

QUES 01:-

A closely wound solenoid 80 cm long has 5 layers of windings of 400 turns each. The diameter of the solenoid is 1.8 cm. If the current carried is 8.0 A, estimate the magnitude of B inside the solenoid near its centre.

Sol. Here, $l = 80 \text{ cm} = 0.8 \text{ m}$, $N = 5 \times 400 = 2000$

$I = 8.0 \text{ A}$, $D = 1.8 \text{ cm}$, $n = \text{no. of turns per unit length}$

Magnitude of magnetic field inside a solenoid near its center

$$B = \mu_0 n I$$

$$n = \frac{N}{l}$$

$$n = \frac{2000}{0.8}$$

Magnitude of magnetic field induction at a point well inside the solenoid is,

$$B = \mu_0 n I = \frac{4\pi \times 10^{-7} \times 2000 \times 8}{0.8}$$

$$= 8\pi \times 10^{-3} \text{ T} = 2.5 \times 10^{-2} \text{ T}$$