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

Mark Schemes

Q1.

Question Number	Acceptable answers	Additional guidance	Mark
(a)	• Calculate missing $f^2 = 9025$ (1) • Plot missing point (1) • Draw line of best fit (1)	Plot (35, 9025) or their calculated value of f^2	3

Question Number	Acceptable answers	Additional guidance	Mark
(b)	• Determines the gradient (1) • Equates $v = f\lambda$ and $v = \sqrt{\frac{T}{\mu}}$ (1) • Uses $\lambda = 0.8$ (m) (1) • Mass per unit length $\mu = (6.0 \text{ to } 6.2) \times 10^{-3}$ (kg m^{-1}) (1) • Conclusion consistent with their value (1)	e.g. gradient$= \frac{(10200-0)}{(40-0)} = 255$ accept $f = \frac{1}{2l}\sqrt{\frac{T}{\mu}}$ $\mu = \frac{1}{255\text{Hz}^2\text{N}^{-1} \times 0.8^2\text{m}^2} = 6.1 \times 10^{-3}$ (kg m^{-1})	5

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Q2

Question Number	Answer	Additional Guidance	Mark
	• Use of $\lambda = \frac{h}{p}$ **Either** • $h = 6.7 \times 10^{-34}$ (J s) • compares answer to 6.63×10^{-34} (J s) **Or** • $\lambda = 1.38 \times 10^{-10}$ (m) • compares answer to 1.40×10^{-10} (m)	Example of calculation $h = 1.4 \times 10^{-10}$ m $\times 4.8 \times 10^{-24}$ kg m s^{-1} $h = 6.7 \times 10^{-34}$ J s $\approx 6.63 \times 10^{-34}$ J s	**3**

Q3

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 = 1.21×10^{-23} kg m s^{-1} Example of calculation $E_k = 1.6 \times 10^{-19}$ C $\times$ 500 V $p^2 = 2\,m\,E_k = 2 \times 9.11 \times 10^{-31}$ kg $\times$ $(1.6 \times 10^{-19} \times 500)$ J $p = 1.21 \times 10^{-23}$ kg m s^{-1}	(1) (1) (1)	**3**
(b)(ii)	Use of $\lambda = h/p$ $\lambda = 5.49 \times 10^{-11}$ m (ecf value of p from (i)) (show that value gives 6.63×10^{-11} m) Example of calculation $p = 6.63 \times 10^{-34}$ J s / 1.21×10^{-23} kg m s^{-1} $\lambda = 5.49 \times 10^{-11}$ m	(1) (1)	**2**
	Total for question		7

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