

EXPERIMENT 3

SCREW GAUGE - 1

AIM

To measure diameter of a given wire using a screw gauge and find its volume.

APPARATUS

Screw gauge, wire.

THEORY

1. If with the wire between plane faces A and B, the edge of the cap lies ahead of N th division of linear scale.

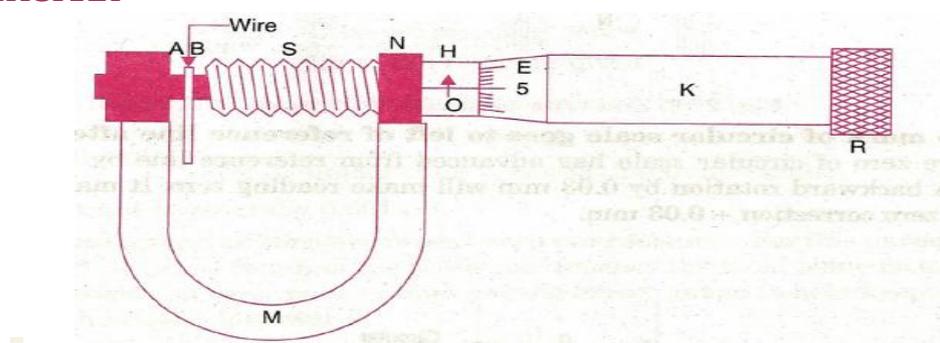
Then, linear scale reading (L.S.R.) = N

If n th division of circular scale lies over reference line.

Then, circular scale reading (C.S.R.) = $n \times$ (L.C.) (L.C. is least count of screw gauge)

Total reading (T.R) = L.S.R. + C.S.R. = $N + n \times$ (L.C.).

DIAGRAM



■ . Screw gauge-measuring diameter (thickness) of the wire

PROCEDURE

1. Find the value of one linear scale division (L.S.D.).
2. Determine the pitch and the least count of the screw gauge and record it stepwise.
3. Bring the plane face B in contact with plane face A and find the zero error. Do it three times and record them. If there is no zero error, then record '**zero error nil**'.
4. Move the face B away from face A. Place the wire lengthwise over face A and move the face B towards face A using the ratchet head R. Stop when R turns (slips) without moving the screw.
5. Note the number of divisions of the linear scale visible and uncovered by the edge of the cap. The reading (N) is called linear scale reading (L.S.R.).
6. Note the number (n) of the division of the circular scale lying over reference line.
7. Repeat steps 5 and 6 after rotating the wire by 90° for measuring diameter in a perpendicular direction.
8. Repeat steps 4, 5, 6 and 7 for five different positions separated equally throughout the length of the wire. Record the observations in each set in a tabular form.
9. Find total reading and apply zero correction in each case.
10. Take mean of different values of diameter.
11. Measure the length of the wire by stretching it along a half metre scale. Keeping one end of wire at a known mark, note the position of other end. Difference in position of the two ends of the wire gives the length of the wire. Do it three times and record them.

OBSERVATIONS

1. Determination of Least Count of the Screw Gauge

1L.S.D. = 1mm

Number of full rotations given to screw = 4

Distance moved by the screw = 4 mm

Hence, pitch = $\frac{4\text{mm}}{4} = 1\text{mm}$

Number of divisions on circular scale = 100

Hence, least count = $\frac{1\text{mm}}{100} = 0.01\text{ mm} = 0.001\text{ cm}$.

2. Zero Error.

zero error (e) = mm

zero correction (c) =mm.

To measure the diameter

Serial No.	Linear Scale Reading (N)	Observed circular scale division	Corrected circular Scale Reading (n × V.C)	Total Reading (T.R=l..S.R+ C.S.R)

CALCULATIONS

Mean diameter =mm

RESULT

The diameter of the given wire =

PRECAUTIONS

1. To avoid undue pressure; the screw should always be rotated by ratchet R and not by cap K.
2. The screw should move freely without friction.
3. The zero correction, with proper sign should be noted very carefully and added algebraically.
4. For same set of observations, the screw should be moved in the same direction to avoid back-lash error of the screw.
5. At each place, the diameter of the wire should be measured in two perpendicular directions and then the mean of the two be taken.
6. Readings should be taken at least for five different places equally spaced along the whole length of the wire.
7. Error due to parallax should be avoided.

SOURCES OF ERROR

1. The screw may have friction.
2. The screw gauge may have back-lash error.
3. Circular scale divisions may not be of equal size .
4. The wire may not be uniform.

EXPERIMENT 4

SCREW GAUGE -2

AIM

To measure thickness of a given sheet using a screw gauge.

APPARATUS

Screw gauge, sheet (it must be rigid).

THEORY

1. If with the wire between plane faces A and B, the edge of the cap lies ahead of N th division of linear scale.

Then, linear scale reading (L.S.R.) = N

If n th division of circular scale lies over reference line.

Then, circular scale reading (C.S.R.) = $n \times$ (L.C.) (L.C. is least count of screw gauge)

Total reading (T.R) = L.S.R. + C.S.R. = $N + n \times$ (L.C.).

PROCEDURE

1. Find the value of one linear scale division (L.S.D.).
2. Determine the pitch and the least count of the screw gauge and record it stepwise.
3. Bring the plane face B in contact with plane face A and find the zero error. Do it three times and record them. If there is no zero error, then record '**zero error nil**'.
4. Move the face B away from face A. Place the sheet lengthwise over face A and move the face B towards face A using the ratchet head R. Stop when R turns (slips) without moving the screw.
5. Note the number of divisions of the linear scale visible and uncovered by the edge of the cap. The reading (N) is called linear scale reading (L.S.R.).
6. Note the number (n) of the division of the circular scale lying over reference line.
7. Repeat steps 4,5,6 for 5 different positions spread equally throughout the surface of the sheet. Record observation in tabular form.
8. Find total reading and apply zero correction in each case.

OBSERVATIONS

1. Determination of Least Count of the Screw Gauge

1 L.S.D. = 1 mm, Number of full rotations given to screw = 4

Distance moved by the screw = 4 mm. Hence, pitch = $\frac{4\text{mm}}{4} = 1\text{mm}$

Number of divisions on circular scale = 100

Hence, least count = $\frac{1\text{mm}}{100} = 0.01\text{ mm} = 0.001\text{ cm}$.

2. Zero Error.

zero error (e) = mm, zero correction (c) =mm.

To measure the thickness

Serial No.	Linear Scale Reading (N)	Observed circular scale division	Corrected circular Scale Reading ($n \times$ V.C)	Total Reading ($T.R = L.S.R + C.S.R$)

CALCULATIONS

Mean thickness =mm

RESULT

The thickness of the given wire =

EXPERIMENT 5

SCREW GAUGE- 3

AIM

To measure volume of an irregular lamina using a screw gauge.

APPARATUS

Screw gauge, an irregular lamina (it must be of uniform thickness) a centimetre graph paper, a pointed pencil.

THEORY

Same as an Experiment 4

PROCEDURE (Stepwise)

Step 1 to 9 as in Experiment 6 for the thickness of the lamina.

10. Put the lamina on a clean centimetre graph paper and mark its boundary by a sharp pointed pencil.

11. Find area of the lamina by counting small squares enclosed by the boundary. Take half or more than half square as full and leave if less than half.

OBSERVATIONS

For thickness same as in Experiment 4.

For area. Number of small squares enclosed by the boundary = _____

CALCULATIONS

Volume = area x thickness = _____

RESULT

The volume of the given lamina is _____