

EXPERIMENT PROCEDURE

- Determine the external dimensions of an irregularly shaped body.
- Determine the internal dimensions of an irregularly shaped body.
- Determine depths on an irregularly shaped body.
- Calculate and measure the volume

OBJECTIVE

Measurement of an irregularly shaped body.

SUMMARY

Callipers are used for making precise measurements of quite short lengths. They are suitable for finding internal and external dimensions and depths, as demonstrated in the measurement of an irregularly shaped body. However, calculating a body's volume from the data obtained is comparatively complex. The displacement method is an easier way to determine the volume of an irregularly shaped body.

REQUIRED APPARATUS

Quantity	Description	Number
1	Callipers, 150 mm	1002601
1	Object for Measurement Exercises	1006889
Additionally recommended:		
1	Vessel with Overflow, Transparent	1003518
1	Graduated Cylinder, 100 ml	1002870
1	Laboratory Jack II	1002941
1	Cord for Experiments	1001055
1	Set of 10 Beakers, Tall Form	1002873

1

BASIC PRINCIPLES

One suitable method for determining the volume of an irregularly shaped body is the overflow method. This involves immersing the body in water inside a vessel with an overflow outlet. The water displaced by the body is then collected in a graduated measuring cylinder. The volume of water displaced is equal to the volume V of the body.

In order to avoid systematic errors, callipers must wherever possible be used in such a way that they are not tilted. The accuracy is conventionally increased to resolve fractions of a millimetre by the inclusion of a vernier scale. The full millimetre values are read off from the left of the zero mark on the vernier. The fraction following the decimal point is read off where a mark further over is in line with one of the marks on the vernier. If you have a displacement vessel available, you can determine the volume using the displacement method. The body is completely immersed in a displacement vessel filled with water. The water displaced from this vessel then flows into a measuring cylinder. The volume of water displaced is equal to the volume V of the body.

EVALUATION

As a rule, a dimension is measured multiple times and the accepted result is obtained by taking the average of the individual readings. To calculate the volume, it can be broken down into sub-volumes of regular shapes, which are then added or, in the case of drill holes, for example, subtracted.

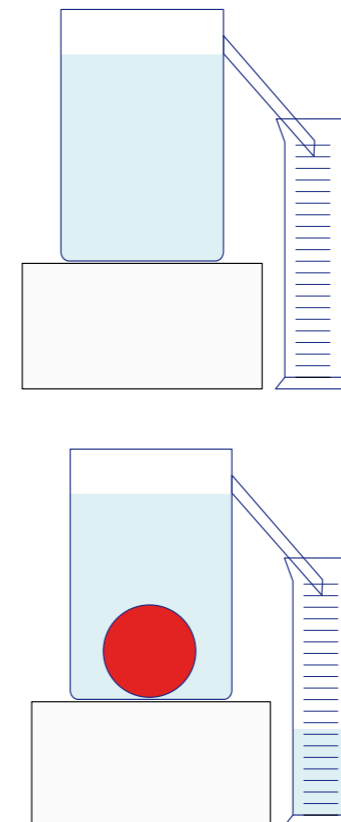


Fig. 6: Schematic illustration of the displacement method

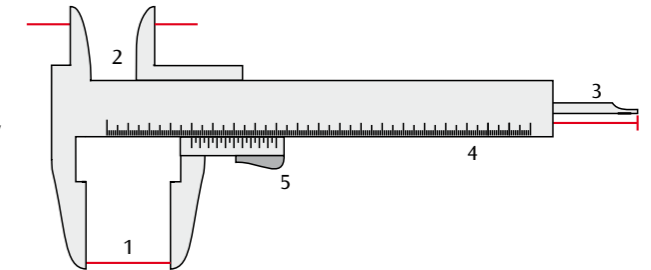


Fig. 1: Prongs for external measurements (1), Prongs (crossed over) for internal measurement (2), Bar for depth measurement (3), Millimetre scale (4), Vernier scale (5)

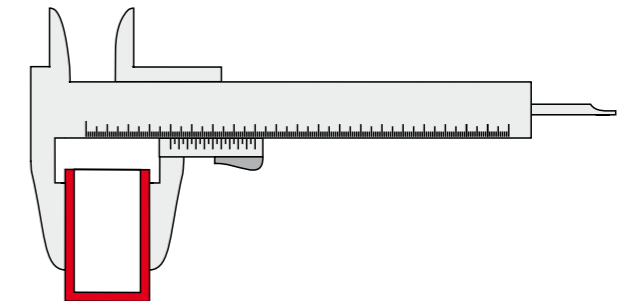


Fig. 2: Determination of external dimensions

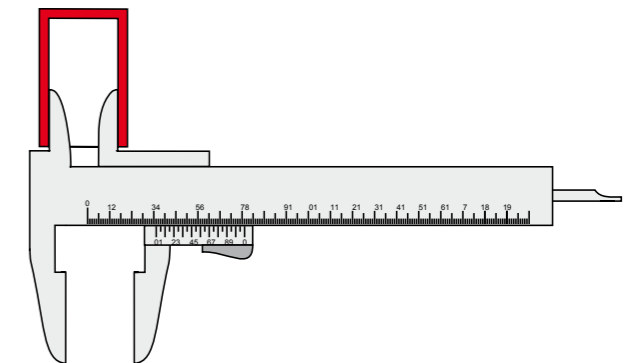


Fig. 3: Determination of internal dimensions

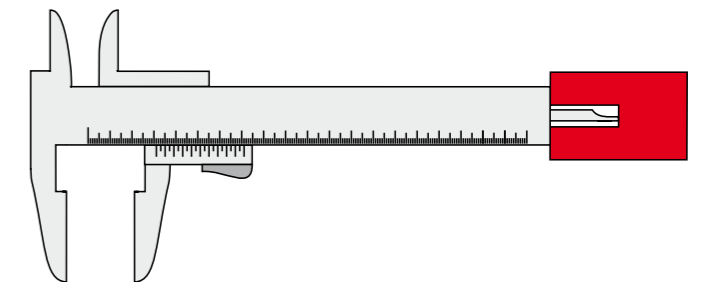


Fig. 4: Determining the depth of a drill hole

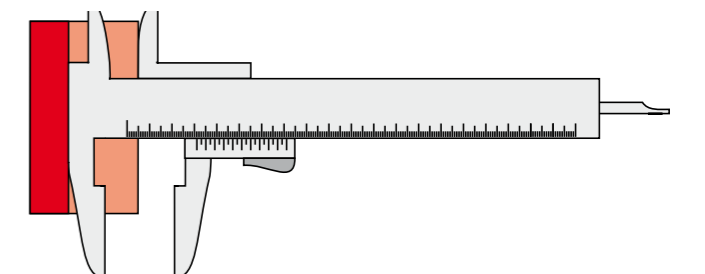


Fig. 5: Determining the height of a step