MOVING CHARGES AND MAGNETISM
Competency Based Questions

1. A galvanometer having a coil resistance of 100 Ω 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) 0.01 ohm

   (b) 2 ohm

   (c) 0.1 ohm

   (d) 3 ohm

2. Two coaxial solenoids of different radii carry current I in the same direction. Let $\vec{F}_1$ be the magnetic force on the inner solenoid due to the outer one and $\vec{F}_2$ be the magnetic force on the outer solenoid due to the inner one. Then:

   (a) $\vec{F}_1 = \vec{F}_2 = 0$

   (b) $\vec{F}_1$ - $\vec{F}_2 = 0$

   (c) $\vec{F}_1 + \vec{F}_2 = 0$

   (d) $\vec{F}_1\vec{F}_2 = 0$

3. Two long parallel wires are at a distance 2d apart. They carry steady equal currents flowing out of the plane of the paper as shown. The variation of the magnetic field B along the line XX' is given by

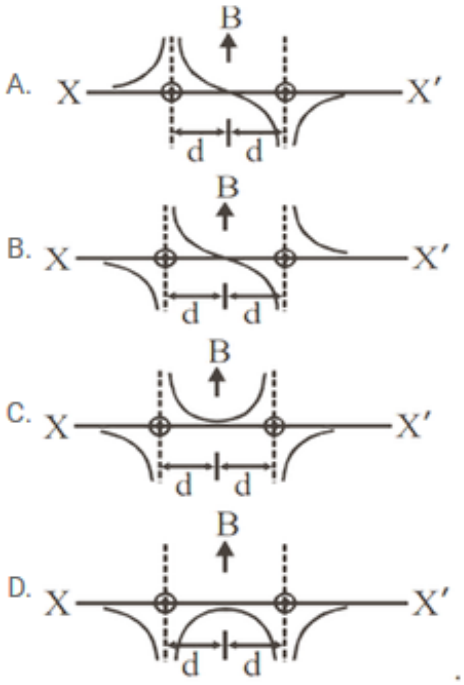

Figure 1:

(a) A

(b) B

(c) C

(d) D

4. Two identical wires A and B, each of length 'l', carry the same current I. Wire A is bent into a circle of radius R and wire B is bent to form a square of side 'a'. If B_A and B_B are the values of the magnetic field at the centres of the circle and square respectively, then the ratio B_A/B_B is:

   (a) $\frac{\pi^2}{8}$

   (b) $\frac{\pi^2}{16\sqrt{2}}$

   (c) $\frac{\pi^2}{16}$

   (d) $\frac{\pi^2}{8\sqrt{2}}$

5. A current loop ABCD is held fixed on the plane of the paper as shown in the figure. The arcs BC (radius = b) and DA (radius = a) of the loop are joined by two straight wires AB andCD. A steady current I is flowing in the loop. Angle made by AB and CD at the origin O is 30°. Another straight thin wire with steady current I1 flowing out of the plane of the paper is kept at the origin.The magnitude of the magnetic field (2) due to the loop ABCD at the origin (O) is

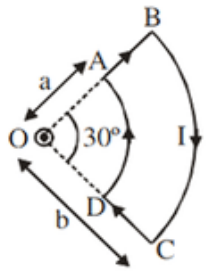

Figure 2:

   (a) Zero

   (b) $\frac{\mu(b-a)}{24ab}$

   (c) $\frac{\mu I}{4\pi}\frac{(b-a)}{ab}$

   (d) $\frac{\mu I}{4\pi}\left[2(b-a)+\frac{\pi}{3}(a+b)\right]$

6. A horizontal overhead power line is at a height of 4m from the ground and carries a current of 100 A from east to west. The magnetic field directly below it on the ground is

   (a) 2.5×10^{-7} T southward

   (b) 5×10^{-6} T northward

   (c) 5×10^{-6} T southward

(d) 2.5×10^{-7} northward

7. 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

   (a) circle

   (b) helix

   (c) straight line

   (d) ellipse

8. A moving coil galvanometer has 150 equal divisions. Its current sensitivity is 10 divisions per milliampere and voltage sensitivity is 2 divisions per millivolt. In order that each division reads 1 volt, the resistance in ohms needed to be connected in series with the coil will be

   (a) 10^3

   (b) 10^5

   (c) 99995

   (d) 9995

9. A uniform electric field and a uniform magnetic field are acting along the same direction in a certain region. If an electron is projected along the direction of the fields with a certain velocity then

   (a) its velocity will decrease.

   (b) its velocity will increase.

   (c) it will turn towards right of direction of motion.

   (d) it will turn towards left of direction of motion.

10. A long wire carries a steady current. It is bent into a circle of one turn and the magnetic field at the centre of the coil is B. It is then bent into a circular loop of n turns. The magnetic field at the centre of the coil will be

    (a) nB

    (b) n^2B

    (c) 2nB

    (d) $2n^2B$