



EXPERIMENT

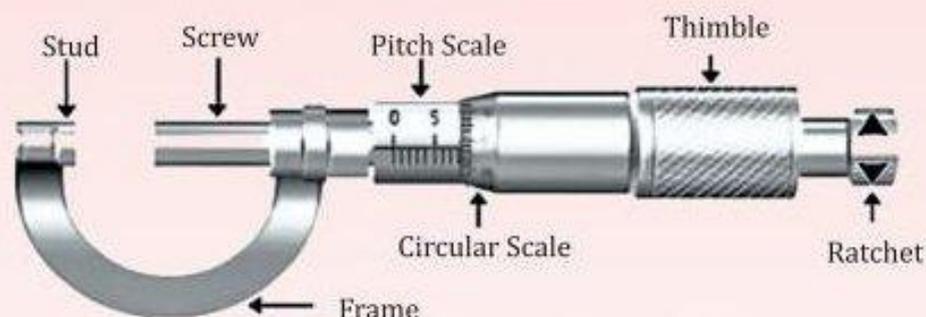
AIM

To determine volume of an irregular lamina using a Screw Gauge.

MATERIAL REQUIRED

A screw gauge, given irregular lamina, millimeter graph paper (bigger in size than the lamina) and pencil.

DIAGRAM



Micrometer screw gauge

THEORY

Volume of given irregular lamina = Area of irregular lamina (A) \times Thickness of lamina (t)

PROCEDURE

Determine the pitch, least count, and zero error as in Experiment-2A and 2B.

1. MEASUREMENT OF THICKNESS OF LAMINA

- Measure the thickness of the lamina by applying the same procedure outlined in Experiment 2B.
- Subsequently, calculate the mean corrected thickness.

2. DETERMINATION OF AREA OF IRREGULAR LAMINA

- Position the provided irregular lamina on a sheet of paper with a millimeter grid and trace its outline on the graph paper using a sharp pencil.
- Proceed to count both complete squares and more than half squares within the confines of the plate's boundary.
- Finally, compute the total area (A) in square millimeters for the lamina. The formula is given as:

$$\text{Area} = x \times \text{area of square} + y \times \text{area of more than the half squares}$$

Where, x and y represent the number of complete squares and the number of those squares which are more than half respectively.

OBSERVATION

Measurement of thickness of the lamina using screw gauge.

- (i) Value of one smallest division on the main scale of screw gauge = _____ mm.



- (ii) Distance traversed by the screw on giving it five rotations = _____ mm.
 (iii) Pitch of the screw = _____ mm.
 (iv) Number of divisions on the circular scale = _____.
 (v) Least count of the screw gauge = _____ mm.

FOR ZERO ERROR

Coinciding division of circular scale with the base line (n) = _____.

For positive zero error (e) = $+x' \times LC$ = _____ mm.

For negative zero error (e) = $-(100 - x') \times LC$ = _____ mm.

Area of the lamina measured by graph paper = _____ mm².

TABLE FOR THE DETERMINATION OF THE THICKNESS OF GIVEN LAMINA

S. No.	Main scale reading (mm)	Circular scale		Observed thickness MSR + CSR t (mm)	Corrected thickness $t = t - (\pm e)$	Mean corrected Thickness (mm)
		Coinciding division	Reading (mm)			
1.						
2.						
3.						

CALCULATION

Measurement of Area and Volume:

From the outline drawn on the graph paper,

Total number of complete squares = _____ mm² = _____ cm²

Volume of lamina = Area \times Mean corrected thickness of lamina = _____ mm³ = _____ cm³

RESULT

Volume of given lamina = _____ cm³.

PRECAUTION

Refer to Experiment - 2A.

SOURCES OF ERROR

1. The lamina may not be of uniform cross-section.
2. Backlash error always exists because it can be minimized to some extent but cannot be removed completely.
3. Instrumental and personal errors.
4. The size of circular division may not be same.

VIVA VOCE

Q1. What are you doing?

Ans. I am using a screw gauge to measure volume of an irregular lamina using a screw gauge.

Q2. What do you mean by the zero error of a screw gauge?

Ans. On completely closing the gap between the fixed stud and the screw if the zero mark of the head scale should be along with the line graduation of the main scale and the beveled edge of the head

should coincide with the zero line of the main scale the instrument has no error. If it does not coincide, the screw gauge has zero error.

Q3. How will you determine the sign of zero error?

Ans. If the zero mark on the circular scale is below the base line of the main scale, the zero error is said to be positive. If the zero mark on the circular scale is above the base line of the main scale, the zero error is said to be negative.

Q4. How will you determine the value of zero error?

Ans. On completely closing the gap between the stud and the screw, read the number of circular scale divisions coinciding with the base line. To get positive zero error, multiply the circular scale division with the least count of the screw gauge. To get negative zero error, subtract coinciding circular scale division from the total number of circular scale divisions and then multiply it with least count.

Q5. What do you mean by backlash error?

Ans. It is the error due to wear and tear of the threads of the screw due to which on reversing the direction of rotation of the thimble (circular head) the tip of the screw does not move in the opposite direction immediately but remains stationary for a part of the rotation.

Q6. Can you avoid backlash errors? How?

Ans. Yes, sir it can be avoided by rotating the screw always in one direction while taking observations.

Q7. You are given two screw gauges. The one with a pitch of half millimeter and the other with a pitch of 1 mm both having 100 circular scale divisions. Which makes more precise measurements?

Ans. Screw gauge having a pitch of 0.5 mm makes a more precise measurement.

Q8. Can you measure backlash error?

Ans. No sir. It is not constant over the entire length of the screw.

Q9. What is the function of the ratchet in a screw gauge?

Ans. Ratchet is provided to avoid excess pressure when the object is held between stud and the spindle of the screw.

