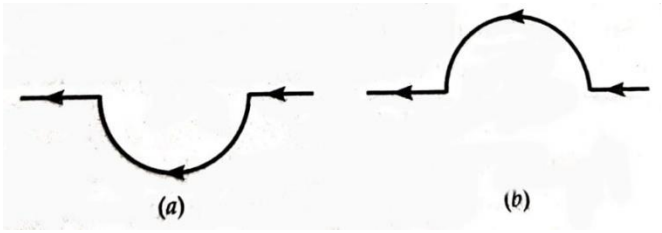
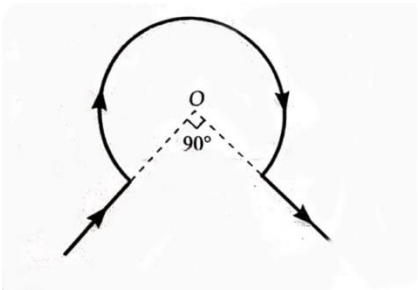
BRAIN INTERNATIONAL SCHOOL

SUBJECT: PHYSICS **CLASS XII** **JULY, 2021**

1. A straight wire carrying a current of 12 A is bent into a semicircular arc of radius 2.0 cm as shown in figure (a). What is the direction and magnitude of $\vec{B}$ at the centre of the arc? Would your answer change if the wire were bent into a semicircular arc of the same radius but in the opposite way as shown in figure (b)?



2. The wire shown in figure carries a current of 10A. Determine the magnitude of the magnetic field at the centre O. Given radius of the bent coil is 3 cm.



3. A straight wire of length $\frac{\pi}{2}$ metre is bent into a circular shape. If the wire were to carry a current of 5 A, calculate the magnetic field, due to it, before bending, at a point distant 0.01 times the radius of the circle formed from it. Also calculate the magnetic field, at the centre of the circular loop formed, for the same value of current.
4. Consider a tightly wound 100 turn coil of radius 10 cm, carrying a current of 1 A. What is the magnitude of the magnetic field at the centre of the coil?
5. A semiconductor arc of radius 20 cm carries a current of 10 A. Calculate the magnitude of the magnetic field at the centre of the arc.

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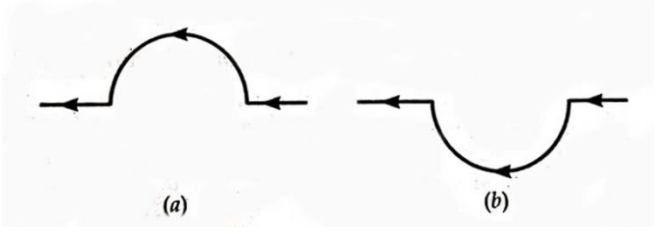
6. A thick straight copper wire, carrying a current of 10 A is bent into a semicircular arc of radius 7.0 cm as shown in figure. (i) State the direction and calculate the magnitude of magnetic field at the centre of arc. (ii) How would your answer change if the same wire were bent into a semicircular arc of the same radius but in opposite way as shown in figure.



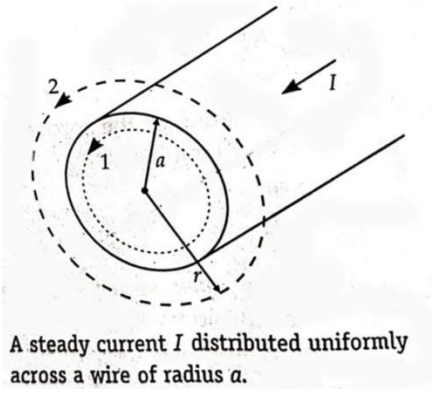
Ans: (i) 4.5×10^{-5} T, outside the plane of paper,

7. A solenoid coil of 300 turns/m is carrying a current of 5 A. The length of the solenoid is 0.5 m and has a radius of 1 cm. Find the magnitude of the magnetic field inside the solenoid.

8. A solenoid of length 0.5 m has a radius of 1 cm and is made up of 500 turns. It carries a current of 5 A. What is the magnitude of the magnetic field inside the solenoid?

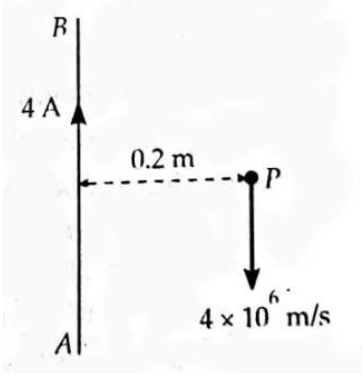
9. A 0.5 m long solenoid has 500 turns and has a flux density of 2.52×10^{-3} T at its centre. Find the current in the solenoid. Given $\mu_0 = 4\pi \times 10^{-7}\ Hm^{-1}$.

10. (i) A straight thick long wire of uniform cross-section of radius 'a' is carrying a steady current I. Use Ampere's circuital law to obtain a relation showing the variation of the magnetic field (B_r) inside and outside the wire with distance r, ($r \leq a$) and ($r > a$) of the field point from the centre of its cross-section. Plot a graph showing the variation of field B with distance r.
    (ii) Calculate the ratio of magnetic field at a point a/2 above the surface of the wire to that at a point a/2 below its surface. What is the maximum value of the field of this wire?



A steady current I distributed uniformly across a wire of radius a.

11. A long straight wire AB carries a current of 4 A. A proton P travels at 4×10^6 m/s, parallel to the wire, 0.2 m from it and in a direction opposite to the current as shown in figure. Calculate the force which the magnetic field of current exerts on the proton. Also specify the direction of the force.



12. A solenoid, of length 1.5 m has a radius of 1.5 cm and has a total of 1500 turns wound on it. It carries a current of 3 A. Calculate the magnitude of the axial magnetic field inside the solenoid. If an electron were to move with a speed of $2 \times 10^4\ ms^{-1}$ along the axis of this current carrying solenoid, what would be the force experienced by this electron?