To Measure the Dimensions of a Given Regular Body of Known Mass Using a Vernier Callipers and Hence Find its Density

Aim

To measure the dimensions of a given regular body of known mass using a Vernier Callipers and hence find its density.

Apparatus

Vernier callipers, a small rectangular metallic block or glass slab of known mass, magnifying lens.

Theory

(i) For measuring dimensions. Same as in Experiment 1 A.
(ii) For volume
Volume of a rectangular block = Length x Breadth x Thickness (height)
Density= Mass/Volume
i.e,.. $\rho = m/V$

Diagram

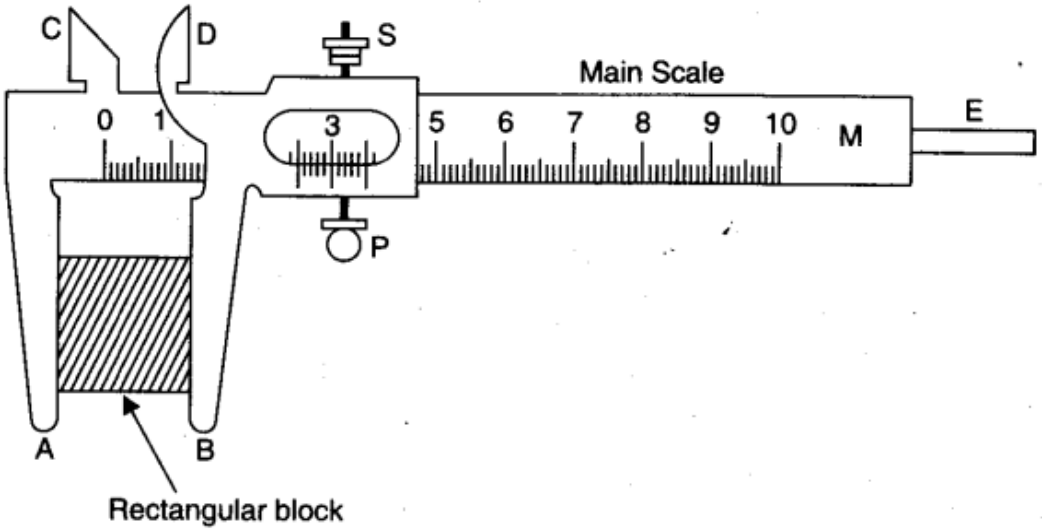

Fig. Vernier callipers—Measuring dimensions of a rectangular metallic block.

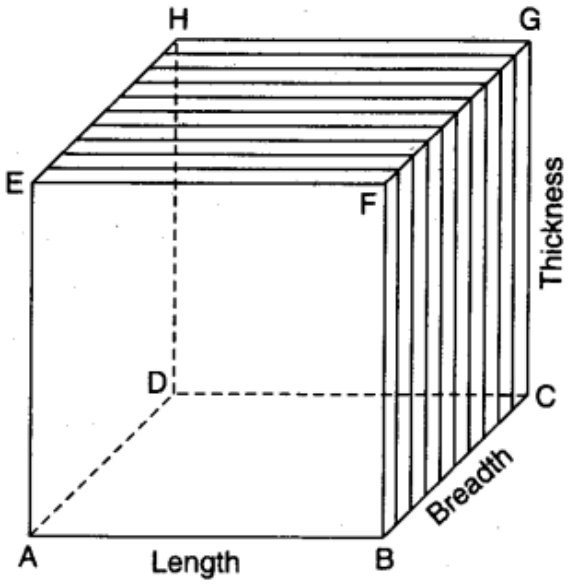

Fig. Rectangular metallic block.

Procedure

1. Proceed in similar manner as in steps 1 to 5 in Experiment 1A.
2. Repeat above steps for the other edge of same face of same dimension.
3. Repeat above steps for other face of same dimension.
4. Repeat steps 1, 2 and 3 above for both edges of both faces of other dimensions.

5. Record your observations in tabular form.
6. Make calculations for each dimension applying zero correction.
7. Take mean of different values of same dimension.
8. Multiply the three mean dimensions to obtain volume of the block.
9. Calculate the density of the block material by dividing its known mass by obtained volume.

Observations

1. Known mass of the block, m =…….g.
2. Determination of Vernier Constant (Least Count) of the Vernier Callipers
   1 M.S.D. = 1 mm 10 V.S.D. = 9 M.S.D.
   ∴ 1 V.S.D. = 9/10 M.S.D. = 0.9 mm.
   Vernier constant, V.C. = 1 M.S.D. – 1 V.S.D. = (1 – 0.9) mm = 0.1 mm = 0.01 cm
3. Zero error = (i)…….cm, (ii)…… cm, (iii)……cm.
   Mean zero error (e) =…… cm
   Mean zero correction (c) = – e =……cm.
4. Table for the length (l)

Serial No. of Obs.	Side	Main Scale Reading (N) (cm)	Vernier Scale Reading		Total Reading	
			No. of Vernier division coinciding (n)	Value [n × (V.C.)]	Observed $l_0 = N + n \times (V.C.)$	Corrected $l = l_0 + c$
1.	AB					$l_1 =$
2.	EF					$l_2 =$
3.	CD					$l_3 =$
4.	GH					$l_4 =$

5. Table for the breadth (b)

Serial No. of Obs.	Side	Main Scale Reading (N) (cm)	Vernier Scale Reading		Total Reading	
			No. of Vernier division coinciding (n)	Value [n × (V.C.)]	Observed $b_0 = N + n \times (V.C.)$	Corrected $b = b_0 + c$
1.	BC					$b_1 =$
2.	FG					$b_2 =$
3.	DA					$b_3 =$
4.	HE					$b_4 =$

6. Table for the thickness (t)

Serial No. of Obs.	*Side*	*Main Scale Reading (N) (cm)*	*Vernier Scale Reading*		*Total Reading*	
			No. of Vernier division coinciding (n)	*Value [n × (V.C.)]*	*Observed $t_0 = N + n \times (V.C.)$*	*Corrected $t = t_0 + c$*
1.	CG					$t_1 =$
2.	BF					$t_2 =$
3.	HD					$t_3 =$
4.	EA					$t_4 =$

Calculations

Mean corrected length of the block,

$$l = \frac{l_1 + l_2 + l_3 + l_4}{4} = \ldots\ldots \text{ cm}$$

Mean corrected breadth of the block,

$$b = \frac{b_1 + b_2 + b_3 + b_4}{4} = \ldots\ldots \text{ cm}$$

Mean corrected thickness of the block,

$$t = \frac{t_1 + t_2 + t_3 + t_4}{4} = \ldots\ldots \text{ cm.}$$

Volume of block, $V = l \times b \times t = \ldots\ldots \text{ cm}^3$

Density of the block material,

$$\rho = \frac{m}{V} = \ldots\ldots \text{ g cm}^{-3}$$

Result

Density of block material = ……g cm^{-3}

Precautions

Same as given in Experiment 1A.

Sources of error

Same as given in Experiment 1A.