



Rewarding Learning

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

Science: Double Award (Modular)

Forces and Energy

End of Module Test

C

Higher Tier

[GDC02]

THURSDAY 11 NOVEMBER 2010, AFTERNOON

**MARK
SCHEME**

			AVAILABLE MARKS
1	$W = F \times d$ [1] $= 80 \times 2$ [1] [1] $= 160$ (J) [1] (Note: 200 cm \rightarrow 2 m is a free-standing mark)	[4]	4
2	Lower c of g / lower com Wider wheel base or wider base or wider base area	[1] [1]	2
3	(i) $E = \frac{\text{energy out}}{\text{energy in}}$ or equiv. or $\frac{EO}{EI}$ $= \frac{3}{75}$ $= 0.04$ or 4%	[3]	
	(ii) No unit	[1]	
	(iii) Energy wasted, Breaks Principle of Conservation of energy, all output is not sound	[1]	5
4	(a) Friction or centripetal force	[1]	
	(b) Momentum = mass \times vel. [1] or $p = mv$ $= 115 \times 6$ [1] $= 690$ [1] kg m/s [1] (or Ns)	[4]	5
5	(a) AB Biggest slope/gradient or biggest distance in same time interval	[1] [1]	
	(b) Speed = grad or $\frac{d}{t}$ [1] $= \frac{60}{30}$ [1] $= 2$ (m/s) [1]	[3]	5
6	(a) $P = \frac{\text{Weight}}{\text{Area}}$ [1] or $\frac{W}{A}$ or $\frac{F}{A}$ $= \frac{900}{450}$ [1] $= 2$ (N/cm ²) [1]	[3]	
	(b) on 10 cm by 20 cm side/on smallest side	[1]	4
7	Vacuum: Conduction, Convection S Surface: Radiation	[3]	3

		AVAILABLE MARKS
8	<p>(i) Any three from: Wind speed ≤ 5 m/s: no power Wind speed b/n 5 + 20: power increases Wind speed b/n 20 + 25: max power Wind speed ≥ 25: power decreases [3]</p> <p>(ii) Too large area of land needed or unpredictable or visual/noise pollution/or kills birds [1]</p>	4
9	<p>(a) steady speed during BC <input checked="" type="checkbox"/> [1]</p> <p>(b) Displacement = Area = $\frac{1}{2} bh$ or = av. vel. \times time [1] $= \frac{1}{2} \times 60 \times 30$ [1] $= 900$ (m) [1] [3]</p>	4
10	<p>(a) The bigger the distance of force from pivot, (the bigger the moment) or moment is proportional to the distance from pivot [1]</p> <p>(b) $72 = F \times 0.2$ [1] $F = 360$ [1] (N) [2]</p>	3
11	<p>(i) (R)F = m a [1] $230 = (70 + 45) a$ [1] $a = 2(m/s^2)$ [1] [3]</p> <p>(ii) Describe: Decreased or no acceleration [1] Explain: Increased air resistance/smaller resultant force [1] MORE friction or wind drag [2]</p>	5
12	<p>(a) $Ke = \frac{1}{2} mv^2$ [1] $Ke = \frac{1}{2} \times 200 \times (36)^2$ [1] $Ke = 129600$ (J) [1] [3]</p> <p style="text-align: center;">↓ ecf.</p> <p>(b) $Pe = 129600$ (J) [1] $129600 = 200 \times 10 \times h$ [1] $h = 64.8$ m [1] or 65 m [3]</p>	6
Total		50