EXPERIMENT NO : 1

Aim: To measure the dimensions of a given object and hence find its volume using a Vernier Calipers

Apparatus: Vernier callipers, object.

Theory: Suppose the zero of the vernier scale lies ahead of N^{th} division of the main Scale when the given object is kept between the jaws, then the main scale reading (M.S.R.) = N

If the n^{th} division of the vernier coincides with any division of the main scale , the vernier scale reading (V.S.R.) = n × least count

Total reading = M.S.R. + V.S.R.
= N + (n × least count)

After measuring the dimensions, the formula for finding the volume is applied to get the volume of the given object.

Volume of sphere = $^4/_3\ \pi r^3$
Volume of cylinder/wire = $\pi\ r^2\ l$
Volume of cuboid = l b h

Procedure:

1. **Observe the main scale and find the value of one smallest main scale division**
2. **Calculate the value of least count**
3. **Calculate the zero error if any**
4. **Hold the object between the two jaws of the vernier callipers without any undue pressure.**
5. **Note the main scale reading *i.e.*, the main scale reading immediately before the zero of the vernier scale.**
6. **Find the vernier scale division that coincides with any one of the main scale division.**
7. **Calculate the V.S.R.**
8. **Find the observed reading by adding the M.S.R. and the V.S. R.**
9. **Subtract the zero error if any from the observed reading to get the correct reading.**
10. **Record more observations taking different positions of the object.**
11. **Find out the mean measurement .**
12. **Similarly find the other required measurements – length, breadth, radius etc.**
13. **Apply the formula to calculate the volume of the object.**

Result : Volume of the given object = ……m^3

Precautions :

1. **The zero error should be noted carefully with sign and taken into account**
2. **The jaws should not be pressed too hard**
3. **The dimension to be measured should be parallel to the main scale.**
4. **Oil the vernier if its motion is not smooth.**

Sources of error:

1. **The vernier may be loose.**
2. **The graduation on the scale may not be evenly marked**
3. **Vernier jaws may not be at right angle to the main scale**
4. **Parallax may be there in taking observations**

Observation and calculation :

Value of one main scale division = ……cm
No. of vernier scale divisions = …….

Least count of the vernier = $\frac{Value\ of\ one\ main\ scale\ division}{Number\ of\ divisions\ on\ the\ vernier\ scale}$

= ……. cm

Vernier scale division coinciding with any division of the main scale when the two jaws are in contact = ……

Zero error = …….. div ; Correction = …….. div

Observations for Length

Sr. No.	M.S.R. (c.m.)	Coinciding Vernier scale Division (*n*)	V.S.R.= *n* × least count (c.m.)	Observed reading = M.S.R.+ V.S.R (c.m.).	Corrected reading = Observed reading – zero error
1. 2. 3.					
				Mean	

Observations for breadth

Sr. No.	M.S.R.	Coinciding Vernier scale Division (*n*)	V.S.R.= *n* × least count	Observed reading = M.S.R.+ V.S.R.	Corrected reading = Observed reading – zero error
1. 2. 3.					
				Mean	

Observations for height

Sr. No.	M.S.R.	Coinciding Vernier scale Division (*n*)	V.S.R.= *n* × least count	Observed reading = M.S.R.+ V.S.R.	Corrected reading = Observed reading – zero error
1. 2. 3.					
				Mean	

Volume of the given object = ……cm^3 (Apply the appropriate formula)

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