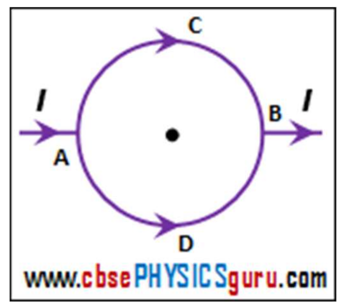
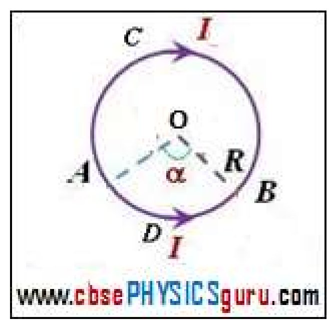
BIOT-SAVART LAW, AMPERE'S CIRCUITAL LAW AND THEIR APPLICATIONS

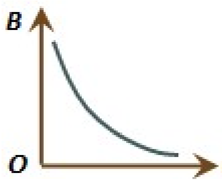
1. The magnetic field due to a current carrying circular loop of radius 3 cm at a point on the axis at a distance of 4 cm from the centre is 54 µT. What will be its value at the centre of the loop?
   (a) 250 µT (b) 150 µT (c) 125 µT (d) 75 µT
2. Two infinitely long parallel wires carry equal currents in same direction. The magnetic field at a mid-point in between the two wires is:
   (a) square of the magnetic field produced due to each of the wires (b) half of the magnetic field produced due to each of the wires (c) twice the magnetic field produced due to each of the wires **(d)** zero
3. An arc of a circle of radius R subtends an angle π/4 at the centre. It carries a current I. The magnetic field at the centre will be:
   (a) $\frac{\mu_0 I}{16R}$ (b) $\frac{\mu_0 I}{4R}$ (c) $\frac{\mu_0 I}{8R}$ (d) $\frac{\mu_0 I}{R}$
4. A circular current carrying coil has a radius R. The distance from the centre of the coil on the axis where the magnetic induction will be (1/8)th of its value at the centre of the coil, is:
   (a) $\frac{R}{\sqrt{3}}$ (b) $\frac{2R}{\sqrt{3}}$ **(c)** $\sqrt{3}R$ (d) $2\sqrt{3}R$
5. If the resistance of the upper half of a rigid loop of radius R is twice that of the lower half, the magnitude of magnetic induction at the centre is equal to:
   (a) zero (b) $\frac{\mu_0 I}{4R}$ (c) $\frac{\mu_0 I}{8R}$ **(d)** $\frac{\mu_0 I}{12R}$

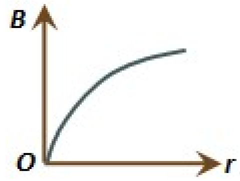


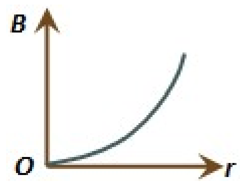
6. Equal current I flows in two segments of a circular loop in the direction shown in figure. Radius of the loop is R. The magnitude of magnetic field at the centre of the loop is:
   (a) $\frac{\mu_0 I\theta}{4\pi R}$ **(b)** $\frac{\mu_0 I}{2\pi R}(\pi - \theta)$ (c) $\frac{\mu_0 I}{2\pi R}(2\pi - \theta)$ (d) zero

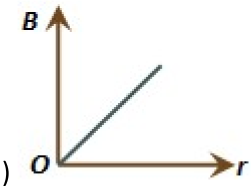


7. A long wire carries a steady current. It is bent into a circle of one turn and the magnetic field at the centre of the coil is B. It is then bent into a circular loop of N turns. The magnetic field at the centre of the coil will be:
   (a) NB **(b)** N^2B (c) N^3B (d) 2NB
8. A horizontal overhead power line carries a current of 90 A in east to west direction. What is the magnitude and direction of the magnetic field due to the current, 1.5 m below the line?
   (a) 1.2×10^{-5} T towards south (b) 1.2×10^{-5} T towards north (c) 1.2×10^{-5} T towards east (d) 1.2×10^{-5} T towards west
9. The magnetic field B at a distance r from a long wire carrying current varies with distance r as shown in the figure:

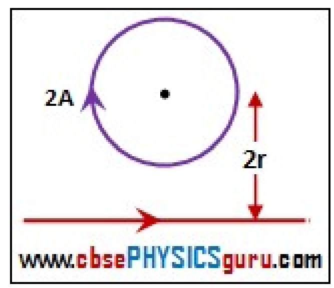
(a) 

(b) 

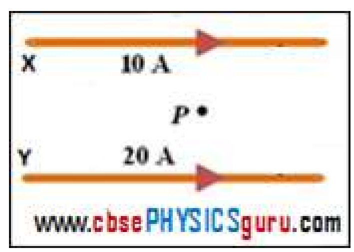
(c) 

(d) 

10. Two similar current loops are placed with their axes along x-axis and y-axis respectively. Then the of resultant magnetic field at a common point on the axis to the individual magnetic field at the same point is:
    (a) $\sqrt{2}$:1 (b) 1 : $\sqrt{2}$ (c) 1 : 2 (d) 1 : 4
11. Two concentric circular coils of ten turns each are situated in the same plane. Their radii are 20 cm and 40 cm they carry currents 0.2 A and 0.3 A respectively in opposite directions. The magnetic field in tesla at the centre is:
    (a) $15\mu_0/4$ (b) $\mu_0/60$ (c) $7\mu_0/90$ **(d)** $5\ \mu_0/4$
12. A square frame of side 1 m carries a current I, produces a magnetic field B_1 at its centre. The same current is passed through a circular coil having the same perimeter as the square. The magnetic field at the centre of the circular coil is B_2. The ratio B_1/B_2 is:
    (a) $\frac{4\sqrt{2}}{\pi^2}$ (b) $\frac{\sqrt{2}}{3\pi^2}$ **(c)** $\frac{8\sqrt{2}}{\pi^2}$ (d) $\frac{4\sqrt{2}}{3\pi^2}$
13. A long wire and a circular loop of radius r lying in the same plane carry currents as shown in the figure. The centre of the loop is at a distance 2r from the wire. The current in the loop is 2A. The current in the wire such that the net magnetic field at the centre of the loop is zero, is:
    (a) π A **(b)** 4π A (c) 3π A (d) 2π A



14. A 2 µC charge moving around a circle with a frequency of 6.25×10^{12} Hz produces a magnetic field 6.28 tesla at the centre of the circle. The radius of the circle is:
    (a) 0.25 m (b) 0.75 m (c) 1.0 m **(d)** 1.25 m
15. X and Y are long parallel conductors separated by certain distance. P is the midpoint between the conductors (see the figure). The net magnetic field at P is B. Now, the current 20 A is switched off. The field at P now becomes:
    (a) B (b) 2B (b) B/2 (d) 4B

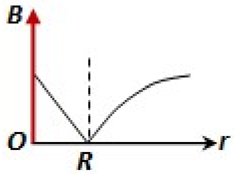


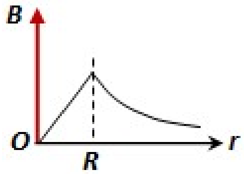
16. A circular coil of radius 2R is carrying current I. The ratio of magnetic fields at the centre of coil and at a point at a distance 6R from centre of coil on axis of coil is:
    (a) 10 (b) 20 **(c)** $10\sqrt{10}$ (d) $20\sqrt{5}$
17. A long solenoid has 200 turns per cm and carries a current I. The magnetic field at its centre is 6.28×10^{-2} Wb/m². Another long solenoid has 100 turns per cm and it carries a current I/3. The value of the magnetic field at its centre is:
    (a) 2.05×10^{-4} Wb/m² **(b)** 1.05×10^{-2} Wb/m² (c) 3.05×10^{-5} Wb/m² (d) 1.05×10^{-3} Wb/m²
18. A long solenoid has 800 turns per metre length of solenoid. A current of 1.6 A flows through it. The magnetic induction at the end of the solenoid on its axis is:

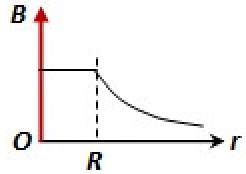
(a) 4 x 10^{-4} T **(b)** 8 x 10^{-4} T (c) 16 x 10^{-4} T (d) 24 x 10^{-4} T

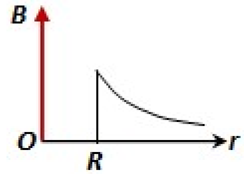
19. A long straight wire of radius r carries a steady current I. The current is uniformly distributed across its cross section. The ratio of the magnetic field at r/2 to that at 2r is:
(a) 4 (b) 2 **(c)** 1 (d) 3

20. A long straight wire of a circular cross section (radius R) carries a steady current I and the current I is uniformly distributed across this cross-section. Which of the following plots represents the variation of magnitude of magnetic field B with distance r from the centre of the wire?

(a) 

(b) 

(c) 

(d) 

21. Six wires with currents as shown are enclosed in a circular loop. Two other wire with currents as shown are situated outside the loop. The value of line integral of magnetic field around the dotted closed path, i.e. $\oint \vec{B} . d\vec{l}$ is:
(a) Zero (b) μ_0 (c) $2\mu_0$ **(d)** $3\ \mu_0$