

Forces-Hooke's law

Mark Scheme 1

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Forces Hooke's law
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 1

Time Allowed: 53 minutes

Score: /44

Percentage: /100

- 1 (a) (i) Straight line through origin B1
- (ii) Strain (energy) OR elastic (energy) B1
- (b) Use of $\frac{1}{2}mv^2$ C1
- $0.5 \times 2.5 \times v^2 = 0.48$ C1
- $v^2 = 0.48 / (0.5 \times 2.5)$ OR $v^2 = 0.384$ C1
- $v = 0.62 \text{ m/s}$ A1

[Total: 6]

- 2 (a) strain / elastic (potential) (energy) B1
- (b) (i) (KE =) $\frac{1}{2}mv^2$ in any form C1
- 1200 J A1
- (ii) (G)PE (gained) = KE (lost) in any form C1
- (G)PE = mgh OR $h = PE \div mg$ in any form C1
- 1.8 m e.c.f. from (b)(i) A1
- (iii) friction with air OR air resistance OR thermal energy / heat produced/lost B1
- (c) (i) limit of proportionality B1
- (ii) Hooke's law B1

- 3 (a) (i) straight line between A and B B1
- (ii) limit of proportionality B1
- (b) (WD =) $\frac{1}{2} F \times d$ OR $F_{\text{ave}} \times d$ OR 6.0×0.030 OR 18 (J) C1
 0.18 J A1
- (c) (i) ($x =$) 2.0 (cm) OR $6.0 - 4.0$ OR $F = kx$ OR 4.0 (N/cm) C1
 $12.0 \times 2.0 / 3.0$ OR 4.0×2.0 OR 8.0 (N) C1
 0.80 kg OR 800 g A
- (ii) ($e =$) 1.0 (cm) OR ($\Delta e = -$)1.0 (cm) C1
 4.0 N OR 4.0 N A1

[Total: 9]

- 4 (a) (i) Hooke's Law B1 [1]
- (ii) straight line (graph) / constant gradient B1
 through origin/(0,0) B1 [2]
 ignore through zero
 ignore extension proportional to load
- (b) curved extension to graph with increasing gradient, condone decreasing NOT if any part of curve is vertical/horizontal or has negative gradient B1 [1]

[Total: 4]

- 5 (a) extension (of spring) proportional to load/force (applied) B1
 OR load/force (applied) proportional to extension
 OR force = constant \times extension
 OR extension = constant \times force
 OR $F = kx$ in any form with symbols explained
- (b) (graph is through the origin AND is a straight line/has a constant gradient B1
- (ii) $F = kx$ in any form OR ($k =$) F/x C1
 use of a point anywhere on graph e.g. 50/20
 2.5 N/mm OR 2500 N/m A3
- (iii) from 50 mm extension, graph curves with no negative gradient B1
- (iv) straight line through origin with smaller gradient than graph shown finishing at more than 50 mm B1

[Total: 7]

- 6 (a) ($W =$) mg or 0.25×10 or 250×10 or 2500 C1
 2.5 N A1 [2]
- (b) (i) limit of proportionality or (the point where) proportionality between force and extension stops or Hooke's Law no longer obeyed (condone elastic limit) B1 [1]
- (ii) gradient or numbers from graph divided e.g. $4.5 \div 10$ C1
 0.45 N/cm or 45 N/m A [2]
- (c) 0 (N) or zero or no net force etc. (ignore absent unit; wrong unit loses mark) B1 [1]
- (ii) 1. 0.9 N (accept $0.8 \text{ N} < \text{value} < 1.0 \text{ N}$) [1]
 2. ($a =$) F/m or 0.90/0.12 (e.c.f. from 2(c)(i)) C1
 7.5 m/s² (e.c.f. from 2(c)(i)) A1 [2]

[Total: 9]