Chapter 6 Properties of materials

Short investigation 6.1: Measuring density

Name: .....

Aim

To determine the average density of objects with varying composition

Materials

Electronic scales, 250 mL beaker, 600 mL beaker, measuring cylinder, golf ball, small block of aluminium, small wooden block, plastic toy, water

Note: the blocks and the plastic toy need to be small enough to fit completely in the 250 mL beaker.

Method

1. Use the scales to measure the mass of the aluminium block (in g) and note this in table 6.1A.
2. Place the 250 mL beaker inside the 600 mL beaker, then carefully fill the 250 mL beaker with water all the way to the top. Ensure that no water flows into the 600 mL beaker while you do this.
3. Carefully lower the aluminium block into the filled beaker. Water should overflow into the 600 mL beaker.
4. Remove the 250 mL beaker. Pour the water from the 600 mL beaker into the measuring cylinder to determine the volume of water (in mL) that has been displaced by the block. Enter this value into table 6.1A.
5. Repeat steps 1–4 for the wooden block, the golf ball and the plastic toy.

Results

Table 6.1A

Object	Mass (g)	Volume (mL)
Aluminium block		
Wooden block		
Golf ball		
Plastic toy		

Analysing the results

1. Determine the density of each of the objects (in g cm^{-3}) by using entering your results into the density equation, $\rho = \frac{\text{mass}}{\text{volume}}$. Note that 1 cm^3 = 1 mL.

   (a) Aluminium:

   (b) Wood:

   (c) Golf ball:

   (d) Plastic:

2. The density of aluminium is theoretically equal to 2.70 g cm^{-3}. Determine the investigational error in the value you obtained in (a):

$$\text{experimental error} = \left| \frac{\text{theoretical value - experimental value}}{\text{theoretical value}} \right| \times 100\%$$

3. What were the main sources of error in this investigation? How, if possible, may they be minimised in future?

4. Would you expect all golf balls to have the same density as the one you have used here? Explain your answer.

Conclusion

State the principle that was used to determine the volume of objects in this investigation and whether the values of density obtained were consistent with theoretical values.

Notes:

