

WJEC Wales Physics GCSE

SP1.3b: I-V Density Practical Notes

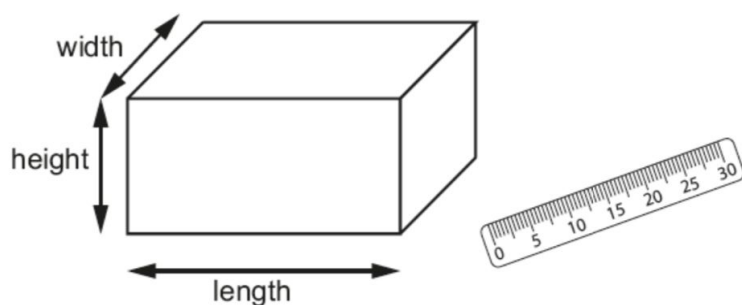


Determination of the density of solids and liquids

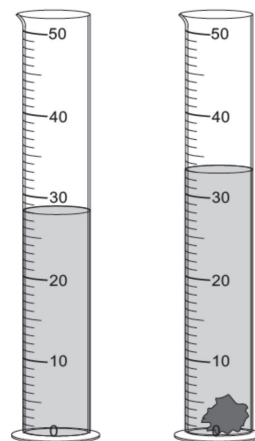
Equipment:

- Balance
- Ruler
- 2 regular solids (e.g. a cube)
- 2 irregular solids (e.g. an oddly-shaped stone)
- Measuring cylinder

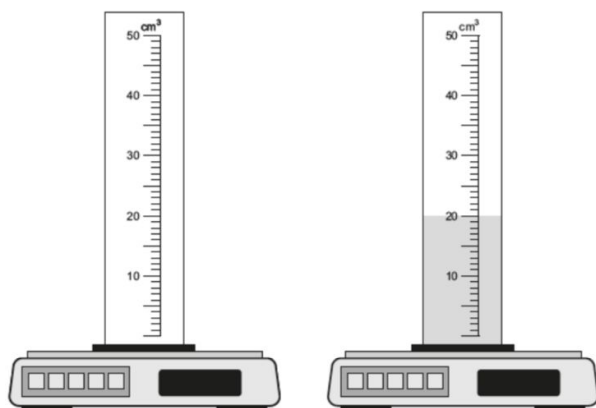
Diagrams



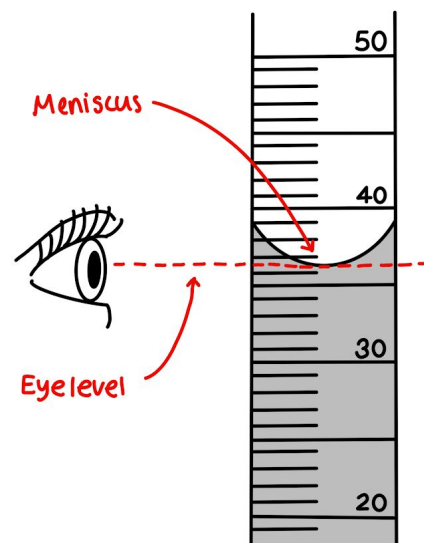
[Image: WJEC](#)



[Image: WJEC](#)



[Image: WJEC](#)



Methods

Regular solids

1. Use the balance to determine the **masses** of the regular solids.
 - Ensure the balance is zeroed before placing the solids on top.
 - Measure mass in grams.
2. Use the ruler to measure the height, width, and length of the solids and multiply them for each solid (height x width x length) to obtain the **volume**.
 - For another shape, take the appropriate measurements to calculate its volume (i.e. radius (r) and height (h) of a cylinder using $\pi r^2 h$).
 - Ensure all measurements are in cm.
3. Use the formula $density = \frac{mass}{volume}$ to calculate the densities of the solids.
 - Mass must be in g and volume must be in cm^3 .

Irregular solids

1. Use the balance to determine the **masses** of the irregular solids.
 - Ensure the balance is zeroed before placing the solids on top.
 - Measure mass in grams.
2. Start with a known volume of water in the measuring cylinder and place the first irregular solid into the water and measure the new volume.
 - Ensure no water splashes out of the cylinder, the amount of liquid inside must remain constant (although the reading will change).
 - The **change in volume** of the water is equal to the volume of the solid.
 - $1\text{ ml} = 1\text{ cm}^3$.
3. Repeat the process for the other irregular solid.
4. Use the formula $density = \frac{mass}{volume}$ to calculate the densities of the solids.
 - Mass must be in g and volume must be in cm^3 .

Liquid

1. Use the balance to determine the **mass** of the liquid.
 - Place the **empty** measuring cylinder on the balance and zero it.
 - Fill the cylinder with water and take the reading (this can be any volume of liquid but ensure that whatever volume you use is recorded).
2. Use the formula $density = \frac{mass}{volume}$ to calculate the density of the liquid.
 - Mass must be in g and volume must be in cm^3 .

Tips

- Take all measurements for the liquid from the **meniscus**.
 - Water sits higher at the edges of a container compared to the centre. The meniscus is the **lowest point** of the water (the centre).
- When using a measuring cylinder, ensure the cylinder is on a level surface and take readings from eye-level to avoid **parallax error**.
- For solids that float; either push the solid down into the water until it is just fully submerged or weigh it down with something of a known volume and subtract that value from the change in volume (this method is more accurate).



Safety Precautions

- Take care when pouring the water into the measuring cylinder to ensure that none of the water gets onto the electronic balance. Water can break the balance or cause a fire if it comes into contact with any of the wires.

