Exp.No:2

VERNIER CALLIPER - VOLUME OF A RECTANGULAR BLOCK

Aim:

To find the volume of the given rectangular block using a vernier calliper.

Apparatus required:

Vernier Calliper, Rectangular Block

Formula:

Volume of the rectangular block, $V = lbh$

where,

$l \rightarrow$ length
$b \rightarrow$ breadth
$h \rightarrow$ height

} of the rectangular block.

Procedure:

1) Observe and note the least count and zero error of the given vernier calliper (by closing the jaws of the ~~vernieries~~ calliper).

2) Place the given rectangular block between the jaws (length wise)

Observations & Tabular Column:

Least count (L.C): It is the least measurement that can be taken accurately by any measuring device.

$$L.C = \frac{\text{Value of 1 main scale division}}{\text{Total no. of Vernier scale divisions}} = \frac{1 \text{ div}}{10}$$

$$L.C = \frac{1mm}{10} = 0.1mm = 0.01cm$$

L.C = 0.01cm (for a vernier calliper).

3) Note the main scale reading (M.S.R) and vernier scale coincidence (V.S.C). Record them.

4) Repeat the experiment for different points of the object for the same dimension to get a few of readings.

5) Calculate the mean value of the dimension of the rectangular block.

6) Repeat the steps 2 to 5 for other dimensions like breadth (b) and height (h) also.

7) Use these values in the formula to calculate the volume of these rectangular block.

Precautions:

1) Before starting the experiment, the working of a vernier calliper should be carefully examined.

2) The least count of the instrument should be calculated before the experiment begins.

3) The vernier should be tightly screwed in

To find length (l), breadth (b) and height (h) of the block :

Sl. No.	Dimension	M.S.R (cm)	V.S.C (div)	V.S.R = (V.S.C × L.C) (cm)	(M.S.R + V.S.R) (cm)	Mean (cm)
1.	Length (l)	5.1	4	0.04	5.14	$l = 5.14$ cm ✓
2.		5.1	4	0.04	5.14	
3.		5.1	4	0.04	5.14	
4.		5.1	4	0.04	5.14	
1.	Breadth (b)	0.9	5	0.05	0.95	$b = 0.95$ ✓
2.		0.9	5	0.05	0.95	
3.		0.9	5	0.05	0.95	
4.		0.9	5	0.05	0.95	
1.	Height (h)	0.9	5	0.05	0.95	$h = 0.95$ ✓
2.		0.9	5	0.05	0.95	
3.		0.9	5	0.05	0.95	
4.		0.9	5	0.05	0.95	

Calculations:

Volume of the rectangular block = $V = lbh$

$V = 5.14 \times 0.95 \times 0.95 \text{ cm}^3 = \underline{4.64 \text{ (approx)}} \text{ cm}^3$

$V = \underline{4.64 \times 10^{-6}} \text{ m}^3$ ✓

position.

4) Too much pressure on the jaws should be avoided.

5) The vernier coincidence should be carefully noted.

Result:

Volume of the given ~~rectangular~~ block using a vernier calliper is V = ~~6.727~~ 4.64 $\times 10^{-6}$ m^3

Exp No: 11

SCREW GAUGE - VOLUME OF THE WIRE

Aim:

To find the thickness of a given wire using a screw gauge and hence to find its volume.

Apparatus required:

Screw gauge, wire, metre scale.

Formula:

Volume of the wire = $V = \pi r^2 h$

where,

$r \rightarrow$ radius
$h \rightarrow$ length
} of the wire

Procedure:

1) Observe and note the least count, zero error and make zero correction of the given screw gauge by closing the gap between the two metal studs.

2) Place the given wire between the gap of the two metal studs of the screw gauge.

Observations and tabular column:

Least count (L.C): It is the least measurement that any measuring instrument can measure accurately.

Pitch of the screw = $\frac{\text{Distance moved}}{\text{No. of rotations made}} = \frac{4mm}{4} = 1mm$

L.C = 0.01mm. $\left(\because \text{Least count (L.C)} = \frac{\text{Pitch of screw}}{\text{Total no. of circular scale div.}} = \frac{1mm}{100}\right)$

Zero error (Z.E) = e = -19

Zero correction (Z.C) = -e = 19 ✓

Rough fig:

Z.E = Nil

eg: e = 0

$\therefore x = 0$

Positive error

e = +4

x = -4

Negative error

e = -5

x = +5

Length of the wire = l = 16 cm = 160 mm

To find the thickness / Diameter (D) of the wire:

To find the thickness (t) of the given glass sheet/plate:

Sl No.	Dimension	(A) PSR (mm)	(B) observed HSC (div)	(C) Corrected HSC [B ± X (L.C)] div	(D) Corrected reading [A + (C (L.C)] mm	Mean (mm)
1.	Thickness (T)	3	76	76+19 = 95	3+0.95 = 3.95	
2.		3	90	90+19 = 109	3+1.09 = 4.09	
3.		3	81	81+19 = 100	3+1.00 = 4.00	
4.		3	72	72+19 = 91	3+0.92 = 3.92	t = 3.987

Calculations:

Nil

them.

4) Repeat the experiment for different points of the object to get a few set of readings.

5) Calculate the mean value of the thickness (t) of the given glass sheet / plate.

Precautions:

1) Examine the working of the screw gauge before starting the experiment.

2) To avoid the error, due to back-lash, the screw should always be turned in the same direction.

3) Note the zero error carefully and it should be always taken into account.

Result:

The thickness of the given glass sheet using a screw gauge is, $t = 3.987 \times 10^{-3}$ m

SCREW GAUGE - VOLUME OF THE SPHERE

Aim:

To find out the volume of a sphere using a screw gauge.

Apparatus required:

screw gauge, sphere

Formula:

Volume of the sphere, $V = \frac{4}{3} \pi r^3$

where,

$r \rightarrow$ radius of the sphere

Procedure:

1) Observe and note the least count, zero error and make zero correction of the given screw gauge by closing the gap between the two metal studs.

2) Place the given sphere between the gap of two studs of the screw gauge.

3) Note Pitch scale reading (P.S.R) and head scale

observations and tabular column:

Least count (L.C): It is the least measurement that any measuring instrument can measure accurately.

Pitch of the screw = $\frac{\text{Distance moved}}{\text{No. of rotations made}} = \frac{4mm}{4} = 1mm$

$\therefore$ least count = $\frac{\text{Pitch of screw}}{\text{Total no. of circular scale divisions.}} = \frac{1mm}{100}$

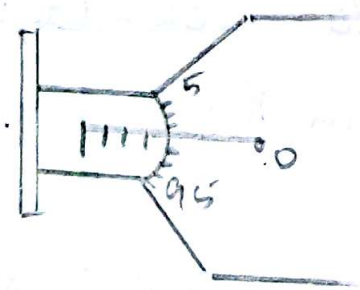
(L.C)

L.C = 0.01 mm.

zero error (Z.E) = e =

zero correction (Z.C) = x = (-(e)) =

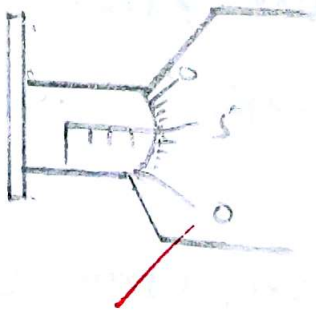
Rough fig:



Z.E = Nil

eg: e = 0

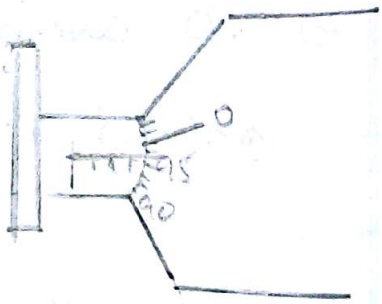
$\therefore$ x = 0



Positive error

e = +4

x = -4



Negative error

eg: e = -5

x = +5

To find diameter(D) of the sphere :

Sl.No	Dimension	(A) PSR (mm)	(B) observed HSC (div)	(C) corrected HSC (B+x) (div)	Corrected reading [A+C(L.C)] (mm)	mean (mm)
1.	Diameter	6	96	96+19=115	6+1.15=7.15	
2.		6	90	90+19=109	6+1.09=7.09	
3.		6	89	89+19=108	6+1.08=7.08	D = 7.12
4		6	92	92+19=116	6+1.16=7.16	

Calculations:

1. Radius of the sphere, $r = \frac{D}{2} = 3.56$ mm
2. Volume of the sphere, $V = \frac{4}{3}\pi r^3 = \frac{4}{3} \times 3.14 \times 3.56 \times 3.56 \times 3.56$

$V = 247.53 \times 10^{-9}$ mm^3

$V = 2.48 \times 10^{-7}$ m^3

coincidence (H.S.C) . Record them.

4) Repeat the experiment for different points of the object to get a few set of readings.

5) Calculate the mean value of the diameter (D) of the given sphere. Hence find the radius (r) of the sphere.

6) Use the value of r in the formula to find the volume of the given sphere.

Precautions:

1) Examine the working of the given screw gauge before starting the experiment.

2) To avoid the error, due to back-lash, the screw should always be turned in the same direction.

3) Note the zero error carefully and it should be always taken into account.

Result:

The volume of the given sphere using a screw gauge is,

$V = 2.48 \times 10^{-3} m^3$