Name of the Student:_____

Max. Marks : 17 Marks **Time : 17 Minutes**

Mark Schemes
Q1.

Question Number	Acceptable Answer		Additional Guidance	Mark
(i)	• set up diffraction grating at right angles to light from laser Or set up grating parallel to screen	(1)	An annotated diagram could score these marks	
	• measure the distance between the diffraction grating and the screen	(1)	MP3 accept between other correct specified orders.	
	• measure the distance between 1st order images on the screen	(1)		3

Question Number	Acceptable Answer		Additional Guidance	Mark
(ii)	• use of $d\sin\theta = n\lambda$	(1)	MP4 dependent on MP3 Example of calculation:	
	• Calculation of one of the diffraction angles (for any n)	(1)	$\sin\theta_1 = \dfrac{656.2\times10^{-9}\,\text{m}}{2.2\times10^{-6}\,\text{m}}$	
	• Attempt to calculate a difference in the angles Or statement that the two angles are very similar	(1)	$\therefore \theta_1 = 17.354°$ $\sin\theta_2 = \dfrac{656.0\times10^{-9}\,\text{m}}{2.2\times10^{-6}\,\text{m}}$	
	• So (accurate) measurement would be very difficult Or the difference in wavelength could not be determined with this grating	(1)	$\therefore \theta_1 = 17.348°$ $\therefore \Delta\theta = 17.354° - 17.348° = 0.006°$	4

Q2.

Question Number	Acceptable answers		Additional guidance	Mark
(i)	• Use of $R = \rho l / A$	(1)	Example of calculation $R = \dfrac{1.6\,\Omega\text{m} \times 0.6\times10^{-3}\,\text{m}}{0.5\times10^{-3}\,\text{m} \times 28\times10^{-3}\,\text{m}}$	
	• Using $A = 0.5\times28$ $(\times10^{-6}\,\text{m}^2)$	(1)	$R = 68.6\,\Omega$	
	• Use of $V = IR$	(1)	$1.5V = I \times 68.6\,\Omega$ $I = 1.5V / 68.6\,\Omega$	
	• $I = 22$ (mA)	(1)	$I = 0.022\text{A} = 22\text{mA}$	4

Question Number	Acceptable answers		Additional guidance	Mark
(ii)	• Use of F=BIL ecf values from (i)	(1)	Use of show that values gives 4.8×10^{-6} N	
	• Force = 5.3×10^{-6} N	(1)	Example of calculation $F = 0.40\text{T} \times 0.022\text{A} \times 0.6 \times 10^{-3}\text{m}$ $F = 5.3 \times 10^{-6}\text{N}$	2

Q3.

Question Number	Acceptable Answer		Additional Guidance	Mark
	• Coherent waves have a constant phase relationship	(1)	MP2-4: accept wavelength for frequency	
	• Coherent waves have the same frequency	(1)		
	• However, for each frequency present the (two) reflected waves are coherent	(1)	MP4: hence with a white light source you would see a set of coloured rings	4
	• Hence with a non-monochromatic source, a set of dark rings for each frequency would be produced	(1)		