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Question 4 (Answer: **B**)

- Whether one liquid floats on another depends on *density*, not on total mass or volume.
- A liquid floats if it is less dense than the one below it.
- So liquid P must have the lower density.

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Question 4 (Answer: **C**)

- Work out each liquid's density from its mass and its volume.
- The least dense floats on top and the densest sinks to the bottom.
- So rank the three by density and read the order from the top down.

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Question 5 (Answer: **D**)

- The least dense liquid floats on top and the densest sinks to the bottom.
- The densities are R 1.2, P 1.8, Q 2.4 g/cm^3.
- So from the top down the order is R, then P, then Q.

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4(a)(i)	930 kg / m^3
4(a)(ii)	1400 N
	(Δ)p = ρg(Δ)h **OR** 930 × 9.8 × 1.1 **OR** 10 000 (N / m^2)
	area = length × width **OR** 0.45 × 0.30 **OR** 0.14 (m^2)
	(F=) p × A **OR** 10 000 × 0.14
	Alternative method:
	1400 N
	volume (of liquid above block) = length × width × height **OR** 0.45 × 0.30 × 1.1 **OR** 0.15 (m^3)
	mass (of liquid above block) = ρ × v **OR** 930 × 0.15 **OR** 140 (kg)
	(F =) mg **OR** 140 × 9.8
4(b)	thermal expansion **OR** to prevent buckling / bending when heated
	any **one** from: • particles vibrate faster • particles have greater speed / kinetic energy / momentum • vibrations (of particles) take up more space • (average) space / separation between particles increases
4(c)	(plastic is a good) insulator / poor conductor
	(handle) will not get too hot to touch **OR** reduces heat flow to hand

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1(a)(i)	l = 6.9 (cm) w = 2.5 (cm) h = 3.0 (cm) all to nearest mm
1(a)(ii)	V_A = 52 (cm^3)
1(b)	irregular dimensions / owtte repeat in **several places** (for each dimension) and take averages
1(c)	effect of uncertainties increased/ larger % uncertainty/owtte
1(d)(i)	V_1 = 152 (cm^3)
1(d)(ii)	line of sight perpendicular / owtte
1(e)	V_2 present and $V_B = V_2 - V_1$
1(f)	suitable source of inaccuracy e.g. graduations on measuring cylinder too large / thread affects volume / cylinder is wide / clay may absorb water matching improvement e.g. use smaller measuring cylinder / more precise scale / thinner thread / no thread and place carefully / measure volume of thread / narrower cylinder / cover clay with paint or cling film

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Question 3 (Answer: **D**)

- Identical dimensions means the two blocks have identical volume.
- Different force-meter readings mean different weights, so different masses.
- Same volume with different mass means different density – the heavier block is the denser one.

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1(a)(i)	two measurements in cm 2.7 and 2.5, both given to nearest mm
1(a)(ii)	correct average: expect 2.6 (cm)
1(a)(iii)	any reasonable advantage for the method in the question given **OR** it is difficult to measure the diameter directly **OR** hard to find centre of ball
	a ruler for measuring the diameter directly would give rise to parallax errors
1(b)	V = 9.1(4)
	unit: cm^3
1(c)	correct **method** for calculation of m_B shown
	m_B = 11.6 (g)
1(d)	ρ on answer line correctly calculated to 2 or more significant figures
	unit: g / cm^3
	answer given to 2 or 3 significant figures

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Question 4 (Answer: **B**)

- Convert to matching units first: $2.5\ \text{kg} = 2500\ \text{g}$.
- $\rho = m/V = 2500/480$.
- $= 5.2\ \text{g/cm}^3$.

Question 4 (Answer: **A**)

- Density is mass divided by volume: X = 120/200 = 0.60, Y = 80/67 = 1.2, Z = 100/120 = 0.83 g/cm^3.
- The least dense liquid floats on top and the densest sinks to the bottom.
- So from the top down the order is X, then Z, then Y.