

Name of the Student: _____

Max. Marks : 17 Marks

Time : 17 Minutes

Mark Schemes

Q1.

Question Number	Acceptable Answer	Additional guidance	Mark
(a)	<ul style="list-style-type: none"> • use of $T = \frac{2\pi}{\omega}$ (1) • $1.7 \times 10^{-3} \text{ rad s}^{-1}$ (1) or $\frac{\pi}{1800} \text{ rad s}^{-1}$ 	<u>Example of calculation:</u> $\omega = \frac{2\pi}{(60 \times 60) \text{ s}}$	(2)

Question Number	Acceptable Answer	Additional guidance	Mark
(b)	<ul style="list-style-type: none"> • recognises weight acts halfway along hand (1) • uses correct angle between the two positions (1) • determines change in vertical height (= 0.008 m) (1) • use of $\Delta E = mg\Delta h$ (1) • work done = 1.1 (mJ) (1) 	<u>Example of calculation:</u> $W = 0.014 \text{ kg} \times 9.81 \text{ N kg}^{-1} \times (2 \times 0.04 \sin 6^\circ \text{ m})$ $W = 1.1 \times 10^{-3} \text{ J}$	(5)

Question Number	Acceptable Answer	Additional guidance	Mark
(c)	<ul style="list-style-type: none"> • use of $P = VI$ (1) • use of $P = \frac{W}{t}$ (1) <u>AND</u> 65% • $t = 141 \text{ s}$ (1) 	<p><u>Example of calculation:</u></p> $P = 1.5 \text{ V} \times 8.0 \times 10^{-6} \text{ A} = 1.2 \times 10^{-5} \text{ W}$ $t = \frac{1.1 \times 10^{-3} \text{ J}}{0.65 \times 1.2 \times 10^{-5} \text{ W}} = 141 \text{ s}$	(3)

Q2.

Question Number	Answer	Mark
(a)	The wavelength (associated) with a particle/electron with a given momentum Or $\lambda = h/p$ all terms defined	(1) (1) (1) (1) 2
(b)(i)	Use of $E_k = eV$ Use of $E_k = p^2/2m$ Or use of $E_k = mv^2/2$ and $p = mv$ Momentum = $1.21 \times 10^{-23} \text{ kg m s}^{-1}$ <u>Example of calculation</u> $E_k = 1.6 \times 10^{-19} \text{ C} \times 500 \text{ V}$ $p^2 = 2 m E_k = 2 \times 9.11 \times 10^{-31} \text{ kg} \times (1.6 \times 10^{-19} \times 500) \text{ J}$ $p = 1.21 \times 10^{-23} \text{ kg m s}^{-1}$	(1) (1) (1) 3
(b)(ii)	Use of $\lambda = h/p$ $\lambda = 5.49 \times 10^{-11} \text{ m}$ (ecf value of p from (i)) (show that value gives $6.63 \times 10^{-11} \text{ m}$) <u>Example of calculation</u> $p = 6.63 \times 10^{-34} \text{ J s} / 1.21 \times 10^{-23} \text{ kg m s}^{-1}$ $\lambda = 5.49 \times 10^{-11} \text{ m}$	(1) (1) 2
Total for question		7