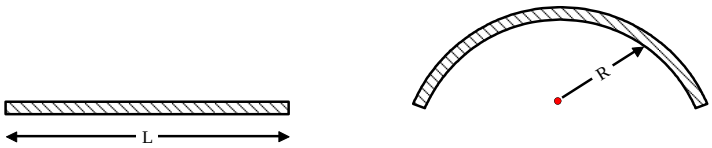
A steel wire has a magnetic moment M. Which of the following will be its magnetic moment if it is bent into a semi-circular arc?

(A) M (B) > M (C) $\frac{M}{\pi}$ (D) $\frac{2M}{\pi}$

Solution



$M \propto L$

$M' \propto 2R$ (2R is the distance between the two poles in semi-circular shape)

$$\frac{M'}{M} = \frac{2R}{L} = \frac{2R}{\pi R} = \frac{2}{\pi}$$

$$\therefore M' = \frac{2}{\pi} M$$

Hence, (D)