Measurement of volume

DETERMINING THE VOLUME OF AN IRREGULARLY SHAPED BODY

- Measure the volume *V* of an irregularly shaped body using the overflow method.
- Measure the mass *m* and determine the density ρ of the irregularly shaped body.

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GENERAL 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.

By also measuring the mass *m* of the body, its average density ρ can be determined as follows:

$$\rho = \frac{m}{V} \qquad (1)$$

Fig. 1 Set-up for determining the volume of an irregularly shaped body

LIST OF EQUIPMENT

1	Object for measurement exercise	1006889 (U8404550)
1	Vessel with overflow, transparent	1003518 (U8411310)
1	Graduated cylinder, 100 ml	1002870 (U14205)
1	Beaker, squat	1002872 (U14210)
1	Laboratory jack I	1002943 (U15022)
1	Mechanical balance 610	1003420 (U42001)
1	Cord for experiments	1001055 (U8724980)

SET UP AND PROCEDURE

- Place the vessel with the overflow outlet on top of the laboratory jack and set it up in such a way that the overflow outlet is directly above the cylinder.
- Fill the vessel with enough water to ensure that the outlet is filled with liquid and is free of bubbles with the water flowing into the graduated cylinder.
- Empty the graduated cylinder and put it back under the overflow outlet.
- Measure the mass *m* of the object for this measurement exercise and make a note of it.
- Attach the object to a length of cord and lower the object into the vessel until it is fully immersed in water.
- Measure the displaced volume of water *V* and make a note of it.
- Determine the average density ρ and compare it with values quoted in literature for various materials.

SAMPLE MEASUREMENT AND EVALUATION

Table 1: Mass *m*, volume *V* and density ρ of the object for the measurement exercise.

m / g	*V* / cm³	ρ / g/cm³
203	76	2,67

Quoted value for aluminium: ρ = 2.7 g/cm³

The density measured matches the density quoted in literature for aluminium. The object is made from aluminium.