

Moments/Centre of Mass

Mark Scheme 1

Level	IGCSE
Subject	Physics
Exam Board	CIE
Topic	General Physics
Sub-Topic	Moments/ Centre of Mass
Paper Type	Alternative to Practical
Booklet	Mark Scheme 1

Time Allowed: 53 minutes

Score: /44

Percentage: /100

Question	Answer	Marks
1(a)(i)	A and B values correct A:40.0, 35.0, 30.0, 25.0, 20.0 B:34.0, 28.8, 24.0, 19.2, 14.0	1
1(a)(ii)	cm, cm, N cm, N cm	1
1(b)	Gra Axes correctly labelled with quantity, right way round Appropriate scales, starting at origin (0,0) All plots correct to ½ small square Good line judgement, thin, continuous, single line through the plots; with neat plots	1 1 1 1
1(c)	Method shown on graph and Y correct to ½ small square.	1
1(d)	$W = 1.0-1.4$. No ecf	1
1(e)	Difficulty of achieving balance or other sensible suggestion	1
1(f)	Expect agree; allow ecf. Explanation includes idea of close enough (or, ecf, too different)	1
		Total 10

Question	Answer	Marks
2(a)	x shown clearly from centre of P to pivot	1
2(b)	M Q into a cube/regular shape/small contact area with rule	1
2(c)	Move Q or P slowly one way until it just tips, then back other way until it tips back and take middle reading OR repeat procedure/experiment AND take average	1
2(d)	Measure width w of cube Place w/2 either side of desired position <u>OR</u> draw centre line on cube/find centre of mass of cube and mark side of rule in desired position <u>OR</u> take readings on both sides of the cube and find the mean	1 1
2(e)	Place rule on pivot (without P and Q) and record/find balance point	
		Total: 6

- 3 (a)** table:
at least 2 d values correct: 30.0, 24.2, 19.8, 17.2, 15.0 (cm) to ± 0.5 cm [1]
(accept values 50– d) [1]
rule readings subtracted from 50 cm [1]
all 5 d values correct: 30.0, 24.2, 19.8, 17.2, 15.0 (cm) to ± 0.2 cm [1]
 $1/d$ values correct (note: at least 2 significant figures) [1]
- (b)** any one difficulty and corresponding solution from:
difficulty obtaining balance as rule tips one way then the other
allow to tip one way then the other and take average

mass obscuring marks on rule
mark centre of the mass so it can be read against rule
OR take average of right hand and left hand readings for mass position

mass sliding off rule
OR rule sliding off pivot
suitable means for preventing mass or rule sliding [max 2]
- (c)** graph:
axes labelled with quantity and unit [1]
scales suitable, plots occupying at least half grid [1]
plots all correct to $\frac{1}{2}$ square (take centre of plot if large) [1]
well-judged thin line ($\leq \frac{1}{2}$ square) [1]
- (d)** triangle method used and shown (any indication on graph) using at least half line
(can be seen in calculation) [1]
- (e)** $\mu = 27 - 33$ (g) to 2 or 3 significant figures [1]

- 4 (a) apparatus:
measuring cylinder/jug OR ruler OR balance (to measure amount of water) [1]
protractor OR rule to measure height of raised surface
OR other means of measuring angle of tilt
OR newtonmeter to apply variable force
OR other method of applying quantifiable force [1]
- instructions:
method of tilting or applying variable force and measuring point at which bottle topples [1]
- attention to accuracy, any two from:
just starts to topple
slowly
repeats / more than 10 values for quantity of water
very large protractor
or any other suitable precaution which would improve accuracy of data [max 2]
- values:
at least 5 values with range at least 1500 cm³ or 30 cm or 1500 g, approximately evenly spaced [1]
- graph:
plot of measured variable (angle or height or force) against quantity of water
(volume or height or mass) (accept vice versa) [1]
- (b) 20° [1]

- 5 (a) $x = 1.4$ (cm) or 14 (mm) or 0.014 (m) [1]
AND $y = 2.6$ (cm) or 26 (mm) or 0.026 (m)
- correct unit for x and y [1]
- (b) X and Y both $10 \times x$ and y , ecf (a) [1]
 $W = 1.08$ (N), to 2 or more significant figures (ecf allowed) [1]
- (c) sensible position indicated for Z , between pivot and centre of rule [1]
- (d) statement matches results [1]
(expect Yes, ecf from (b) only if difference $>10\%$)
- justified with reference to results; must include idea of being close enough to be within limits of experimental accuracy, ecf (b) [1]
- (e) difficulty in achieving balance OR difficulty in positioning load exactly, e.g. load covers rule markings or uncertainty about position of centre of mass of load [1]

[Total: 8]