensity 0.1 T is applied perpendicular to the plane of the ring. The torque due to magnetic field on the ring will be
a) zero b) 10^{-4} N-m c) 10^{-2} N-m d) 1 N-m

96. An electron is moving in a cyclotron at a speed of 3.2 x 10^7 ms" in a magnetic field of 5 x 10^{-4} T perpendicular to it. What is the frequency of this electron? (q = 1.6 x 10^{-19} C,m_e = 9.1 x 10^{-31} kg)
a) 1.4 x 10^5 Hz b) 1.4 x 10^7 Hz c) 1.4 x 10^6 Hz d) 1.4 x 10^9 Hz

97. A particle of mass m and charge q is accelerated through a potential difference V to a velocity $\vec{v}$ towards south. The particle enters a region with both a magnetic field $\vec{B}$ (pointing eastwards) and electric field $\vec{E}$ (pointing downwards). The particle travels with a constant velocity through this region. The potential difference V through this region should be equal to
a) E/B b) E/qB c) 2 mE/qB d) $mE^2/2qB^2$

98. The gyro-magnetic ratio of an electron in an H-atom, according to Bohr model, is
a) independent of which orbit it is in. b) neutral c) positive
d) increases with the quantum number n.

99. An electron is projected along the axis of a circular conductor carrying the same current. Electron will experience
a) no force experienced. b) a force along the axis. c) a force perpendicular to the axis
d) a force at an angle of 4° with axis

100. When a proton is released from rest in a room, it starts with an initial acceleration a_0 towards west. When it is projected towards north with a speed v_0 it moves with an initial acceleration 3 a_0 towards west. The electric and magnetic fields in the room are
a) $\frac{ma_0}{e}east, \frac{3ma_0}{ev_0}down$ b) $\frac{ma_0}{e}west, \frac{2ma_0}{ev_0}up$ c) $\frac{ma_0}{e}west, \frac{2ma_0}{ev_0}down$ d) $\frac{ma_0}{e}east, \frac{3ma_0}{ev_0}up$

101. A short bar magnet of magnetic moment $0.4JT^{-1}$ is placed in a uniform magnetic field of 0.16 T. The magnet is in stable equilibrium when the potential energy is
a) -0.064 J b) zero c) -0.082 J d) 0.064 J

102. There is a thin conducting wire carrying current. What is the value of magnetic field induction at any point on the conductor itself ?
a) 1 b) Zero c) - 1 d) Either (a) or (b

103. If the velocity of charged particle is doubled and value of magnetic field is reduced to half, then the radius of path of charged particle will be
a) 8 times b) 3 times c) 4 times d) 2 times

104. Ampere's circuital law can be derived from
a) Ohm's law b) Biot-Savart's law c) Kirchhoff's law d) Gauss's law

105. An electron of charge (e) is moving parallel to uniform magnetic field B with constant velocity v. The force acting on electron is
a) Bev b) Be / v c) B / ev d) Zero

106. For a cylindrical conductor of radius a, which of the following graphs shows a correct relationship of B versus r?

a)  b)  c)  d) 

107. A positive charge enters in a magnetic field and travels parallel to but opposite the field. If experiences
a) an upward force. b) a downward force. c) an accelerated force d) no force.

108. Vector form of Biot-Savart's law is
a) $d\mathbf{B} = \frac{\mu_0}{4\pi}\frac{1\times dl}{r^2}$ b) $d\mathbf{B} = \frac{Id\mathbf{l}\times\mathbf{r}}{r^3}$ c) $d\mathbf{B} = \frac{\mu_0}{4\pi}\frac{Id\mathbf{l}\times\mathbf{r}}{r^3}$ d) $d\mathbf{B} = \frac{\mu_0}{4\pi}\frac{Id\mathbf{l}\times\mathbf{r}}{r^2}$

109. A charged particle goes undeflected in a region containing electric and magnetic field. It is possible that
a) $\vec{E} \parallel \vec{B}$ but $\vec{v}$ is not parallel to $\vec{E}$ b) $\vec{v} \parallel \vec{B}$ but $\vec{E}$ is not parallel to $\vec{B}$ c) $\vec{E} \parallel \vec{B}$, $\vec{v} \parallel \vec{E}$
d) $\vec{E}$ is not parallel to $\vec{B}$ and $\vec{v}$

110. For a toroid, magnetic field strength in the region enclosed by wire turns is given by
a) B = μ_0 n I, where n = number of turns.
b) B = μ_0 I / n, where n = number of turns per metre c) $B = \frac{\mu_0 I}{2r}$,where r = mean radius
d) $B = \frac{\mu_0 NI}{2\pi r}, \begin{cases} \text{where, } N = \text{ number of turn} \\ \text{and } r = \text{ radius of toroid.} \end{cases}$

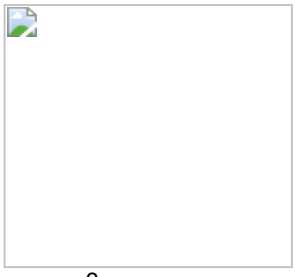
111. A horizontal wire 0.1 m long carries a current of 5 A. Find the magnitude and direction of the magnetic field, which can support the weight of the wire. Given the mass of the wire is $3 \times 10^{-3} kg/m \quad and \quad g = 10 ms^{-2}$.
a) $6 \times 10^{-3} T$, acting vertically upwards
b) $6 \times 10^{-3} T$, acting horizontally perpendicular to wire
c) $6 \times 10^{-2} T$, acting vertically downwards
d) $6 \times 10^{-2} T$, acting horizontally perpendicular to wire

112. A current loop placed in a non-uniform magnetic field experiences
a) a force of repulsion. b) a force of attraction. c) a torque but not force.
d) a force and a torque

113. An electron is travelling along the X-direction. It encounters the magnetic field in the Y-direction. Its subsequent motion will be
a) straight line along X-direction b) a circle in the X-Z plane c) a circle in the YZ plane
d) a circle in the XY plane

114. Two particles X and Y having equal charges after being accelerated through the same potential difference, enter a region of uniform magnetic field and describe circular paths of radii $R_1 \; and \; R_2$ respectively. The ratio of the mass of X to that Y is
a) $\frac{R_1}{R_2}$ b) $\frac{R_2}{R_1}$ c) $\left(\frac{R_1}{R_2}\right)^{1/2}$ d) $\left(\frac{R_1}{R_2}\right)^{2}$

115. Three long, straight parallel wires, carrying current are arranged as shown in the figure. The force experienced by a 25 cm length of wire C is



a) 10^{-3} N b) 2.5 x 10^{-3} N c) zero d) 1.5 x 10^{3} N

116. The strength of magnetic field at the centre of circular coil is

a) $\frac{\mu_0 I}{R}\left(1-\frac{1}{\pi}\right)$ b) $\frac{\mu_0 I}{\pi R}$ c) $\frac{\mu_0 I}{2R}\left(1-\frac{1}{\pi}\right)$ d) $\frac{\mu_0 I}{2R}\left(1+\frac{1}{\pi}\right)$

117. An electron moving in a circular orbit of radius r makes n rotations per second. The magnetic field produced at the centre has magnitude
a) zero b) $\frac{\mu_0 n^2 e}{r}$ c) $\frac{\mu_0 ne}{2r}$ d) $\frac{\mu_0 ne}{2\pi r}$

118. A proton and an α-particle moving with same velocity enter into a uniform magnetic field, acting normal to the plane of their motion. The ratio of radii of the circular paths described by the proton and α-particle is
a) 1 : 2 b) 1 : 4 c) 1 : 16 d) 4 : 1

119. A long solenoid has 20 turns cm^{-1}. The current necessary to produce a magnetic field of 20 mT inside the solenoid is approximately
a) l A b) 2 A c) 4 A d) 8 A

120. A current carrying closed loop of an irregular shape lying in more than one plane when placed in uniform magnetic field, the force acting on it
a) will be more in the plane where its larger position is covered. b) is zero. c) is infinite.
d) mayor may not be zero.

121. A coil of wire has an area of 600 sq. cm and has 500 turns. If it carries 1.5 A current, its magnetic dipole moment is
a) 5 Am^2 b) 15 Am^2 c) 30 Am^2 d) 45 Am^2

122. Two similar coils of radius R, are lying concentrically with their planes at right angles to each other. The currents flowing in them are I and 2 I respectively. The resultant magnetic field at the centre will be :

a) $\frac{\sqrt{5}\mu_0 I}{2R}$ b) $\frac{3\mu_0 I}{2R}$ c) $\frac{\mu_0 I}{2R}$ d) $\frac{\mu_0 I}{R}$

123. A galvanometer has a sensitivity of 60 division/ampere. When a shunt is used its sensitivity becomes 10 division/ampere. What is the value of shunt used if the resistance of the galvanometer is 20Ω ?
a) 2Ω b) 3Ω c) 4Ω d) 6Ω

124. A current carrying circular loop of radius R is placed in the x-y plane with centre at the origin. Half of the loop with x>0 is now bent so that it now lies in the y-z plane.
a) The magnitude of magnetic moment now diminishes
b) The magnetic moment does not change
c) The magnitude of $\vec{B}$ at (0,0,z), z>>R increases.
d) The magnitude $\vec{B}$ at (0,0,z), z>>R is unchanged.

125. The value of force F acting on charge q moving with velocity perpendicular to the magnetic field B will be
a) F = qvB b) $F = \frac{qv}{B}$ c) $F = \frac{qB}{v}$ d) $F = \frac{Bv}{q}$

126. A long straight wire of radius a carries a steady current i. The current is uniformly distributed across its cross-section. The ratio of the magnetic field at a/2 and 2 a is
a) 1/2 b) 1/4 c) 4 d) 1

127. A positive charge is moving towards an observer. The direction of magnetic induction lines is
a) clockwise b) anticlockwise c) right d) left

128. An element $\triangle$I = $\triangle$x $\hat{i}$ is placed at the origin and carries a current I = 10A.

If $\triangle$x = 1cm, magnetic field at point P is
a) $4 \times 10^8 \hat{\mathbf{k}}\mathrm{T}$ b) $4 \times 10^{-8}\,\hat{\mathbf{i}}\mathrm{T}$ c) $4 \times 10^{-8}\hat{\mathbf{j}}\mathrm{T}$ d) $-4 \times 10^{-8}\hat{\mathbf{j}}\mathrm{T}$

129. A long solenoid has n turns per metre and current I A is flowing through it. The magnetic field induction at the ends of the solenoid is
a) zero b) $\mu_o nI/2$ c) $\mu_o nI$ d) $2\mu_o NI$

130. The magnetic field of earth can be modeled by that of a point dipole placed at the center of the earth. The dipole axis makes an angle of 11.3° with the axis of the earth. At Mumbai, declination is nearly zero. Then,
a) the declination varies between 11.3°W to 11.3° b) the least declination is 0°
c) the plane defined by dipole axis and earth axis passes through Greenwich.
d) declination averaged over the earth must be always negative.

131. An electron of mass M_e, initially at rest, moves through a certain distance in a uniform electric field in time t_1. A proton of mass M_p also initially at rest, takes time t_2 to move through an equal distance in this uniform electric field. Neglecting the effect of gravity, the ratio t_2/t_1 is nearly equal to
a) 1 b) $\sqrt{\frac{M_p}{M_e}}$ c) $\sqrt{\frac{M_e}{M_p}}$ d) 1836

132. The current sensitivity of a moving coil galvanometer increases by 35%, when its resistance is increased by a factor 3. The voltage sensitivity of galvanometer changes by a factor
a) 35% b) 45% c) 55% d) none of the above

133. A rectangular loop carrying a current i is situated near a long straight wire such that the wire is parallel to the one of the sides of the loop and is in the plane of the loop. If a steady current I is established in wire as shown in figure, the loop will

a) rotate about an axis parallel to the wire. b) move away from the wire or towards right
c) move towards the wire d) remain stationary.

134. The coil of a galvanometer consists of 100 turns and effective area of 1 cm^2. The restoring couple is 10^{-8} Nm rad^{-1}. The magnetic, field between poles is of 5 T. Current sensitivity of this galvanometer is
a) 5x 10^4 rad /μ amp b) 5 x10^6 per amp c) 2 x 10^{-7} per amp d) 5 rad/ μ amp

135. A conducting circular loop of radius r carries a constant current i. It is placed in a uniform magnetic field B, such that B is perpendicular to the plane of the loop. The magnetic force acting on the loop is
a) irB b) 2πriB c) zero d) πrib

136. Two parallel wires are placed 1m apart and 1A and 3 A currents are flowing in the wires in opposite direction. The force acting per unit length of both the wires will be
a) 6 x10^{-7} N / m attractive b) 6 x10^{-5} N /m attractive c) 6 x10^{-7} N / m repulsive
d) 6 x10^{-5} N / m repulsive

137. A magnetic needle suspended parallel to a magnetic field requires $\sqrt{3}J$ of work to turn it through 60°. The torque needed to maintain the needle in this position will be :
a) $2\sqrt{3}J$ b) $3J$ c) $\sqrt{3}J$ d) $\frac{3}{2}J$

138. Two identical current carrying coaxial loops, carry current I in an opposite sense. A simple amperian loop passes through both of them once. Calling the loop as C,
a) $\oint_C \boldsymbol{B}\cdot\boldsymbol{dl} = \pm\boldsymbol{2}\mu_0\boldsymbol{I}$ b) the value of $\oint_C \boldsymbol{B}.dl$ is independent of sense of C.
c) there may be a point on C where, B and dl are parallel. d) B vanishes everywhere on C.

139. A galvanometer having a coil resistance of 100Ω gives a full scale deflection, when a current of 1 mA is passed through it. The value of the resistance, which can convert this galvanometer into ammeter giving a full scale deflection for a current of 10 A is
a) 0.01Ω b) 2Ω c) 0.1Ω d) 3Ω

140. A helium nucleus moves in a circle of 0.8 m radius in one second. The magnetic field produced at the centre of circle will be
a) $\mu_0 \times 10^{-19}$ b) $\mu_0 \times 10^{+19}$ c) $2\mu_0 \times 10^{-19}$ d) $\frac{2\times10^{-19}}{\mu_0}$

141. Current carrying wire produces
a) Only electric field b) Only magnetic field c) Both electric and magnetic field
d) None of the above

142. Two charged particles traverse identical helical paths in a completely opposite sense in a uniform magnetic field $\vec{B} = B_0\hat{k}$.
a) They have equal z-components of momenta b) They must have equal charges
c) They necessarily represent a particle anti-particle pair.
d) The charge to mass ratio satisfy $\left(\frac{e}{m}\right)_1 + \left(\frac{e}{m}\right)_2 = 0$

143. A paramagnetic sample shows a net magnetization of when placed $8Am^{-1}$ in an external magnetic field 0.6 T at a temperature of 4K. When the same sample is placed in an external magnetic field of 0.2 T at a temperature of 16 K, the magnetization will be
a) $\frac{32}{3}Am^{-1}$ b) $\frac{2}{3}Am^{-1}$ c) $6 \quad Am^{-1}$ d) $2.4 \quad Am^{-1}$

144. A proton and an alpha particle both enter a region of uniform magnetic field B, moving at right angles to the field B. If the radius of circular orbits for both the particles is equal and the kinetic energy acquired by proton is 1 MeV, the energy acquired by the alpha particles will be :
a) 1 MeV b) 4 MeV c) 0.5 MeV d) 1.5 MeV

145. Which of the following represent a correct figure to display of magnetic field lines due to a solenoid?
a)  b)  c)  d) 

146. A magnetic field can be produced
a) only by moving charge b) only by changing electric field c) Both (a) and (b)
d) None of the above

147. Biot-Savart law indicates that the moving electrons produce a magnetic field $\vec{B}$such that
a) $\vec{B} \perp \vec{v}$ b) $\vec{B} \parallel \vec{v}$ c) it obeys inverse cube law
d) it is along the line joining the electron and point of observation.

148. The magnetic field at a perpendicular distance of 2 cm from an infinite straight current carrying conductor is $2x10^{-6}$ T. The current in the wire is
a) 0.1 A b) 0.2 A c) 0.4 A d) 0.8 A

149. The current i is flowing in a coil of area A with the number of turns N, then the magnetic moment of the coil M will be
a) NiA b) Ni / A c) $Ni/\sqrt{A}$ d) N^2 Ai

150. A circular current loop of magnetic moment M is in arbitrary orientation in an external magnetic field.$\vec{B}$ The work does to rotate the loop by 30° about an axis perpendicular to its plane is
a) MB b) $\sqrt{3}\frac{MB}{2}$ c) $\frac{MB}{2}$ d) zero

151. In an ammeter 0.5% of main current passes through galvanometer. If resistance of galvanometer is G, the resistance of ammeter will be
a) G/200 b) G/199 c) 199 G d) 200G.

152. A straight wire of mass 200 g and length 1.5 m carries a current of 2 A. It is suspended in mid air by uniform horizontal magnetic field B. The magnitude of B (in Tesla) is : (Take $g = 9.8m/s^2$)
a) 2 b) 1.5 c) 0.55 d) 0.65

153. A charged particle with charge q enters a region of constant, uniform and mutually orthogonal fields $\vec{E} \quad and \quad \vec{B}$ with a velocity $\vec{v}$ perpendicular to both $\vec{E} \quad and \quad \vec{B}$, and comes out without any change in magnitude or direction of $\vec{v}$. Then
a) $\vec{v} = \vec{B} \times \vec{E}/E^2$ b) $\vec{v} = \vec{E} \times \vec{B}/B^2$ c) $\vec{v} = \vec{B} \times \vec{E}/B^2$ d) $\vec{v} = \vec{E} \times \vec{B}/E^2$

154. In a uniform magnetic field, an electron (or charge particle) enters perpendicular to the field. The path of electron will be
a) ellipse b) circular c) parabolic d) linear

155. A toroid of n turns, mean radius R and cross-sectional radius carries a current I. It is placed on a horizontal table taken as x-y plane. Its magnetic moment $\vec{M}$
a) is non-zero and points in the z-direction by symmetry
b) points along the axis of the toroid $(\vec{M} = M\hat{\phi})$
c) is zero, otherwise, there would be a field falling as $\frac{1}{r^3}$ at large distances outside the toroid
d) is pointing radially outwards.

156. Two circular coils 1 and 2 are made from the same wire but the radius of the Ist coil twice that of the 2nd coil. What potential difference ratio should be applied across them so that the magnetic field at their centres is the same?
a) 2 b) 3 c) 4 d) 6

157. A polygon shaped wire is inscribed in a circle of radius R. The magnetic induction at the centre of polygon, when current flows through the wire is
a) $\frac{\mu_0 nI}{2\pi R}\tan\left(\frac{2\pi}{n}\right)$ b) $\frac{\mu_0 nI}{2\pi R}\tan\left(\frac{4\pi}{n}\right)$ c) $\frac{\mu_0 nI}{2\pi R}\tan\left(\frac{\pi}{n}\right)$ d) $\frac{\mu_0 nI}{2\pi R}\tan\left(\frac{\pi}{n^2}\right)$

158. A circular coil carrying current behaves as a
a) bar magnet b) horse shoe magnet c) magnetic shell d) solenoid

159. In a circular coil of radius r, the magnetic field at the centre is proportional to
a) r^2 b) r c) $\frac{1}{r}$ d) $\frac{1}{r2}$

160. A thin ring of radius R metre has charge q coulomb uniformly spread on it. The ring rotates about its axis with a constant frequency of f revolutions/s. The value of magnetic field induction in Wb/m^2 at the centre of the ring is
a) $\frac{\mu_o qf}{2\pi R}$ b) $\frac{\mu_o q}{2\pi f R}$ c) $\frac{\mu_o q}{2fR}$ d) $\frac{\mu_o qf}{2R}$

161. Consider the two idealized systems: (i) a parallel plate capacitor with large and small separation and (ii) a long solenoid of length L>>R, radius of the cross-section. In (i) $\vec{E}$ is ideally treated as a constant between plates and zero outside. In (ii) magnetic field is constant inside the solenoid and zero outside. These idealized assumptions, however, contradict fundamental law as below:
a) case (i) contradicts Gauss's law for electrostatic fields.
b) case (ii) contradicts Gauss's law for magnetic fields.
c) case (i) agrees with $\oint \vec{E}.\vec{dl} = 0$ d) case (ii) contradicts $\oint \vec{H}.\vec{dl} = l_{en}$

162. An electron is projected with uniform velocity along the axis of a current carrying long solenoid. Which of the following is true?
a) The electron will be accelerated along the axis
b) The electron path will be circular about the axis.

c) The electron will experience a force at 45° to the axis and hence execute a helical path.
d) The electron will continue to move with uniform velocity along the axis of the solenoid.

163. An electric charge + q moves with velocity $\vec{v} = 3\hat{i} + 4\hat{j} + \hat{k}$, in an electromagnetic field give $\vec{E} = 3\hat{i} + \hat{j} + 2\hat{k}, \quad \vec{B} = \hat{i} + \hat{j} - 3\hat{k}$. They y-component of the force experienced by + q is
a) 2 q b) 11 q c) 5 q d) 3 q

164. An electron is travelling horizontally towards East. Amagnetic field in vertically downward direction exerts a force on the electron along
a) East b) West c) North d) South

165. In a permanent magnet at room temperature
a) the magnetic moment of each molecule is zero
b) the individual molecules have a non-zero magnetic moment which is all perfectly aligned
c) domains are partially aligned d) domains are all perfectly aligned.

166. If a charged particle moves through a magnetic field perpendicular to it
a) both momentum and energy of particle change.
b) momentum as well as energy are constant.
c) energy is constant but momentum changes.
d) momentum is constant but energy changes

167. A conducting wire of length l is turned in the form of a circular coil and a current I is passed through it. For the torque, due to magnetic field produced at its centre, to be maximum, the number of turns in the coil will be
a) one b) two c) three d) more than three.

168. A magnet with moment M is given. If it is bent into a semicircular form, its new magnetic moment will be :
a) M/π b) $M/2$ c) M d) $2M/\pi$

169. A circular coil of radius 4 cm and of 20 turns carries a current of 3 amperes. It is placed in a magnetic field of intensity 0.5 weber/m^2. The magnetic dipole moment of the coil is
a) 0.15 ampere-m^2 b) 0.3 ampere-m^2 c) 0.45 ampere-m^2 d) 0.6 ampere-m^2

170. A circular coil of n turns and radius r carries a current I. The magnetic field at the centre is
a) $\frac{\mu_o nI}{r}$ b) $\frac{\mu_o nI}{2r}$ c) $\frac{2\mu_o nI}{r}$ d) $\frac{\mu_o nI}{4r}$

171. Two particles each of mass m and charge q are attached to the two ends of a light rigid rod of length 2 R. The rod is rotated at constant angular speed about a perpendicular axis passing through its centre. The ratio of the magnitudes of the magnetic moment of the system and its angular momentum about the centre of the rod is
a) q/2 m b) q/m c) 2 q/m d) $q/\pi\, m$.

172. A circular loop of area A, carrying current I, is placed in a magnetic field B perpendicular to the plane of the loop. The torque on the loop due to magnetic field is
a) BIA b) 2 BIA c) $\frac{1}{2}BIA$ d) Zero

173. For the voltmeter circuit given,

a) $\frac{I_g}{I} = \frac{G}{S}$ b) $\frac{I}{I_g} = \frac{R_L+G}{S}$ c) (I - I_g)R_L = I_g (G+S) d) IR_L = I_gG

174. If a copper wire carries a direct current, the magnetic field associated with the current will be
a) only outside the wire b) only inside the wire c) both inside and outside the wire
d) neither inside nor outside the wire

175. A cubical region of space is filled with some uniform electric and magnetic fields. An electron enters the cube across one of its faces with velocity v and a positron enters via opposite face with velocity -v. At this instant
a) the electric forces on both the particles cause identical accelerations.
b) the magnetic forces on both the particles cause equal accelerations.
c) Only electron gains or looses energy
d) the motion of the centre of mass (CM) is determined by E alone

176. The work done in turning a magnet of magnetic moment M by an angle of 90° from the magnetic meridian is n times the corresponding work done to turn it through an angle of 60°, where n is
a) 1/2 b) 2 c) 1/4 d) 1.

177. What is the net force on the rectangular coil?

a) 25 x 10^{-7} N towards wire. b) 25 x 10^{-7} N away from wire c) 35 x 10^{-7} N towards wire
d) 35 x 10^{-7} N away from wire.

178. A galvanometer of resistance 25Ω is connected to a battery of 2 volt along with a resistance in series. When the value of this resistance is 3000Ω, a full scale deflection of 30 units is obtained in the galvanometer. In order to reduce this deflection 10 20 units, the resistance in series will be
a) 4514Ω b) 5413Ω c) 2000Ω d) 6000Ω.

179. In a cyclotron a charged particle
a) undergoes acceleration all the time
b) speeds up between the dees because of the magnetic field. c) speeds up in a dee
d) slows down within a dee and speeds up between dees.