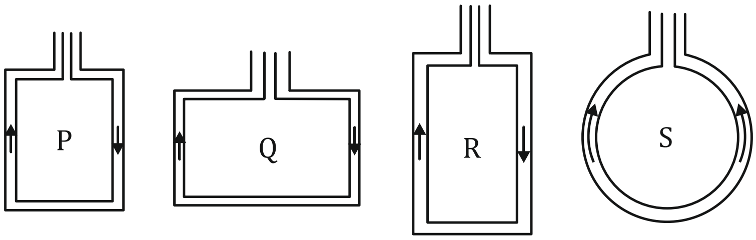
DPP – 3

Q.1 Four wires each of length 2.0 metres are bent into four loops P, Q, R and S and then suspended into uniform magnetic field. Same current is passed in each loop. Which statement is correct?



(A) Couple on loop P will be the highest

(B) Couple on loop Q will be the highest

(C) Couple on loop R will be the highest

(D) Couple on loop S will be the highest

Q.2 A wire of length L metre carrying a current of I ampere is bent in the form of a circle. Its magnitude of magnetic moment will be

(A) $\frac{IL}{4\pi}$ (B) $\frac{IL^2}{4\pi}$ (C) $\frac{I^2L^2}{4\pi}$ (D) $\frac{I^2L}{4\pi}$

Q.3 A current i flows in a circular coil of radius r. If the coil is placed in a uniform magnetic field B with its plane parallel to the field, magnitude of the torque that acts on the coil is

(A) Zero (B) $2\pi riB$ (C) $\pi r^2 iB$ (D) $2\pi r^2 iB$

Q.4 A circular current loop of magnetic moment M is in an arbitrary orientation in an external magnetic field B. The work done 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

Q.5 A circular coil of radius 4 cm has 50 turns. In this coil a current of 2 A is flowing. It is placed in a magnetic field of 0.1 weber $/m^2$. The amount of work done in rotating it through 180° from its equilibrium position will be

(A) 0.1 J (B) 0.2 J (C) 0.4 J (D) 0.8 J

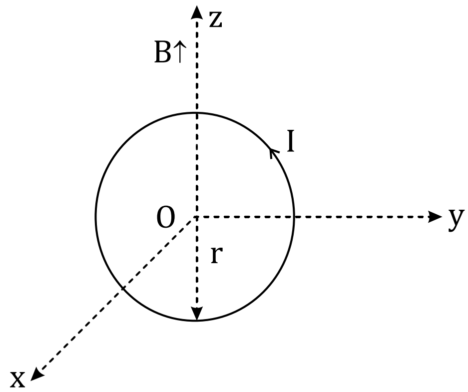
Q.6 A magnetic dipole $\vec{M} = (A\hat{i} + B\hat{j})J/Wb$ is placed in magnetic field $\vec{B} = (Cx^2\hat{i} + Dy^2\hat{j})Wb$ in XY plane at $\vec{r} = (E\hat{i} + F\hat{j})m$. Then force experienced by the bar magnet is

(A) $2ACE\hat{i} + 2BDF\hat{j}(\text{ N})$ (B) $2ACE\hat{i}(\text{ N})$

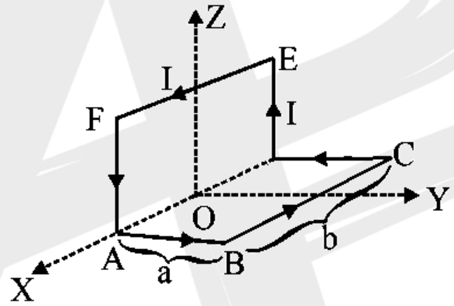
(C) 0 (D) $ACE\hat{i} + BDF\hat{j}(\text{ N})$

Q.7 In hydrogen atom, the electron is making 6.6×10^{15} rev/s around the nucleus in an orbit of radius 0.528Å. The magnetic moment is $x \times 10^{-23}$ A m^2. Find the value of x.

Q.8 A current carrying loop placed in a uniform magnetic field as shown in the figure. The magnitude of torque on the loop is $\frac{\alpha\pi I r^2 B}{8}$. Find α.



Q.9 A wire carrying current I is bent in the shape ABCDEFA as shown, where rectangle ABCDA and ADEFA are perpendicular to each other. If the sides of the rectangles are of lengths a and b, then the magnitude and direction of magnetic moment of the loop ABCDEFA is



(A) abI, along $\left(\frac{\hat{j}}{\sqrt{5}}+\frac{2\hat{k}}{\sqrt{5}}\right)$ (B) $\sqrt{2}$ abI, along $\left(\frac{\hat{j}}{\sqrt{2}}+\frac{\hat{k}}{\sqrt{2}}\right)$

(C) $\sqrt{2}$abI, along $\left(\frac{\hat{j}}{\sqrt{5}}+\frac{2\hat{k}}{\sqrt{5}}\right)$ (D) abI, along $\left(\frac{\hat{j}}{\sqrt{2}}+\frac{\hat{k}}{\sqrt{2}}\right)$

Q.10 A charged particle going around in a circle can be considered to be a current loop. A particle of mass m carrying charge q is moving in a plane with speed v under the influence of magnetic field $\vec{B}$. The magnetic moment of this moving particle

(A) $\frac{mv^2\vec{B}}{2B^2}$ (B) $-\frac{mv^2\vec{B}}{2\pi B^2}$ (C) $-\frac{mv^2\vec{B}}{B^2}$ (D) $-\frac{mv^2\vec{B}}{2B^2}$

Q.11 A circular coil having N turns and radius r carries a current I. It is held in the XZ plane in a magnetic field $B\hat{i}$. The torque on the coil due to the magnetic field is

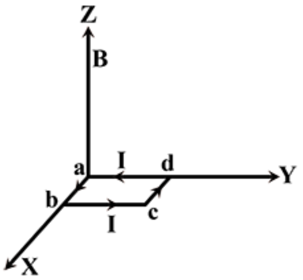
(A) $\frac{B\pi r^2 I}{N}$ (B) $\frac{Br^2 I}{\pi N}$ (C) $B\pi r^2 IN$ (D) zero

Q.12 An insulating thin rod of length l has a linear charge density $\rho(x) = \rho_0 \frac{x}{l}$ on it. The rod is rotated about an axis passing through the origin (x = 0) and perpendicular to the rod. If the rod makes n rotations per second, then the time averaged magnetic moment of the rod is

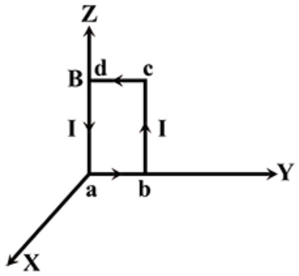
(A) $\pi n \rho_0 l^3$ (B) $\frac{\pi}{3} n \rho_0 l^3$ (C) $\frac{\pi}{4} n \rho_0 l^3$ (D) $n \rho_0 l^3$

Q.13 A uniform magnetic field B of 0.3 T is along the positive Z-direction. A rectangular loop (abcd) of sides 10 cm × 5 cm carries a current I of 12 A. Out of the following different orientations which one corresponds to stable equilibrium?

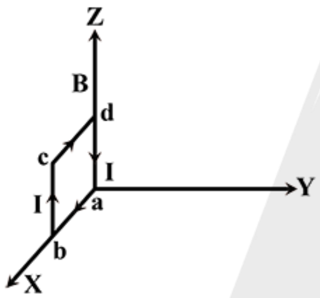
(A)



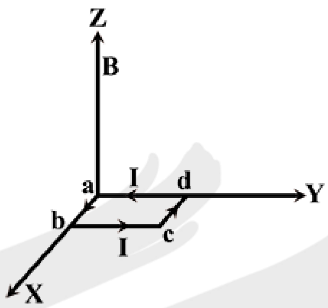
(B)



(C)



(D)



ANSWER KEY

1.	(D)	**2.**	(B)	**3.**	(C)	**4.**	(D)	**5.**	(A)	**6.**	(A)	**7.**	(1)
8.	(8)	**9.**	(B)	**10.**	(D)	**11.**	(C)	**12.**	(C)	**13.**	(A, D)		