



Rewarding Learning

**General Certificate of Secondary Education
2010–2011**

Science: Double Award (Modular)

Forces and Energy

End of Module Test

C

Higher Tier

[GDC02]

FRIDAY 25 FEBRUARY 2011, MORNING

**MARK
SCHEME**

			AVAILABLE MARKS
1	<p>(a) $9\text{ cm} = 3\text{ N}$ [1] $3\text{ N} = 9\text{ cm}$ [1] $1\text{ cm} = \text{N}$ [1] or $1\text{ N} = 3\text{ cm}$ [1] $21\text{ cm} = 7\text{ N}$ [1] $7\text{ N} = 21\text{ cm}$ [1]</p> <p>(b) Permanently deformed</p>	<p>[3]</p> <p>[1]</p>	<p>4</p>
2	<p>(a) Black surfaces are better [1] absorbers of heat [1]</p> <p>(b) Poor radiators of heat [1] or reflects heat back in [1]</p>	<p>[2]</p> <p>[1]</p>	<p>3</p>
3	<p>$P = F/A$ or equivalent [1] $= \frac{650}{0.5}$ [1] $= 1300$ [1] N/m^2 or Pa [1]</p>	<p>[4]</p>	<p>4</p>
4	<p>(a) Contravenes the Law of C of E</p> <p>(b) Efficiency = $\frac{\text{Useful output energy}}{\text{Input energy}}$ [1] $= \frac{240}{600}$ [1] $= 0.4$ or 40% [1]</p>	<p>[1]</p> <p>[3]</p>	<p>4</p>
5	<p>(a) $WD = F \times d$ [1] $= 720 \times 20$ [1] $= 14400$ (J) [1]</p> <p>(b) $P = \frac{WD}{\text{time}}$ [1] $= \frac{14400}{24}$ [1] ecf from (a) $= 600$ (W) [1]</p>	<p>[3]</p> <p>[3]</p>	<p>6</p>
6	<p>(a) Tension/centripetal force</p> <p>(b) Momentum = Mass \times Velocity [1] $= 2.5 \times 8$ [1] $= 20$ (kg m/s) [1]</p>	<p>[1]</p> <p>[3]</p>	<p>4</p>

		AVAILABLE MARKS
7	$F = ma$ [1] or equivalent $600 = 2400 \times a$ [1] $a = 0.25 \text{ (m/s}^2\text{)}$ [1]	[3] 3
8	(a) Copper has free electrons [1]	[1]
	(b) (i) Molecules [1]	[1]
	(ii) Molecules (at hot end) – vibrate faster/vibrate more – with greater k.e. – greater amplitude Any one → [1] Jostling/colliding [1]	[2] 4
9	(i) Force exerted by spring = 5 (N) [1]	[1]
	(ii) CWM = ACWM [1] $5 \times 18 = P \times 30$ [1], [1] ecf from (i) $P = 3 \text{ (N)}$ [1]	[4] 5
10	Distance = area under graph [1] $= \frac{20 \times 15}{2} + (20 \times 45)$ or $150 + 900$ [2] $= 1050 \text{ (m)}$ [1]	
	Average speed = $\frac{1050}{60}$ [1] $= 17.5 \text{ (m/s)}$ [1]	[6] 6
11	$a = \frac{\Delta v}{t}$ (or equivalent) [1] $0.5 = \frac{6}{t}$ [1] $t = 12 \text{ (s)}$ [1]	[3] 3
12	$pe = mgh$ [1] $48 = 0.8 \times 10 \times h$ [1] + [1] $h = 6 \text{ (m)}$ [1]	[4] 4
Total		50