ENGINEERING PHYSICS LAB MANUAL

EXPERMENT-No.1

AIM OF THE EXPERIMENT

Determination of the volume of a solid cylinder by using Slide calipers .

APPARATUS REQUIRED

1. A slide callipers
2. A solid cylinder

THEORY

The volume of a solid cylinder is given by $V=\frac{\pi}{4}d^2h$

where d is the diameter and 'h' is the height of the solid cylinder.

Least count = The smallest measurement than can be done by an instrument is known as its least count.

Least count = 1 M.S.D - 1 V.S.D= 0.1cm - 0.09 cm =0.01cm

PROCEDURE

The diameter and height of the solid cylinder are to be measured by making the use of the slide calipers.The solid cylinder was kept tightly by two lower jaws of the slide calipers .Now the main scale reading was recorded into the proper tabulation of the experiment. Then the vernier Coincidence was also noted down.

The number of vernier coincidence was multiplied to the value of least count to obtain vernier scale reading. In this way the added value of the main scale reading and the vernier scale reading was the desired value of the diameter of the solid cylinder. Similar method as noted above was adopted to find out the height of the solid cylinder. In each case as many as 8 to 10 observations were taken to find out the value of the diameter and the height before determining the mean value.

TABULATION

Table for diameter (d)

No of observations	Least count in cm	Main scale reading in cm	Vernier coincidence	Vernier scale reading in cm	Total in cm	Zero error in cm	Correct measurement in cm	Mean d in cm

2 Table for height (h)

No of observations	Least count in cm	Main scale reading in cm	Vernier coincidence	Vernier scale reading in cm	Total in cm	Zero error in cm	Correct measurement in cm	Mean h in cm

CALCULATION

It has been observed from the above two table that

Diameter d= ..... cm

Height h = ……. cm

. The volume of the solid cylinder V = $\frac{\pi}{4}$ d²h

CONCLUSION: The volume of the give solid cylinder was found to be ……. cm³

EXPERIMENT NO. 2

AIM OF THE EXPERIMENT

Determination of the Volume of a hollow cylinder by using Slide calipers .

APPARATUS REQUIRED

1. A slide calipers
2. A hollow cylinder

THEORY

The volume of a hollow cylinder is given by $V=\frac{\pi}{4}(D^2 - d^2)h$

where D is the external diameter, d is the internal diameter and h is the height of the hollow cylinder.

Least count The smallest measurement than can be done by an instrument is known as its least count.

Least count = 1 M.S.D - 1 V.S.D= 0.1cm - 0.09 cm =0.01cm

PROCEDURE

The external diameter as well as the height of the hollow cylinder were measured by making use of the lower jaws, and the internal diameter was measured by using the upper jaws of the slide calipers . In every case the hollow cylinder was held tightly by means of the jaws. The main scale reading and the vernier coincidence were noted down. To determine the vernier scale reading the number of the vernier coincidence was multiplied to the value of the least count. Then the main scale reading was added to the vernier scale reading to find out the desired result. In each case as many as 8 to 10 observations were taken to

find out the value of the diameter and the height before determining the mean value.

TABULATION

Table for external diameter (D)

No of observations	Least count in cm	Main scale reading in cm	Vernier coincidence	Vernier scale reading in cm	Total in cm	Zero error in cm	Correct measurement in cm	Mean D in cm

2. Table for height (h)

No of observations	Least count in cm	Main scale reading in cm	Vernier coincidence	Vernier scale reading in cm	Total in cm	Zero error in cm	Correct measurement in cm	Mean h in cm

3. Table for the internal diameter (d)

No of observations	Least count in cm	Main scale reading in cm	Vernier coincidence	Vernier scale reading in cm	Total in cm	Zero error in cm	Correct measurement in cm	Mean d in cm

CALCULATION

It was found from the tables that

The external diameter D = ….. cm , the Internal diameter d =….. cm and the height h = ... cm

$V = \frac{\pi}{4} (D^2 - d^2) h$

V = ….. cm^3

CONCLUSION

Hence the volume of the given hollow cylinder was ….. cm^3

EXPERIMENT NO-3

AIM OF THE EXPERIMENT

Determination of the cross-sectional area of a small piece of wire by using screw gauge.

APPARATUS REQUIRED

1. Screw gauge

2. The sample wire

THEORY

The cross-sectional area of a small piece of given wire is A = $\frac{\pi}{4} d^2$

Where d is the diameter of the sample wire.

Pitch: It is the distance travelled by the screw head when the circular scale completes one rotation and it was observed that the pitch of the screw gauge = 0.1cm

Least count The smallest measurement than can be done by an instrument is known as its least count.

Least count = $\frac{Pitch}{100}$ = $\frac{0.1}{100}$ cm = 0.001 cm

PROCEDURE

The sample wire was held tightly by keeping it in between the movable and the fixed Screw heads. At this time the number of the initial circular coincidence was noted down. After removing away the sample wire the circular wire rotated in

clock-wise direction fill the movable and the fixed screw heads tached touched each other. In the mean while the number of complete rotations and the circular coincidence were noted down. All these three one observation similar to 10 observations along different Points of taken.

TABULATION

Table for diameter of wire (d)

No of observations	Pitch in cm	Least count in cm	Initial circular coincidence	No of complete rotation	Final circular coincidence	Extra circular division	Pitch scale reading in cm	Circular scale reading in cm	Total in cm	Mean in cm

CALCULATION

It was observed that the diameter of the given wire d = …… cm

Area of the cross-section A = $\frac{\pi}{4}d^2$ = ... cm^2

CONCLUSION

The area of the given wire was found to be ….. cm^2

EXPERIMENT-NO 4

AIM OF THE EXPERIMENT

Determination of the volume of an irregular lamina.

APPARATUS REQUIRED

1. A screw gauge
2. A piece of graph Paper
3. An irregular Lamina

THEORY

Volume of the lamina = Area of the base of lamina × height of the lamina

Pitch It is the linear distance travelled by the Screw head by the time the circular scale completes one rotation.

Pitch of the screw gauge is 0.1cm.

Least count The smallest measurement than can be done by an instrument is known as its least count.

Least count = Pitch/100 = 0.1/100 cm = 0.001 cm

About graph paper A graph paper was used in this experiment. The area of the smallest square of this graph paper is $0.01cm^2$

PROCEDURE

For the determination of the area of the base of the irregular Lamina a Small piece of cm. graph paper was taken on which the irregular lamina was placed and its outline was drawn by means of a Sharp -pointed Pencil. Such type of out line figures were taken at least 5 times. Then the number of complete Squares, number of incomplete squares which were equal to or more than half squares in size were counted one by one. It was important to remember that the half and more than the half squares were considered as single squares each. And those Squares ass less than half in size were not at all Counted and ignored. Finally the total number of complete squares were determined for each figure. Then the time came to determine the height of the lamina. For that purpose the given lamina was held tightly by its fixed and the movable Screw heads. Now the number of initial circular coincidence was noted down. After removing away the lamina from the screw heads the circular scale was rotated in clock-wise direction till the movable and the fixed Screw heads touched each other. In the mean while the number of complete rotation of the circular scale and the final circular coincidence were noted down. Thus one observation was completed. Similar 8 to 10 observations were taken.

TABULATION

1. Table for area of the base of lamina

No of observations	**No of complete squares**	**No of incomplete squares**	**Total no of squares**	**Area of a square**	**Area of the base in cm^2**	**Mean in cm^2**

Table 2

Table for thickness of lamina (h)

No of observations	Pitch in cm	Least count in cm	Initial circular coincidence	No of complete rotation	Final circular coincidence	Extra circular division	Pitch scale reading in cm	Circular scale reading in cm	Total in cm	Mean h in cm

CALCULATON

It was found that the mean area A = ... cm^2

the mean thickness h = ... cm

The volume V = mean area x mean thickness.

V = …… x …… cm^3

CONCLUSION The volume of the given lamina was ..... cm^3

EXPERIMENT 5

AIM OF THE EXPERIMENT

Determination of the external radius of curvature of a watch-glass.

APPARATUS REQUIRED

1. A Spherometer

2. A base plate

3. A watch-glass

THEORY

The external radius of curvature of a watch-glass $R = \frac{d^2}{6H} + \frac{H}{2}$.

Where d is the distance between the legs of spherometer and H is the external height of the watch-glass

Pitch It is the linear distance travelled by the Screw head when the circular scale of the spherometer completes one rotation. The pitch of the Spherometer was found to be 0.1 cm

Least count The smallest measurement than can be done by an instrument is known as its least count.

Least count = Pitch/100 = 0.1/100 cm = 0.001 cm

PROCEDURE

Firstly the distance between legs of the Spherometer was measured. For this Purpose a small piece of paper was taken upon which the Spherometer was pressed hardly so as to get 3 foot Marks on it. These foot mark points were joined together to get an equilateral triangle whose length of one arm is the **'d'** i, e the

distance between 2 legs of the spherometer. At least 3 observations like this were taken. Then the external height of the watch-glass i.e it was measured. For this purpose the spherometer was made to stand by its legs upon the external surface of the watch glass, by adjustment of the circular scale the 3 legs and the Screw-head were made to touch the external Surface of the watch – glass . Now the number of initial circular coincidence was noted down. Again after removing away the watch -glass the spherometer was placed on the base plate. A gap between the screw-head and the surface of the base plate was noticed, In order to measure the gap the circular scale was notated in clock-wise direction till the screw head just touched the base Plate. By this time the number of the complete rotation and final circular coincidence were noted down. All these constituted one observation. At least 8 to 10 Similar observations were taken whose readings were recorded in a table.

TABULATION

1) Table for d

Figure no	d_1 in cm	d_2 in cm	d_3 in cm	$d = \frac{d_1+d_2+d_3}{3}$ In cm	Mean d in cm

2) Table for H

No of observations	Pitch in cm	Least count in cm	Initial circular coincidence	No of complete rotation	Final circular coincidence	Extra circular division	Pitch scale reading in cm	Circular scale reading in cm	Total in cm	Mean H in cm

CALCULATION

It was observed that the mean d = ... cm

and the mean H =....cm

$$R = \frac{d^2}{6H} + \frac{H}{2}$$

R = …… cm

CONCLUSION

The external radius of curvature of the watch glass was ....cm.

EXPERIMENT-6

AIM OF THE EXPERIMENT

Determination of the tree internal radius of curvature of a watch glass

APPARATUS REQUIRED

1. A Spherometer

2. A base plate

3. A watch-glass

THEORY

The internal radius of curvature of a watch- glass $r = \frac{d^2}{6h} + \frac{h}{2}$

Where d is the distance between the legs of spherometer and h is the internal height of the watch-glass

Pitch It is the linear distance travelled by the Screw head when the circular scale of the spherometer completes one rotation. The pitch of the Spherometer was found to be 0.1 cm

Least count The smallest measurement than can be done by an instrument is known as its least count.

Least count = Pitch/100 = 0.1/100 cm = 0.001 cm

PROCEDURE

The impressions of the legs of the spherometer were taken on a small paper. The 3 marks were joined to make a triangle. The average of the length of the 3 arms of it was d. At least 3 such observations were taken. Then the spherometer was kept on the base plate So that the 3 legs and the screw-head touched the base Plate After noting the number of the initial circular Coincidence the spherometer was placed on the concave Side of the watch glass. The circular scale was rotated clockwise till the screw head touched the concave surface of the watch glass. The number of complete rotations of the Circular scale and the number of final & circular Coincidence were noted down. Several observations were taken by repeating the above procedure

TABULATION

1. Table for 'd'

Figure no	d_1 in cm	d_2 in cm	d_3 in cm	$d = \frac{d_1+d_2+d_3}{3}$ In cm	Mean d in cm

2. Table for 'h'

No of observations	Pitch in cm	Least count in cm	Initial circular coincidence	No of complete rotation	Final circular coincidence	Extra circular division	Pitch scale reading in cm	Circular scale reading in cm	Total in cm	Mean h in cm

CALCULATION

It was observed that the mean d = ... cm

and the mean h =....cm

$R = \frac{d^2}{6h} + \frac{h}{2}$

R = …… cm

CONCLUSION

The internal radius of curvature of the watch glass was ....cm.