Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Mark Schemes

Q1

Question Number	Acceptable answers	Additional guidance	Mark
(i)	• Use of stress = F/A (1) • Use of Young modulus = stress / strain (1) • Use of strain = $\Delta x/x$ (1) • Extension = 0.053 m (1)	Example of calculation stress = 93.4 N / 6.6 $\times 10^{-7}$ m^2 = 1.42 $\times 10^{8}$ N m^{-2} strain = 1.42 $\times 10^{8}$ N m^{-2} / 1.8 $\times 10^{9}$ N m^{-2} = 0.0786 extension = 0.0786 × 0.68 m = 0.053 m	4
(ii)	• Increase tension so increase wavespeed since $v = \sqrt{\frac{T}{\mu}}$ **Or** decrease μ so increase wavespeed since $v = \sqrt{\frac{T}{\mu}}$ (1) • Since $v = f\lambda$ and wavelength unchanged, this increases frequency (1)		2

Q2

Question Number	Acceptable Answers	Additional guidance	Mark
	• Use of $I = \frac{P}{A}$ (1) • Use of $P = \frac{E}{t}$ (1) • Multiply by 23% (1) • 1700 MJ (1)	Example of Calculation E = 1300 Wm^{-2} × 200 m^2 × (8 × 60 × 60 s × 0.23) E = 1700 MJ	4

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Q3

Question Number	Answer		Mark
(a)	Use of power = intensity x area Use of time = energy / power Time = 19 s Example of calculation $P = 8000\ \text{W m}^{-2} \times 1.5 \times 10^{-5}\ \text{m}^2$ $= 0.12\ \text{J s}^{-1}$ $t = 2.3\ \text{J} \div 0.12\ \text{J s}^{-1}$ $= 19\ \text{s}$	(1) (1) (1)	3
(b)(i)	Use of $E = IVt$ Energy = 19 000 J (2 sf)(no ue) Example of calculation $E = 1.4\ \text{A} \times 3.7\ \text{V} \times (60 \times 60)\ \text{s}$ $= 18\ 648\ \text{J}$	(1) (1)	2
(b)(ii)	Energy required = 210 x 2.3 J Use of efficiency = output energy / input energy Efficiency = 0.026 or 2.6% Example of calculation efficiency $= 210 \times 2.3\ \text{J} \times 100\ \% \div 19\ 000\ \text{J}$ $= 0.026$ or 2.6%	(1) (1) (1)	3
	Total for question		**8**

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