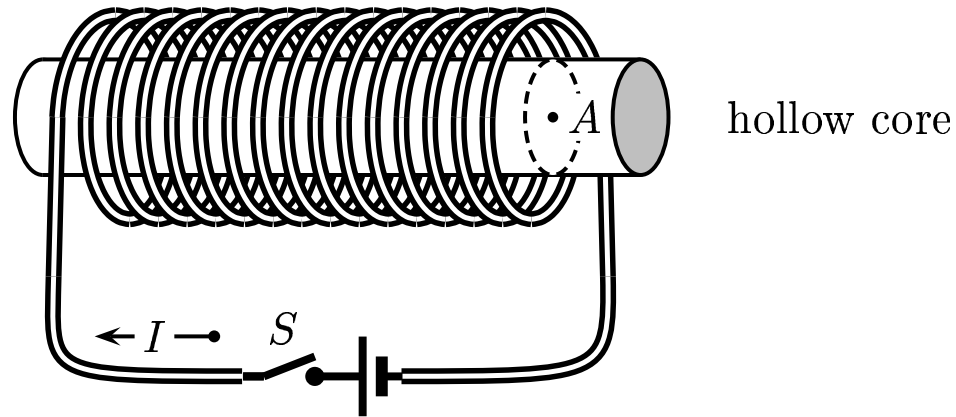


Given a long solenoid which has a current  $I$  and the linear number density (turns per length),  $n$ .



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**.