

Density

Mark Scheme 1

Level	IGCSE
Subject	Physics
Exam Board	CIE
Topic	General Physics
Sub-Topic	Density
Paper Type	Alternative to Practical
Booklet	Mark Scheme 1

Time Allowed: 44 minutes

Score: /36

Percentage: /100

- 1 (a) (i) $l = 14.7$ AND $d = 2.5$ [1]
- (ii) boiling tube between blocks and ruler spanning gap [1]
- suitable precaution e.g. [1]
measure in (at least) 2 places and take average,
avoid lip,
ensure blocks smooth,
no dirt between tube and block
- (iii) $V_1 = 72$ [1]
- (b) (i) $V_2 = 54$ [1]
- (ii) line of sight perpendicular to reading /
read from bottom of meniscus [1]
- (iii) V_3 correctly calculated [1]
- (c) (i) $\rho = 1.7$ to 1.8 [1]
unit g/cm^3 [1]
- (ii) $m = 32$ (g) [1]
- (d) suitable source of inaccuracy [1]
e.
 - any reference to why tube is not a cylinder,
 - tube may contain some water when mass taken,
 - difficult to fill to brim and then pour out
- appropriate effect on value of ρ explained [1]

[Total: 12]

- 2 (a)(i)(ii) $m_1 = 40.68$ (g) and $m_2 = 113.60$ (g)
correct answer only (not 40:68, 113:60) [1]
- (iii) $V_1 = 72$ (cm³) correct answer only [1]
- (iv) ρ_1 with unit of g/cm³ or kg/m³ seen in (a), (b) or (c) and not contradicted
(unit must match value) [1]
- (b)(i)(ii) $m_3 = 15.47$ (g) and $V_2 = 88$ (cm³) correct answer only [1]
- (iii) $V_3 = 16$ (cm³)/ecf
- (iv) ρ_2 to 2/3 sig. figs. [1]
- (c) $\rho_{AV} 0.99(1)$ (g/cm³) **or** 991/990 (kg/m³) **or** ecf from (a) and (b) [1]
- (d) any one from:
• take reading perpendicularly/at right angles to scale
• read bottom of meniscus
• other suitable precaution [1]
- (e) appropriate source of inaccuracy, other than in (d)
e.g. balance not at zero/test-tube catches on side of measuring cylinder [1]
- matching effect on ρ with explanation
e.g. ρ greater as mass reading larger/ ρ greater as volume smaller [1]

[Total: 10]

- 3 (a) (i) $h = 2.5$, $w = 2.7$, and $d = 2.7$ [1]
- (ii) $V_A = 18.225 \text{ (cm}^3\text{)}$ to 2 or more sig. figs. ecf (i) [1]
- (iii) density = 3.22 g/cm^3 to 2 or 3 sig. figs. ecf (ii) [1]
unit needed, penalise additional sig. figs.
- (b) diagram showing blocks and rule correctly used – blocks touching the sphere, and rule spanning gap and touching blocks [1]
- (c) $V_1 = 66 \text{ (cm}^3\text{)}$ [1]
- (ii) line of sight at right angles to measuring cylinder [1]
- (d) $V_B = 18 \text{ (cm}^3\text{)}$ ecf from candidate's V_1 [1]
- (e) any two from:
measuring cylinder not sensitive owtte
some clay left on fingers
cube not perfectly shaped/difficult to measure owtte
air bubbles clinging to modelling clay/within the modelling clay
volume of string
difficult to judge the bottom of the meniscus/bubble on meniscus [2]
ignore parallax
do not credit poor experimental practice e.g. spills or splashes

[Total: 9]

- 4 (a) $V_1 = 66 \text{ (cm}^3\text{)}$ [1]
 $V_2 = 83 \text{ (cm}^3\text{)}$ [1]
- (b) density = 6.7 or 6.71 / allow e.c.f. [1]
unit g/cm^3 [1]
- (c) suitable cause:
e.g. object not dried before measuring ma
mass measured after immersion
measuring cylinder not read at eye-level / parallax explained
measuring cylinder not read at meniscus (o.w.t.t.e.)
zero reading on balance not allowed for [1]

[Total: 5]