



Rewarding Learning

**General Certificate of Secondary Education
2011–2012**

Science: Double Award (Modular)

Forces and Energy

End of Module Test

Higher Tier

C

[GDC02]

THURSDAY 24 MAY 2012

9.15 am–10.00 am

**MARK
SCHEME**

		AVAILABLE MARKS
1	(a) Arrow tangentially upwards [1]	
	(b) Momentum = Mass \times Velocity or $p = mv$ [1] $= 0.6 \times 3.0$ [1] $= 1.8$ (kg m/s) [1]	4
2	(a) $2\text{ N} \equiv 6\text{ cm}$ [1] $1\text{ N} \equiv 3\text{ cm}$ [1] $5\text{ N} \equiv 15\text{ cm}$ [1]	4
	(b) Permanently deformed [1]	4
3	Pressure = $\frac{\text{Force}}{\text{Area}}$ or $P = F/A$ [1] $= \frac{650}{0.02}$ [1] $= 32500$ [1] Pa or N/m^2 [1]	4
4	(a) 5 or 6 points correct [1] Straight line through (0,0) [1]	5
	(b) e.g. Grad. = Velocity [1] $= \frac{300}{10}$ [1] $= 30$ (m/s) [1]	5
5	(a) Efficiency = $\frac{\text{Useful output energy}}{\text{Input energy}}$ [1] $= \frac{240}{1500}$ [1] $= 0.16$ or 16% [1]	4
	(b) 1260 (J) [1]	4
6	(a) $WD = F \times d$ [1] $= 120 \times 1.5$ [1] $= 180$ (J) [1]	6
	(b) Power = $\frac{WD}{t}$ [1] $= \frac{180}{15}$ [1] allow e.c.f. from (a) $= 12$ (W) [1]	6

		AVAILABLE MARKS
7	(i) Geothermal	[1]
	(ii) Wind or Wave or Solar	[1]
	(iii) Gas	[1]
8	Average velocity = displacement/time [1] = 8/25 [1] = 0.32 (m/s) [1]	[3]
9	(a) String not tied at c of g (or middle) or weight provides a (turning) moment or moments not balanced	[1]
	(b) CM = ACM [1] W × 10 [1] = 8 × 6 [1] W = 4.8 (N) [1]	[4]
10	Distance = area under graph [1] = (10 × 15) [1] + $\frac{1}{2}$ (30 × 15) [1] = 375 (m) [1]	[4]
11	$F_R = 12000$ (N) [1] $F_R = ma$ [1] 12000 = 800 × a [1] a = 15 (m/s ²) [1]	[4]
12	PE = KE [1] $KE = \frac{1}{2}mv^2$ [1] 6750 = $\frac{1}{2} \times 15 \times v^2$ [1] v = 30 (m/s) [1]	[4]
Total		50