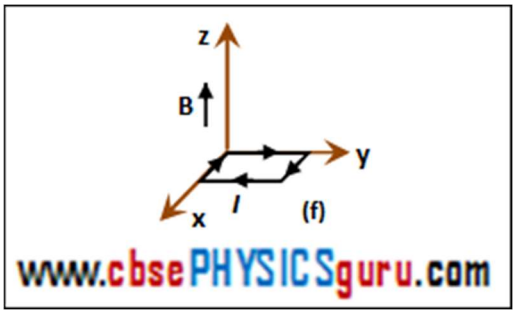
TORQUE ON A CURRENT LOOP, GALVANOMETER AND MAGNETIC DIPOLE MOMENT

1. A uniform magnetic field of 500 G is established along the positive z-direction. A rectangular loop of sides 12 cm and 6 cm carries a current of 2 A. The torque on the loop as shown in the figure is:
   (a) Zero (b) 1.44 x 10^{-2} N m (c) 7.2 x 10^{-3} N m (d) 1.44 x 10^{-3}N m



2. A circular coil of 40 turns and radius 10 cm is placed a uniform magnetic field of 0.20 T such that the plane of the coil makes an angle of 60^0 with the field. If the current in the coil is 5.0 A, the torque on the coil will be:
   (a) 0 **(b)** 0.628 Nm (c) 3.14 Nm (d) 6.28 Nm
3. A galvanometer has resistance of 5 ohm and a full deflection is produced by 15 milliamperes. The resistance that must be connected in series with it to measure 1.5 volt is:
   (a) 95 Ω (b) 99 Ω (c) 103 Ω (d) 109 Ω
4. A galvanometer has 30 divisions and a sensitivity 16 μA/division. It can be converted into a voltmeter to read 3 V by connecting a resistance of:
   (a) nearly 6 kΩ series (b) nearly 6 kΩ in parallel (c) nearly 500 Ω in series (d) nearly 7.0 kΩ in series
5. The deflection in a moving coil galvanometer falls from 50 divisions to 10 divisions when a shunt of 12 ohm is applied. The resistance of the galvanometer is:
   (a) 8 Ω (b) 16 Ω (c) 32 Ω **(d)** 48 Ω
6. A moving coil galvanometer has following characteristics. Number of turns of coil = 80; Area of coil = 50 mm^2; Resistance of coil = 20 Ω; Flux density of radial field 0.2 T; Torsional constant of suspension wire = 5 x 0^{-9} N m/rad. For this moving coil galvanometer, mark the correct statement(s):
   (a) The angular deflection produced due to a potential difference of 0.01 mV is 0.08 div. (b) Current sensitivity of the galvanometer is 160 div/mA. (c) Voltage sensitivity of the galvanometer is 8 div/mV. **(d)** All of these.
7. If a galvanometer current is 10 mA, resistance of the galvanometer is 40 Ω and shunt of 2 Ω is connected to the galvanometer, the maximum current which can be measured by this ammeter is:
   (a) 0.21 A (b) 0.42 A (c) 0.63 A (d) 2.1 A
8. In a galvanometer 5% of the total current in the circuit passes through it. If the resistance of the galvanometer is G, the shunt resistance S connected to the galvanometer is:
   (a) G/9 **(b)** G/19 (c) G/29 (d) G/39
9. A galvanometer of resistance 100 Ω gives full-scale deflection with 0.01 A current. The resistance that should be connected in parallel to convert it into an ammeter of range 10 A is:
   (a) 0.10 Ω (b) 1.00 Ω (c) 10.00 Ω (d) 100.00 Ω
10. The range of voltmeter of resistance 300 Ω is 5 V. The resistance to be connected to convert it into an ammeter of range 5 A is:
    (a) 1 Ω in series (b) 0.1 Ω in series **(c)** 1 Ω in parallel (d) 0.1 Ω in parallel
11. If the number of turns in a moving coil galvanometer of current sensitivity I_S and voltage sensitivity V_S is doubled, then:

(a) I_S remains unchanged and V_S is doubled (b) both I_S and V_S are doubled **(c)** I_S is doubled and V_S remains unchanged (d) both I_S and V_S remain unchanged

12. The magnetic moment of a current carrying circular coil of radius r and number of turns N varies as:
    (a) r^2 (b) r (c) r^3 (d) $1/r^2$
13. Two wires of same length are shaped into a square and a circle. If they carry same current, ratio of magnetic moment is:
    (a) 1: π (b) π: 1 **(c)** π: 4 (d) 2: π
14. Magnetic field at the centre of a circular loop of area A is B. The magnetic moment of the loop is:
    (a) $\frac{BA^2}{\mu_0\sqrt{\pi}}$ **(b)** $\frac{2BA\sqrt{A}}{\mu_0\sqrt{\pi}}$(c) $\frac{BA\sqrt{A}}{\mu_0\sqrt{\pi}}$ (d) $\frac{2BA}{\mu_0\sqrt{\pi}}$
15. An electron (charge = e) moving in a circular orbit of radius r makes n rotations per second. The magnetic moment of the orbital electron is:
    (a) zero **(b)** $\pi r^2 ne$ (c) $\pi r^2 n^2 e$ (d) πrne
16. An electron (mass m, charge e) moving around the nucleus with an angular momentum L has a magnetic moment:
    (a) $\frac{2\pi e}{m}L$ (b) $\frac{2e}{m}L$ (c) $\frac{e}{m}L$ **(d)** $\frac{e}{2m}L$
17. The gyromagnetic ratio of an electron of charge e and mass m is equal to:
    (a) $\frac{e}{2m}$ (b) $\frac{\pi e}{2m}$ (c) $\frac{e}{4m}$ (d) $\frac{e}{2\pi m}$
18. A steel wire of length l has a magnetic moment M. It is bent in L shape at its midpoint. The new magnetic moment is:
    (a) M (b) 2M **(c)** $M/\sqrt{2}$ (d) M/2
19. A steel wire of length l has a magnetic moment M. It is then bent into a semicircular arc. The new magnetic moment is:
    (a) M **(b)** $2M/\pi$ (c) M/π (d) πM