<u>Physics Practical For class XI (2018-02019)</u>

<u>Exp No : 1</u>

<u>Aim /Object</u> : To measure the dimensions of a given solid (cuboids) using a vernier calipers and to find the volume of the solid.

<u>Appratus Required</u> : Verneir calipers, given solid (cuboid).

<u>Theory /Formula Used</u>: When the body is placed between the two jaws A and B, the main scale reading is x and if n is the number of vernier scale division coinciding, then the observed reading is given as

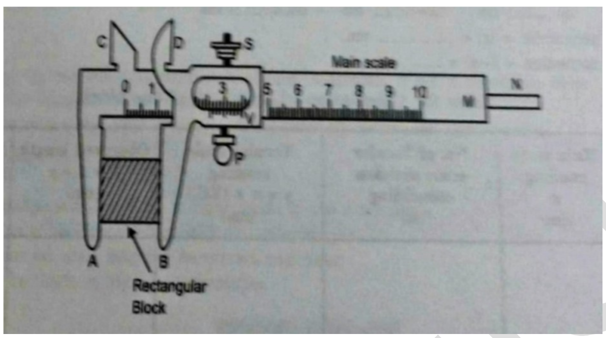
Observed reading = x + n (VCD)

Volume of the rectangular block is

V = Length x breadth x height

V= l x b x h

<u>Diagram</u> :



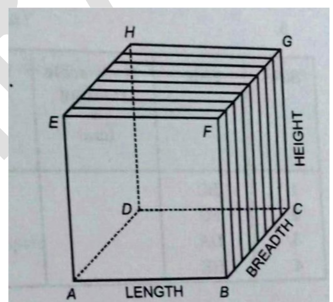


Fig. 10. (b) Rectangular metallic block

<u>Observations:</u> 1. Value of one main scale division (1MSD)= 1mm

10 VSD = 9 MSD

! VSD = 9/10 MSD

Least Count or Vernier constant = !MSD - !VSD = (1- 0.9)= 0.1 mm

Least Count = 0.01 cm

<u>Table for length L of the block</u>

SNo	Main scale Reading x(cm)	Vernier scale division coinciding n	Vernier scale Reading Y = n x (LC)	Observed Length L = x + y cm
1.				

2.				
3.				

Table for breadth b of the block

SNo	Main scale Reading x(cm)	Vernier scale division coinciding n	Vernier scale Reading Y = n x (LC)	Observed Length b = x + y cm
1.				
2.				
3.				

Table for height h of the block

SNo	Main scale Reading x(cm)	Vernier scale division coinciding n	Vernier scale Reading Y = n x (LC)	Observed Length h = x + y cm
1.				
2.				
3.				

Calculations :

Mean length = L = --------------- cm

Mean breadth b = -------------- cm

Mean height h = ----------------- cm

Volume of the block = V = l x b x h = ------------ cm^3

Result : The volume of the given block is = ----------- cm^3

Precautions:

1. **The motion of vernier scale on main scale should be smooth. If not it should be oiled.**
2. **The jaws of the vernier calipers should not be pressed hard.**
3. **The vernier constant and zero error should be carefully calculated and recorded.**

Sources of errors:

1. **The graduations on scales may not be correct and clear.**
2. **Parallax may be there in taking observations.**
3. **Vernier scale may be loosely fitted with the movable jaw.**

Exp No : 2

Aim /Object : To measure the internal diameter and depth of a given beaker or cylinder using vernier callipers and to find its volume.

Appratus Required : Verneir calipers, given beaker or cylinder.

Theory /Formula Used: When the body is placed between the two jaws A and B, the main scale reading is x and if n is the number of vernier scale division coinciding, then the observed reading is given as

Observed reading = x + n (VCD)

If D is the diameter and h the depth of a cylinder then,

its Volume of the beaker or cylinder is

$V = \frac{1}{4} \pi D^2 h$

Diagram :

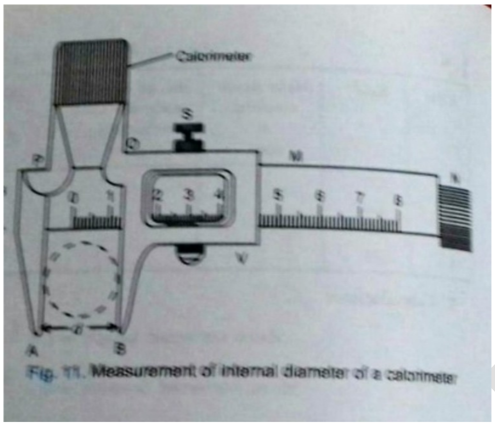


Fig. 11. Measurement of internal diameter of a calorimeter

Observations: 1. Value of one main scale division (1MSD)= 1mm

10 VSD = 9 MSD

! VSD = 9/10 MSD

Least Count or Vernier constant = !MSD - !VSD = (1- 0.9)= 0.1 mm

or = 0.01 cm

Table for diameter of the beaker/cylinder:

SNo	Main scale Reading x(cm)	Vernier scale division coinciding n	Vernier scale Reading Y = n x (LC)	Observed diameter L = x + y cm
1.				
2.				
3.				

Table for depth h of the beaker/ cylinder:

SNo	Main scale	Vernier	Vernier scale	Observed

	Reading x(cm)	scale division coinciding n	Reading Y = n x (LC)	depth h = x + y cm
1.				
2.				
3.				

<u>Calculations :</u>

Mean diameter D = --------------- cm

Mean depth h = ----------------- cm

Volume of the beaker/cylinder V = ¼ ∏D^2 h = ------------- cm^3

<u>Result</u> : The volume of the given beaker/cylinder is = ------------ cm^3

<u>Precautions:</u>

4. **The motion of vernier scale on main scale should be smooth. If not it should be oiled.**
5. **The jaws of the vernier calipers should not be pressed hard.**
6. **The vernier constant and zero error should be carefully calculated and recorded.**

<u>Sources of errors</u>:

4. **The graduations on scales may not be correct and clear.**
5. **Parallax may be there in taking observations.**
6. **Vernier scale may be loosely fitted with the movable jaw.**

<u>Exp No : 3</u>

<u>Aim /Object</u> : To measure the radius of the given wire using a screw gauge.

<u>Appratus Required</u> : Screw Gauge, given wire.

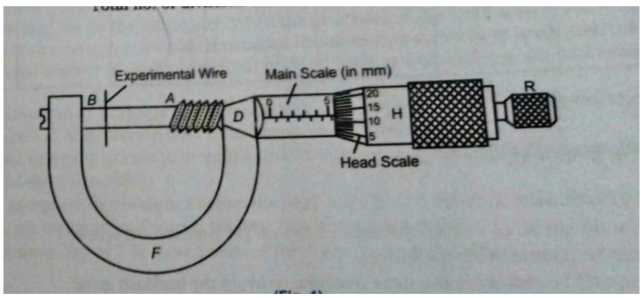
Theory /Formula Used: The diameter of the wire is the sum of main scale reading (M) and circular /head scale (H) reading.

Observed reading = M + H

Diameter D = M + (no of divisions on head scale coinciding with base line) X Least count

Where Least count = Pitch / Total no of divisions on head scale

Diagram :



Observations: 1. Value of one main scale division (1MSD)= 1mm

100 CSD = 99 MSD

! VSD = 99/100 MSD

Least Count or Vernier constant = !MSD - !VSD = (1- 0.99)= 0.01 mm

or = 0.001 cm

Table for diameter of the wire :

SNo	Direction of measurement	Main scale reading M cm	Head scale reading		Total reading D = M+H (cm)	
			No of div coinciding with base line (p)	Reading H=px LC		Mean Observed Diameter(D) (cm)
1.	Horizontal					
	Perpendicular					
2.	Horizontal					
	Perpendicular					
3.	Horizontal					
	Perpendicular					

Result: The **diameter of the given wire = -------------- cm**

Precautions:

1. **The wire should not be excessively pressed between the stud and the screw.**
2. **Screw should be rotated using the ratchet.**
3. **The screw should be rotated in the same direction to avoid the backlash error.**

Sources of errors:

1 .The screw gauge may have backlash error.

2.The threads of the screw may not be of equal pitch.

3. The screw may have friction.

Exp No : 4

Aim /Object : To plot the graph between L and T^2 of a simple pendulum and to find the value of acceleration due to gravity “g”.

Appratus Required : Simple pendulum ,stop clock, Meter scale , Vernier calipers etc.

Theory /Formula Used: If the effective length of a simple pendulum is L, the time period of the pendulum is T and acceleration due to gravity is g, then

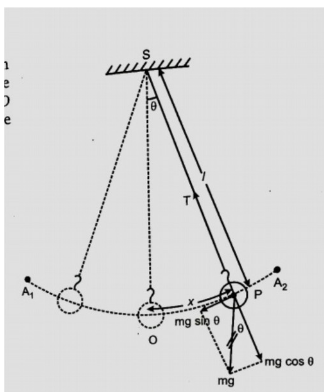
$$T = 2\prod\frac{\sqrt{L}}{\sqrt{g}}$$

Or $$T^2 = \frac{4\prod 2}{g}L$$

And $$g = 4\prod 2\ \frac{L}{T2}$$

While plotting the graph between L and T^2 is a straight line.

Diagram : If O is the mean position of the motion, When the bob moves from its mean position A1 on one side, then to extreme position A2 to other side and then back to mean position O is called one oscillation and time taken in this motion is called time period T.



(Fig. 1)

Observations:

1. Least count of vernier calipers = 0.01 cm
2. For the radius of the bob = ----------- cm
3. Table for effective length and Time period:

SNo	Effective length (L)			Time period (T)				T^2
	Length of the thread (l)cm	Radius of the bob (r)cm	Effective length L cm	No of Oscsn	Time recorded t(sec)	Time period T= t/n sec	Mean T (sec)	
1.								
2.								
3.								

Graph : To be pasted on left page of the note book after plotting between L and T2. And to find the slope of the graph.

Calculations : Value of L / T^2 to be calculated by finding the slope of the graph and then

$$g = 4\prod 2 \ \frac{L}{T2}$$

The value of g to be calculated.

Result : 1. The graph between L and T2 comes to be a straight line.

2. The value of g comes by experiment = ------------ cms-2.

Percentage Error :

$$\text{Percentage Error} = \frac{Standard\ value - Experimental\ value}{standard\ value} \text{ x100 = ----------\%}$$

Precautions:

1. The bob should be small in size and heavy.
2. The suspension base of the pendulum should be rigid.
3. There should no flow of air at the place of experiment ,otherwise the motion of the bob will not remain linear.

Sources of Errors:

1. The effect of air resistance on the motion of the bob can not be avoided.
2. There may be personal error of starting and stopping the stop watch.

Exp No : 5

Aim /Object : To find the force constant of helical spring by plotting a graph between load and extension.

Appratus Required : Given spring. Pan, 50 g weights(upto about 400g), scale, pointer.

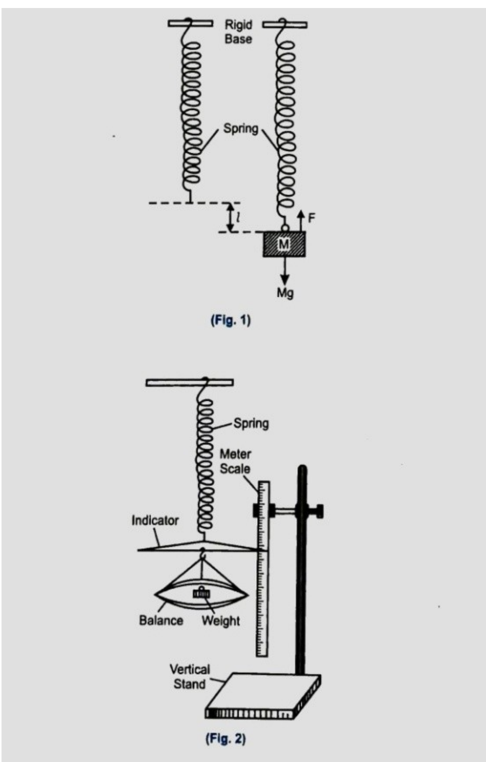
Theory /Formula Used: Let a weight M suspended from the lower end of a weightless spring (upper end being fixed) and the increase in length is L, then:

$$L \propto M$$

If a graph is drawn between the weight M and increase in length L , then it is a straight line . The value of force constant K is obtained from the graph as :

$$K = g\left(\frac{\Delta M}{\Delta L}\right)$$

Diagram : On left page of the note book



Observations:

Table for weight M and expansion L :

SNo	Weight in pan M (g)	Position of pointer		Mean position $= (\frac{a+b}{2})$ cm	Increase in length L cm
		Increasing weight (a) cm	Decreasing weight (b) cm		
1					
2.					
3.					
4.					
5.					
6.					

Calculation:

The graph between M and L is a straight line.

From the graph , ΔL = --------- cm = -------m

ΔM = ---------gm = ----------kg

The Force constant of the given spring is $K = g\left(\frac{\Delta M}{\Delta L}\right)$ = ---------- Nm^{-1}

Result : The Force constant of the given spring is ---------- Nm^{-1}

Precuations:

1. The reading of the pointer must be taken some

Exp No : 6

Aim /Object :

To find the weight of a given body by using the law of parallelogram of forces.

Appratus Required :

Gravesend’s apparatus, hangers and weights, Plane mirror strip, board pins, geometry box, pencil and white paper.

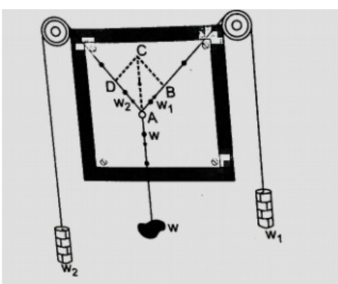
Theory /Formula Used:

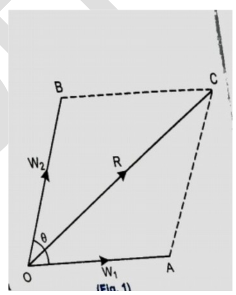
The law of parallelogram of forces states that if two forces acting at a point are represented in magnitude and direction by two adjacent sides of a parallelogram, then their resultant in magnitude and direction is represented by that diagonal of the parallelogram which passes through that point.

Let weights w1 and w2 in magnitude and direction are represented by the side OA and OB of a parallelogram and a third weight w balanced them, then in magnitude of w will be given by the length of the diagonal OC . in mathematical form:

$$W2 = w_1^{\,2} + w_2^{\,2} + 2\, w_1\, w_2 \cos\theta$$

Diagram : On left page of the note book





Observations:

SNo	Weight w1(gm)	Weight w2 (gm)	Length of side AB (cm)	Length of side AD (cm)	Length of digonal AC (cm)	Weight corresponding to digonal AC (gm)	Mean weight W (gm)
1.							
2.							
3.							

Result : The weight of the given body is w= ---------- gm.

Precuations:

1. The wooden board must be vertical.
2. The pulleys must be frictionless.
3. Hangers should not touch the board.
4. The threads must be light, thin and knot free.

Sources of error:

1. Some error may occour in the marking of points using plane mirror.
2. The error introduced due to friction in the pulleys cannot be completely eliminated. Hence re is always some difference in the result.