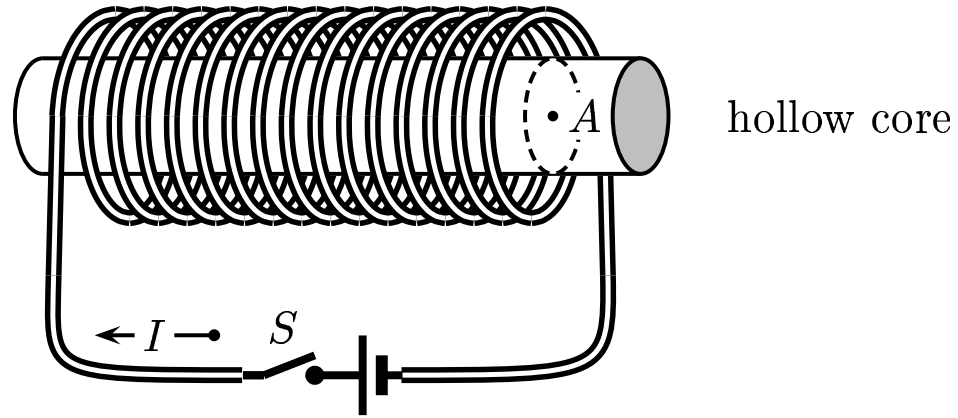


Given a long solenoid which has a current I and the linear number density (turns per length), n .



Find \vec{B}_A , the magnetic field at the point A , located on the axis at the right end of the solenoid.

- A) $\|\vec{B}_A\| = \mu_0 I n$; and its direction is \leftarrow .
- B) $\|\vec{B}_A\| = \mu_0 I n$; and its direction is \rightarrow .
- C) $\|\vec{B}_A\| = \frac{\mu_0 I n}{2}$; and its direction is \leftarrow .
- D) $\|\vec{B}_A\| = \frac{\mu_0 I n}{2}$; and its direction is \rightarrow .

Assume the solenoid is long. Near the center $B_{in} = B_R + B_L = 2 B_R$.

By inspection, $B_A = B_R$, or $B_A = \frac{B_{in}}{2} = \frac{\mu_0 I n}{2}$.

This is a special case of $B = \mu_0 I n \frac{\sin \phi_2 - \sin \phi_1}{2}$, where $\phi_2 = 0^\circ$, and

$$\phi_1 = -90^\circ.$$

Answer **C**.

30.05-01 B at One End of a Long Solenoid 2004-3-24