PHYSICS

NEET

CRASH COURSE

MAGNETIC EFFECT OF CURRENT & MAGNETISM

SMART ACHIEVERS

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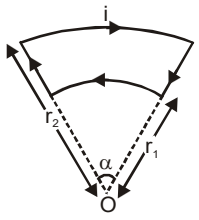
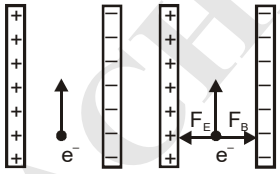
MAGNETIC EFFECT OF CURRENT & MAGNETISM

Q.1 The magnetic induction at centre O in the following figure will be -



(1) $\frac{\mu_0 i\alpha}{4\pi}\left(\frac{1}{r_1}-\frac{1}{r_2}\right)\odot$ (2) $\frac{\mu_0 i\alpha}{4\pi}\left(\frac{1}{r_1}+\frac{1}{r_2}\right)\odot$ (3) $\frac{\mu_0 i\alpha}{2\pi}\left[\frac{1}{r_1}-\frac{1}{r_2}\right]\otimes$ (4) $\frac{\mu_0 i\alpha}{2\pi}\left[\frac{1}{r_1}+\frac{1}{r_2}\right]\otimes$

Q.2 The distance between the plates of a parallel plate condenser is 4 mm and potential difference between them is 200V. The condenser is placed in a magnetic field B. An electron is projected vertically upwards parallel to the plates with a velocity of 10^6 m/s. The electron passes undeviated through the space between the plates. The magnitude and direction of magnetic field B will be –

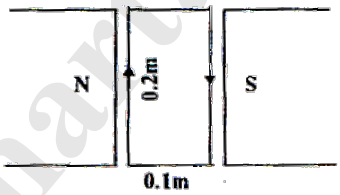


(1) 0.05T ⊗ (2) 0.02T ⊗ (3) 0.05 T (4) 0.02T

Q.3 Two parallel wires P and Q carry electric currents of 10 A and 2A respectively in mutually opposite directions. The distance between the wires is 10 cm. If the wire P is of infinite length and wire Q is 2m long, then the force acting Q will be -

(1) 4×10^{-5} N (2) 8×10^{-5} N (3) 4×10^{5} N (4) 0 N

Q.4 A coil of 100 turns is lying in a magnetic field of 1T as shown in the figure. A current of 1A is flowing in this coil. The torque acting on the coil will be



(1) 1N–m (2) 2N–m (3) 3N–m (4) 4N–m

Q.5 Which of the following relations is not correct ?

(1) $B = \mu_0 (H + I)$ (2) $B = \mu_0 H (1 + \chi_m)$ (3) $\mu_0 = \mu (1 + \chi_m)$ (4) $\mu_r = 1 + \chi_m$

Q.6 The material for making permanent magnets should have :

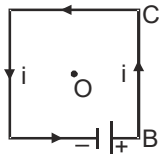
(1) high retentivity, high coercivity (2) high retentivity, low coercivity
(3) low retentivity, high coercivity (4) low retentivity, low coercivity

Q.7 Soft iron is used in many electrical machines for :

(1) low hysteresis loss and low permeability (2) low hysteresis loss and high permeability

(3) high hysteresis loss and low permeability (4) high hysteresis loss and high permeability

Q.8 Following is square shape loop, whose one arm BC produces magnetic field B at the centre of coil. The resultant magnetic field due to all the arms will be :-

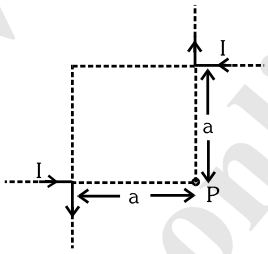


(1) 4B (2) B/2 (3) B (4) 2B

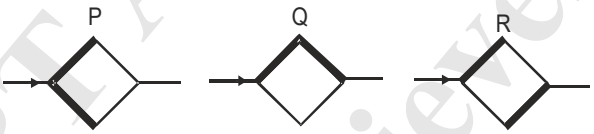
Q.9 Magnetic field at point 'P' due to given current distribution :-

(1) $\frac{\mu_0 I}{4\pi a}\odot$ (2) $\frac{\mu_0 I}{2\pi a}\odot$

(3) $\frac{\mu_0 I}{\pi a}\otimes$ (4) Zero



Q.10 Two thick wires and two thin wires, all of the same materials and same length form a square in the three different ways P, Q and R as shown in figure with current connection shown. The magnetic field at the centre of the square is zero in cases :-



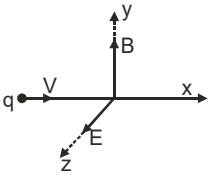
(1) in P only (2) in P and Q only (3) in Q and R only (4) P and R only

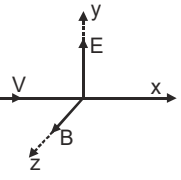
Q.11 The charges 1, 2, 3 are moves in uniform transverse magnetic field then :-

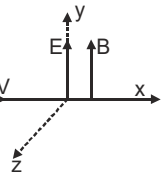
(1) particle '1' positive and particle 3 negative (2) particle 1 negative and particle 3 positive

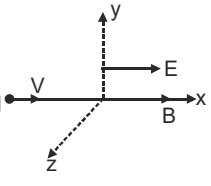
(3) particle 1 negative and particle 2 neutral (4) particle 1 and 3 are positive and particle 2 neutral

Q.12 A particle of charge q and mass m is moving along the x-axis with a velocity v and enters a region of electric field E and magnetic field B as shown in figure beolw. For which figure the net force on the charge may be zero :-

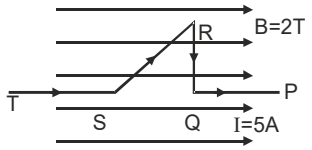
(1) 

(2) 

(3) 

(4) 

Q.13 A wire PQRST carrying current I = 5A is placed in uniform magnetic field B = 2T as shown in figure If the length of part QR = 4 cm and SR = 6 cm then the magnetic force on SR edge of the wire is:-



(1) 0.4 N (2) 0.6 N (3) zero (4) 6 N

Q.14 If the angle of dip at two places are 30° and 45° respectively, then the ratio of horizontal component of earth's magnetic field at two places will be :-

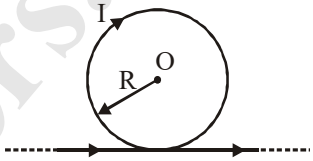
(1) $\sqrt{3}:\sqrt{2}$ (2) $1:\sqrt{2}$ (3) $1:\sqrt{3}$ (4) 1 : 2

Q.15 Following is the Biot-savart's law in vector form :

(1) $d\vec{B}=\frac{\mu_0}{4\pi}\frac{id\vec{l}\sin\theta}{r}\hat{n}$ (2) $d\vec{B}=\frac{\mu_0}{4\pi}\frac{id\vec{l}\sin\theta}{r^3}\hat{n}$

(3) $d\vec{B}=\frac{\mu_0}{4\pi}\frac{id\vec{l}\sin\theta}{r^2}\hat{n}$ (4) None

Q.16 Magnetic field at point O will be :



(1) $\frac{\mu_0 I}{2R}\otimes$ (2) $\frac{\mu_0 I}{2R}\odot$

(3) $\frac{\mu_0 I}{2R}\left(1-\frac{1}{\pi}\right)\otimes$ (4) $\frac{\mu_0 I}{2R}\left(1+\frac{1}{\pi}\right)\odot$

Q.17 The SI unit of magnetic induction is :
(1) tesla (2) henry (3) gauss (4) orested

Q.18 A current I flows through a circular coil of radius r the intensity of field at its centre is
(1) Proportional to 'r' (2) Inversely proportional I
(3) Proportional to I (4) Proportional to I^2

Q.19 One ampere current is passed through a 2m long straight wire. The magnetic fields in air at a point distant 3m from one end of wire on its axis will be :

(1) $\frac{\mu_0}{2\pi}$ (2) $\frac{\mu_0}{4\pi}$ (3) $\frac{\mu_0}{8\pi}$ (4) zero

Q.20 An electron is moving in a circle of radius 5.1×10^{-11} m. at a frequency of 6.8×10^{15} revolution/sec. The equivalent current is approximately :
(1) 5.1×10^{-3} A (2) 6.8×10^{-3} A (3) 1.1×10^{-3} A (4) 2.2×10^{-3} A

Q.21 An electron revolves with frequency 6.6×10^{15} r.p.s. around nucleus in circular orbit of radius 0.53Å of hydrogen atom, then magnetic field produced at centre of orbit is :
(1) 0.125 T (2) 1.25 T (3) 12.5 T (4) 125 T

Q.22 Two concentric circular loops of radii 0.08 m and 0.1 m carries current such that magnetic field at the centre is zero. If the current in the outer loop is 8A clockwise, current in the inner loop is :
(1) 6.4 A anticlockwise (2) 6.4 A clockwise (3) 8A anticlockwise (4) 3.2 A clockwise

Q.23 The pattern of magnetic lines of force produced by passing a direct current in a straight wire is :
(1) Perpendicular to the conductor and coming outward
(2) Perpendicular to the conductor and going inward
(3) Parallel to conductor
(4) surrounding the conductor and of circular nature

Q.24 The field produced by a moving charged particle is :
(1) Electric (2) Magnetic (3) Both of the above (4) None of above

Q.25 If a charge particle enters in to a uniform magnetic field neither perpendicular, nor parallel than its path will be :
(1) Straight line (2) Elliptical (3) Helical (4) parabola

Q.26 The force acts for a conducting loop when magnetic field is :
(1) Perpendicular to the plane (2) Parallel to plane of loop
(3) Antiparallel to plane of loop (4) None of the above

Q.27 An electron revolving with speed V in any orbit of radius 'r' then value of current is :
(1) $\frac{eV}{2\pi r}$ (2) $\frac{2\pi r}{eV}$ (3) $eV \times 2\pi r$ (4) $\frac{4\pi r}{eV}$

Q.28 The magnetic moment of a straight wire of length L is M. If the wire is bent in form of a semicircle then its magnetic moment becomes :
(1) $\frac{2M}{\pi}$ (2) $\frac{M}{\pi}$ (3) M (4) $M\pi$

Q.29 The unit of magnetic permeability is
(1) $\frac{\text{weber}}{\text{amper - metre}}$ (2) $\frac{\text{weber}}{\text{metre}}$ (3) $\frac{\text{tesla}}{\text{ampere}}$ (4) $\frac{\text{tesla}}{\text{metre}}$

Q.30 An electron is moving with velocity $\vec{v}$ in the direction of magnetic field $\vec{B}$, then force acting on electron is :
(1) zero (2) $e(\vec{v} \times \vec{B})$ (3) $e(\vec{B} \times \vec{v})$ (4) None

Q.31 An α-particle experiences a force of 3.84×10^{-14} N when its moves perpendicular to magnetic field of 0.2 Wb/m^2 then speed of the α-particle is :
(1) 6.0×10^5 m/sec (2) 5.0×10^5 m/sec (3) 1.2×10^6 m/sec (4) 3.8×10^6 m/sec

Q.32 Current I is flowing in a conducting circular loop of radius R. It is kept in a magnetic field B which is perpendicular to the plane of circular loop, the magnetic force acting on the loop is :
(1) IRB (2) 2πIRB (3) Zero (4) πIRB

Q.33 The direction of Lorentz force can be found by :
(1) fleming's right hand rule (2) fleming's left hand rule
(3) maxwell's screw rule (4) none of these

Q.34 A coil of 100 turn and area 5 cm^2 is placed in a magnetic field 0.2T. The normal to the plane of the coil makes an angle of 60º with the direction of magnetic field. The magnetic flux linked with the coil is :
(1) 5×10^{-3} wb (2) 5×10^{-5} wb (3) 10^{-2} wb (4) 10^{-4} wb

Q.35 A current is flowing in a circular coil of radius R and the magnetic field at its centre is B_0. It what distance from the centre on the axis of the coil, the magnetic field will be $B_0/8$:
(1) $\sqrt{7}R$ (2) $\sqrt{3}R$ (3) 2R (4) 8R

Q.36 Wire in the form of a right angle ABC, with AB = 3cm and BC = 4 cm, carries a current of 10A. There is a uniform magnetic field of 5T perpendicular to the plane of the wire. The force on the wire will be :
(1) 1.5 N (2) 2.0 N (3) 2.5 N (4) 3.5 N

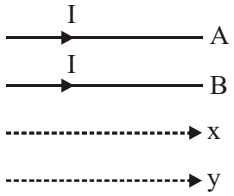
Q.37 A rectangular coil 20 cm × 20 cm, has 100 turns and carries a current of 1A. It is placed in a uniform magnetic field 0.5T with the direction of magnetic field parallel to the plane of the coil. The magnitude of the torque required to hold this coil in this position is :
(1) zero (2) 200 N-m (3) 2 N-m (4) 10 N-m

Q.38 1 A current flows through an infinitely long straight wire. The magnetic field produced at a point 1m. away from it is :
(1) 2×10^{-3} T (2) $\frac{2}{10}$T (3) 2×10^{-7} T (4) $2\pi \times 10^{-6}$ T

Q.39 A current carrying coil behave like tiny magnet, if area of coil is A and magnetic moment is 'M' then current through the coil is :
(1) $\frac{M}{A}$ (2) $\frac{A}{M}$ (3) MA (4) $\frac{A^2}{M}$

Q.40 Current I_0 flow through solenoid of length L having N number of turns, when it is connected to DC emf. If charged particle is projected along the axis of solenoid with a speed v_0, the force on the charged particle in the solenoid :
(1) Zero (2) Remains same (3) Decreases (4) Increases

Q.41 A and B are two wire carrying a current I in the same direction. x and y are two electron beams moving in the same direction. There will be :
(1) Attraction between A and B, repulsion between x and y
(2) Repulsion between A and B, attraction between x and y
(3) Attraction between A and B & x and y
(4) Repulsion between A and B & x and y

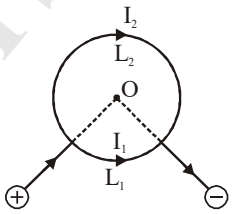


Q.42 A proton of mass 1.67×10^{-27} kg and charge 1.6×10^{-19} C is projected with a speed of 2×10^6 ms^{-1} at an angle of 60° to the X-axis . If a uniform magnetic field of 0.104 telsa is applied along Y-axis, the path of proton is :
(1) A circle of radius = 0.2 m and time period = $2\pi \times 10^{-7}$ s
(2) A circle of radius = 0.1 m and time period = $2\pi \times 10^{-7}$ s
(3) A helix of radius = 0.1 m and time period = $2\pi \times 10^{-7}$ s
(4) A helix of radius = 0.2 m and time period = $2\pi \times 10^{-7}$ s

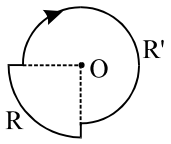
Q.43 The time period of a charged particle undergoing a circular motion in a uniform magnetic field is independent of its-
(1) speed (2) mass (3) charge (4) magnetic induction

Q.44 A particle of mass M and charge Q moving with velocity $\vec{v}$ describes a circular path of radius R when subjected to a uniform transverse magnetic field of induction B. The work done by the field when the particle completes one full circle is-
(1) $\left(\frac{Mv^2}{R}\right)2\pi R$ (2) zero (3) BQ 2πR (4) BQ v 2πR

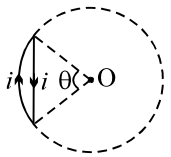
Q.45 Any two point of a circular conducting wire are connected with coil in such a way that length of one part is L_1 and that of other part is L_2. Then resultant magnetic induction at the centre will :
(1) zero (2) $\frac{\mu_0 \pi I}{2r}$
(3) $\frac{\mu_0 I}{2r}$ (4) $\frac{\mu_0 I}{2\pi}$



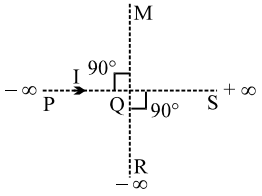
Q.46 A current of 'i' ampere is flowing through each of the bent wires as shown the magnitude and direction of magnetic field at O is
(1) $\frac{\mu_0 i}{4}\left(\frac{1}{R}+\frac{2}{R'}\right)$ (2) $\frac{\mu_0 i}{4}\left(\frac{1}{R}+\frac{3}{R'}\right)$
(3) $\frac{\mu_0 i}{8}\left(\frac{1}{R}+\frac{3}{2R'}\right)$ (4) $\frac{\mu_0 i}{8}\left(\frac{1}{R}+\frac{3}{R'}\right)$



Q.47 Net magnetic field at the centre of the circle O due to a current carrying loop as shown in figure is ($\theta < 180°$)
(1) zero
(2) perpendicular to paper inwards
(3) perpendicular to paper outwards
(4) is perpendicular to paper inwards if $\theta \le 90°$ and perpendicular to paper outwards if $90° \le \theta < 180°$



Q.48 An infinitely long conductor PQR is bent to form a right angle as shown. A current I flows through PQR. The magnetic field due to this current at the point M is H_1. Now, another infinitely long straight conductor QS is connected at Q so that the current in PQ remaining unchanged. The magnetic field at M is now H_2. The ratio H_1/H_2 is given by
(1) 1/2 (2) 1 (3) 2/3 (4) 2



Q.49 An electron having kinetic energy T is moving in a circular orbit of radius R perpendicular to a uniform magnetic induction $\vec{B}$. If kinetic energy is doubled and magnetic induction tripled, the radius will become

(1) $\frac{3R}{2}$ (2) $\sqrt{\frac{3}{2}}\,R$ (3) $\sqrt{\frac{2}{9}}\,R$ (4) $\sqrt{\frac{4}{3}}\,R$

Q.50 A electron experiences a force $\left(4.0\hat{i}+3.0\hat{j}\right)\times10^{-13}$ N in a uniform magnetic field when its velocity is $2.5\hat{k}\times10^{7}$ ms^{-1}. When the velocity is redirected and becomes $\left(1.5\hat{i}-2.0\hat{j}\right)\times10^{7}$ ms^{-1}, the magnetic force of the electron is zero. The magnetic field vector $\vec{B}$ is :

(1) $-0.075\hat{i}+0.1\hat{j}$ (2) $0.1\hat{i}+0.075\hat{j}$ (3) $0.075\hat{i}-0.1\hat{j}+\hat{k}$ (4) $0.075\hat{i}-0.1\hat{j}$

Q.51 A charged particle of mass m and charge q travels on a circular path of radius r that is perpendicular to a magnetic field B. The time taken by the particle to complete one revolution is-

(1) $\frac{2\pi mq}{B}$ (2) $\frac{2\pi q^2B}{m}$ (3) $\frac{2\pi qB}{m}$ (4) $\frac{2\pi m}{qB}$

Q.52 A particle of charge $-16\times10.^{18}$ C moving with velocity 10 ms^{-1} along the x-axis enters a region where a magnetic field of induction B is along the y-axis and an electric field of magnitude 10^4 V/m is along the negative z-axis If the charged particle continues moving along the x-axis, the magnitude of B is-

(1) 10^3 Wb/m^2 (2) 10^5 Wb/m^2 (3) 10^{16} Wb/m^2 (4) 10^{-3} Wb/m^2

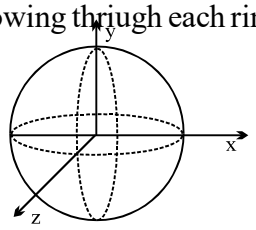
Q.53 A magnetic needle is kept in a non-uniform magnetic field. It experiences-

(1) a torque but not a force (2) neither a force nor a torque
(3) a force and a torque (4) a force but not a torque

Q.54 In a region, steady and uniform electric and magnetic fields are present. These two fields are parallel to each other. A charged particle is released from rest in this region. The path of the particle will be a-

(1) helix (2) straight line (3) ellipse (4) circle

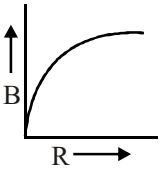
Q.55 Three rings, each having equal radius R, are placed mutually perpendicular to each other and each having its centre at the origin of co-ordinate system. If current I is flowing thriugh each ring then the magnitude of the magnetic field at the common centre is

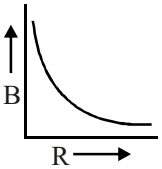


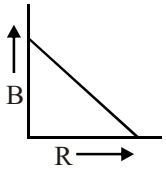
(1) $\sqrt{3}\frac{\mu_0 I}{2R}$ (2) zero

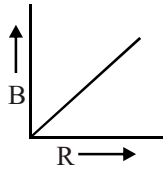
(3) $\left(\sqrt{2}-1\right)\frac{\mu_0 I}{2R}$ (4) $\left(\sqrt{3}-\sqrt{2}\right)\frac{\mu_0 I}{2R}$

Q.56 A charge Q is uniformly distributed over the surface of non-conducting disc of radius R. The disc rotates about an axis perpendicular to its plane and passing through its centre with an angular velocity ω. As a result of this rotation a magnetic field of induction B is obtained at the centre of the disc. If we keep both the amount of charge placed on the disc and its angular velocity to be constant and vary the radius of the disc then the variation of the magnetic induction at the centre of the disc will be represented by the figure

(1) 

(2) 

(3) 

(4) 

Direction for following questions :

A. Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

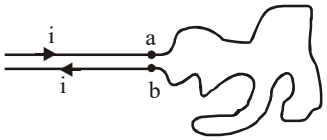
C. Assertion is true but Reason is false.

D. Assertion and Reason both are false.

Q.57 **Assertion :** A magnetic monopole does not exist.
Reason : Electron spin is always found in pair.
(1) A (2) B (3) C (4) D

Q.58 **Assertion :** If Earth's rotation instantaneously stops, its magnetic field at that instant will not vanish.
Reason : Electric charges in motion produce a magnetic field.
(1) A (2) B (3) C (4) D

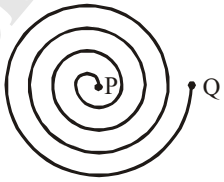
Q.59 **Assertion :** Force on a moving charge in a magnetic field depends on velocity of the moving charge.
Reason : Magnetic force depends on the frame of reference.
(1) A (2) B (3) C (4) D

Q.60 

Assertion : A messy loop of limp wire is placed on a frictionless table and anchored at points a and b as shown in figure. If a current i is now passed through the wire, it will try to form a circular loop
Reason : Two wires carrying current in same direction attract each other.
(1) A (2) B (3) C (4) D

Q.61 **Assertion :** Force due to magnetic field is relativistic.
Reason : When we move along with the charge so that there is no motion relative to us, we find no magnetic force on the charge.
(1) A (2) B (3) C (4) D

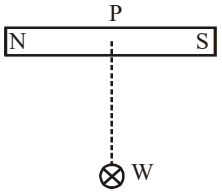
Q.62 A charged particle enters into a region which offers a resistance against its motion and a uniform magnetic field exists in the region. The particle traces a spiral path as shown.



Assertion : If the particle is positively charged, the magnetic field must be outward to the plane of the paper.
Reason : Force exerted by the magnetic field is always normal to the direction of motion. Therefore, its angular momentum remains unchanged.
(1) A (2) B (3) C (4) D

Q.63 Figure shows a bar magnet and a long straight wire W, carrying current into the plane of the paper.

Point P is the point of intersection of axis of magnet and line of shortest distance between magnet and wire (line PW).



Assertion : If P is the midpoint of the magnet, magnet experiences no torque and a force normal to the line of shortest distance (line PW).

Reason : North pole experiences a force in the direction of the magnetic field and south pole experiences a force opposite to the magnetic field.

(1) A (2) B (3) C (4) D

Q.64 **Assertion :** The field in a moving coil galvanometers is made radial.

Reason : The field is made radial in order to have a linear relation between current and deflection.

(1) A (2) B (3) C (4) D

Q.65 **Assertion :** Two charged particles are released from rest in gravity free space. After some time, one particle will exert a non-zero electrostatic force on the other particle.

Reason : A moving charge cannot produce magnetic field. But a magnetic force may act on a charged particle moving in an external magnetic field.

(1) A (2) B (3) C (4) D

Q.66 **Assertion :** Magnetic flux enclosed with a closed surface is always zero

Reason : Gauss law applies in the case of electric field and magetic field both

(1) A (2) B (3) C (4) D

Q.67 **Assertion :** The density of field lines decreases in a medium of high permeability

Reason : Beacuse $B \propto \frac{1}{\mu}$

(1) A (2) B (3) C (4) D

Q.68 **Assertion :** A dip circle (used for dip measurement) is taken to geomegnetic equator. The needle is alowed to move in a vertical plane The needle will stay in any direction when it is relesed

Reason : At geomagnetic equator B_v = zero

(1) A (2) B (3) C (4) D

Q.69 **Assertion :** Diamagnetic materials can exhibit magnetism.

Reason : Diamagnetic meterials have permanent magnetic dipole moment

(1) A (2) B (3) C (4) D

ANSWER KEY

Q.1	1	Q.2	1	Q.3	2	Q.4	2	Q.5	3
Q.6	1	Q.7	2	Q.8	1	Q.9	2	Q.10	4
Q.11	1	Q.12	2	Q.13	1	Q.14	1	Q.15	3
Q.16	3	Q.17	1	Q.18	3	Q.19	4	Q.20	3
Q.21	3	Q.22	1	Q.23	4	Q.24	3	Q.25	3
Q.26	4	Q.27	1	Q.28	1	Q.29	1	Q.30	1
Q.31	1	Q.32	3	Q.33	2	Q.34	1	Q.35	2
Q.36	3	Q.37	3	Q.38	3	Q.39	1	Q.40	1
Q.41	1	Q.42	3	Q.43	1	Q.44	2	Q.45	1
Q.46	4	Q.47	3	Q.48	3	Q.49	3	Q.50	1
Q.51	4	Q.52	1	Q.53	3	Q.54	2	Q.55	1
Q.56	2	Q.57	1	Q.58	2	Q.59	1	Q.60	2
Q.61	1	Q.62	3	Q.63	1	Q.64	1	Q.65	3
Q.66	3	Q.67	4	Q.68	1	Q.69	3		