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 × Velocity **or** p = mv [1] = 0.6 × 3.0 [1] = 1.8 (kg m/s) [1]	[3]	4
2	**(a)** 2 N ≡ 6 cm [1] 1 N ≡ 3 cm [1] 5 N ≡ 15 cm [1]	[3]	
	(b) Permanently deformed	[1]	4
3	Pressure = $\frac{\text{Force}}{\text{Area}}$ **or** P = F/A [1] = $\frac{650}{0.02}$ [1] = 32 500 [1] Pa or N/m^2 [1]	[4]	4
4	**(a)** 5 or 6 points correct [1] Straight line through (0,0) [1]	[2]	
	(b) e.g. Grad. = Velocity [1] = $\frac{300}{10}$ [1] = 30 (m/s) [1]	[3]	5
5	**(a)** Efficiency = $\frac{\text{Useful output energy}}{\text{Input energy}}$ [1] = $\frac{240}{1500}$ [1] = 0.16 or 16% [1]	[3]	
	(b) 1260 (J)	[1]	4
6	**(a)** WD = F × d [1] = 120 × 1.5 [1] = 180 (J) [1]	[3]	
	(b) Power = $\frac{WD}{t}$ [1] = $\frac{180}{15}$ [1] allow e.c.f. from (**a**) = 12 (W) [1]	[3]	6

			AVAILABLE MARKS
7	**(i)** Geothermal	[1]	
	(ii) Wind **or** Wave **or** Solar	[1]	
	(iii) Gas	[1]	3
8	Average velocity = displacement/time [1] = 8/25 [1] = 0.32 (m/s) [1]	[3]	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]	5
10	Distance = area under graph [1] = (10 × 15) [1] + $\frac{1}{2}$ (30 × 15) [1] = 375 (m) [1]	[4]	4
11	F_R = 12 000 (N) [1] F_R = ma [1] 12 000 = 800 × a [1] a = 15 (m/s^2) [1]	[4]	4
12	PE = KE [1] KE = $\frac{1}{2}$ mv^2 [1] 6750 = $\frac{1}{2}$ × 15 × v^2 [1] v = 30 (m/s) [1]	[4]	4
		Total	**50**