

Measuring mass and volume accurately

Grade 6 science (Year 7 · Class 6) · Lab

Name: _____ Date: _____ Class: _____

Does the heaviest stone always take up the most space? In this lab you measure the mass of four stones on a balance and their volume by displacement, then compare the two rankings. Everything fits on a school bench.

Level: Grade 6 science (Year 7 · Class 6) · **Curriculum:** SEP measurement

Aim

To find the mass and the volume of four small stones, and to compare the order of their masses with the order of their volumes.

Equipment

- 100 mL graduated cylinder
- 4 small stones, each tied to a 30 cm thread
- Balance (0.1 g steps)
- Water and a dropper
- Paper towel

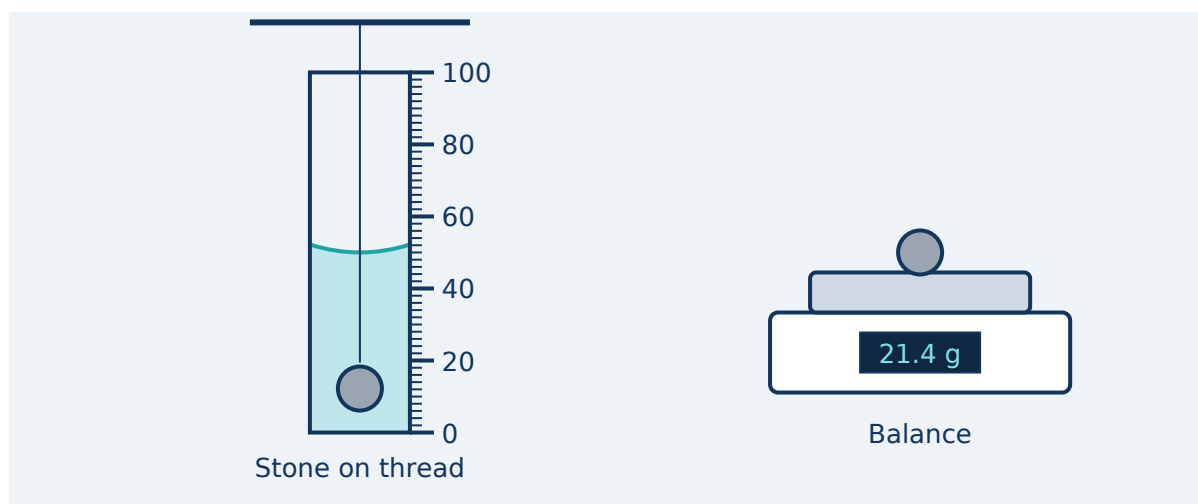
Safety

Safety

Mop up any spilled water at once so nobody slips. Lower the stones gently down the side of the cylinder so the glass does not crack.

Method

1. Check that the balance reads zero, then find the mass of each stone and record it.
2. Pour water into the cylinder up to about 50 mL and use the dropper to set the bottom of the meniscus on 50 mL.
3. Hold stone A by its thread and lower it slowly until it is fully under water. Read the new level with your eye level with the surface.
4. Remove the stone, dry it, and check that the level returns to 50 mL.
5. Repeat for stones B, C and D.



The water level is read before and after the stone goes in; the balance gives the mass.

Results

Stone	Mass (g)	Start level (mL)	Final level (mL)	Volume (cm ³)
A	21.4	50	58	to calculate
B	37.9	50	64	to calculate
C	12.6	50	55	to calculate
D	18.0	50	65	to calculate

Analysis questions

Question 1 Volumes of the stones

Calculate the volume of each stone.

Question 2 Two orders

List the stones from smallest to largest by mass, then by volume. Are the lists the same?

Question 3 All four together

Calculate the total mass of the four stones and predict the water level if all four were lowered into 50 mL of water.

Question 4 Repeat readings

Three trials for stone A gave volumes of 8 cm³, 9 cm³ and 8 cm³. Calculate the mean volume to one decimal place.

Question 5 Uncertainty

Each level reading is uncertain by ± 0.5 mL, so each volume is uncertain by ± 1 mL. Calculate the percentage uncertainty in the volume of stone C and of stone B.

Question 6 Sources of error

Describe two things that could make the volumes wrong.

Question 7 Improvement

Suggest one change that would give a more precise volume for stone C.