



Rewarding Learning

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

Science: Double Award (Modular)

Forces and Energy

End of Module Test

C

Higher Tier

[GDC02]

MONDAY 14 NOVEMBER 2011

1.30 pm–2.15 pm

**MARK
SCHEME**

			AVAILABLE MARKS
1	Efficiency = (useful) energy out/energy in or $\frac{EO}{EI}$ = 600/800 = 0.75 (75%) or Eff = $\frac{EO}{EI}$	[1] [1] [1]	3
2	(i) 600 (cm ²) (ii) P = weight/area or $\frac{F}{A}$ or equivalent = 200/600 = 0.33 (N/cm ²) allow e.c.f. or P = $\frac{F}{A}$	[1] [1] [1] [1]	4
3	(a) (i) B (ii) B (b) p = m × v or Mom = mv etc. = 160 × 200 = 320 000 (kg m/s)	[1] [1] [1] [1] [1]	5
4	(a) Extension is (directly) proportional to force up to elastic limit depends on proportionality mark (b) 5N causes 15cm ext } look for at least 1 unit for partial credit 1N causes 3cm ext } (Ext of 6 cm caused by) 2(N)	[1] [1] [1] [1] [1]	5
5	Conduction Radiation Conduction Convection	[1 mark each]	4
6	(a) OP (b) Statements (i) and (iv) are correct (c) Displacement is a vector OR displacement has direction (converse reason acceptable)	[1] [1 mark each] [1]	4

			AVAILABLE MARKS
7	(i) $F = ma$ or $RF = ma$	[1]	4
	$12 = 1.5 a$ or $(15 - 3) = 1.5 a$	[1]	
	$a = 8 \text{ (m/s}^2\text{)}$	[1]	
(ii) Not "free fall" or Fall is not in a vacuum or resistive/drag/friction force/s is/are acting or ball is falling in an atmosphere	[1]		
8	Power = Work done/time	[1]	
	$t = 36\,000/6000$ or any correctly substituted formula	[1]	
	= 6 (s)	[1]	
9	(i) 0 (J)	[1]	
	(ii) 25 (J)	[1]	
9	(iii) $pe = mgh$	[1]	
	$h = 25/0.2 \times 10$ allow e.c.f from (ii)	[1]	
	or any correctly substituted formula	[1]	
	= 12.5 (m)	[1]	
10	(a) No CO ₂ produced/No greenhouse gases produced/no global warming/saves fossil fuels	[1]	
	(b) (Plant) dismantled/destroyed/taken apart/knocked down (Site) restored	[1] [1]	
11	(i) Length of race = area under graph	[1]	
	= $(5 \times 4)/2 + (38 \times 5)$	[1], [1]	
	= 200 (m)	[1]	
11	(ii) $a = \Delta v/t$ or $a = \frac{v-u}{t}$ or $a = \frac{v}{t}$	[1]	
	= 5/4	[1]	
	= 1.25 (m/s ²)	[1]	
12	CW(M) = ACW(M) or $M_1d_1 = M_2d_2$ [not $Fd = Fd$]	[1]	
	Load $\times 70 = 210 \times 200$	[1]	
	Load = 600 (N)	[1]	
Total			50