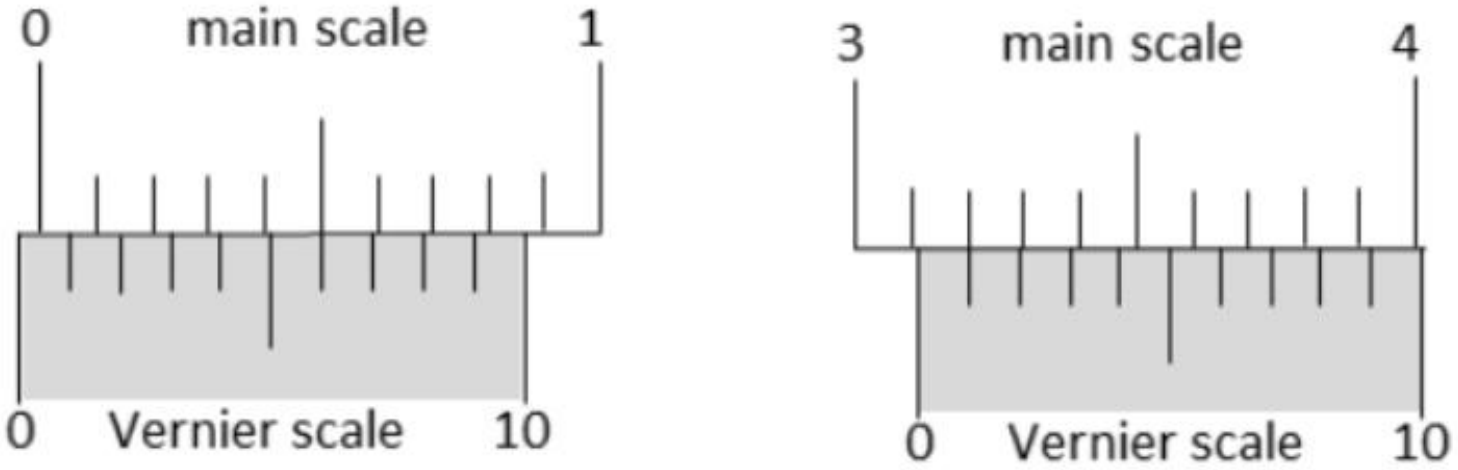
The smallest division on the main scale of a Vernier calipers is 0.1 cm. Ten divisions of the Vernier scale correspond to nine divisions of the main scale. The figure below on the left shows the reading of this calipers with no gap between its two jaws. The figure on the right shows the reading with a solid sphere held between the jaws. The correct diameter of the sphere is



A 3.07 cm

B 3.11 cm

C 3.15 cm

D 3.17 cm

Explanation

Least count of Vernier calipers (L.C) = $\left(1-\frac{9}{10}\right)0.1$ = 0.01 cm

We know that main scale reading (MSR) is the first reading on the main scale immediately to the left of the zero of the Vernier scale. But there are no marks on the main scale before zero of the Vernier scale. We claim that MSR = −0.1 cm. The Vernier scale reading is VSR = 6 and the least count is LC = 0.01 cm.

Substitute these values to get,

Zero Error = MSR + VSR $\times$ LC

= -0.1 + 6 $\times$ 0.01 = -0.04 cm

Now in the second figure, the reading from main scale is 3.1 cm will be added to 1^{st} matching division of vernier so,

Reading = 3.1 cm + 1 $\times$ L.C

= 3.1 cm + 0.01

= 3.11 cm

So correct diameter of the sphere

= 3.11 - (Zero Error)

= (3.11 + 0.04) cm