

SNAP IT!

Find a small irregular object denser than water and drop it gently inside a measuring jug filled to the 300 ml mark with water. Take a photo of the jug before and after adding your object and calculate the density of your object in kg/m^3 .

WORKIT!

What is the density of the irregular rock in the diagram? (2 marks)

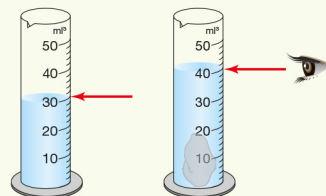
The mass of the rock is $m = 25 \text{ g} = 0.025 \text{ kg}$, and its volume is the difference in the volumes recorded in the measuring cylinder before and after dropping in the rock,

$$V = 10 \text{ cm}^3 = 0.00001 \text{ m}^3 \quad (1)$$

So, using the density equation, we get

$$\rho = \frac{m}{V} = 0.0025 / 0.00001 \\ = 2500 \text{ kg/m}^3 \quad (1)$$

Remember to put mass into kg.



Practical Skills

You might have used micrometers and vernier callipers to measure the dimensions of regular objects and to calculate their volume in density investigations.

Reading vernier and micrometer scales can be tricky.

The Vernier scale in the diagram reads 2.6 mm.

The 0 mark on the lower scale is between 2 mm and 3 mm on the upper scale, so we know that the vernier calliper is measuring an object that is 2 mm and something wide. To find out the tenth of millimetres measured by the calliper, we need to check that the mark on the lower 0–10 scale aligns exactly with one of the marks on the top scale. In our diagram, this is mark 6, so the reading is 2.6 mm, or 0.0026 m.

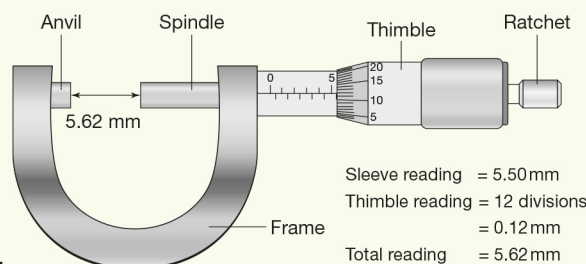
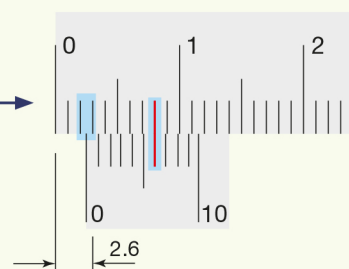
Most micrometers can measure objects' thicknesses and diameters to the nearest 100th mm (0.01 mm). A full turn of the thimble measures a length of 0.5 mm.

So, you first read the numbers on the sleeve (in our example, 5.50 mm).

Then, read which mark on the thimble aligns with the middle line on the sleeve (in our example, 0.12 mm).

Finally, add the two readings together ($5.50 + 0.12 = 5.62 \text{ mm}$).

Can you convert all these readings to cm or m?



CHECK IT!

- 1 What does the density of a material depend on?
- 2 The density of the element mercury is 13534 kg/m^3 . What volume would 2.3 kg of mercury have?
- 3 0.250 kg of fresh water has a volume of 250 cm^3 . The average density of the human body is 985 kg/m^3 . Explain (with calculations) why a person would float better in the Dead Sea than in a fresh water lake, knowing that 0.250 kg of Dead Sea water has a volume of about 202 cm^3 .