

Edexcel Physics GCSE

Topic 14.3: Particle Model

Practical notes

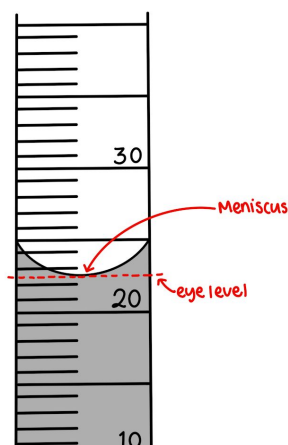


Core Practical 6: Investigate the densities of solids and liquids

Equipment

- Balance
- Ruler
- Regular solid (e.g. a cube)
- Irregular solid (e.g. an oddly-shaped stone)
- Measuring cylinder

Diagram



Method

1. Use the balance to determine the mass of the regular and irregular solids.
 - Ensure the balance is zeroed before placing the solids on top
 - If the mass is displayed in grams, divide it by 1000 to get the mass in kilograms
2. Use the balance again 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)
3. Use the ruler to measure the height, width and depth of the cube and multiply them to obtain the volume of the cube.
 - For another shape, take the appropriate measurements and use a relevant equation to calculate the volume (i.e. radius and height of a cylinder for $\pi r^2 h$)
 - Ensure all measurements are in metres
4. Start with a known volume of water in the measuring cylinder and place the stone (or other irregular solid) into the water and measure the new volume.
 - Ensure no water splashes out of the cylinder (the amount of liquid inside must not change, although the reading should increase)
 - The **change in volume** of the water is equal to the volume of the solid
 - Convert from ml to m³ by dividing by a million (1,000,000)
5. Use the formula $density = \frac{mass}{volume}$ to calculate the densities of the solids and the liquid.
 - Mass must be in kg and volume must be in m³

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, you can either push the solid down into the water until it is just fully submerged, or you can 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.

