Name of the Student:_____
Max. Marks : 25 Marks **Time : 25 Minutes**

Mark Schemes

Q1

Question Number	Acceptable Answers	Additional guidance	Mark
(i)	• Use of $n_1 \sin\theta_1 = n_2 \sin\theta_2$ using angle of incidence = 20° (1) • r(blue) = 31.3° **and** r(red) = 31.1° **Or** Calculates difference between r(blue) and r(red) = 0.2° (1) • Compares their answer to an uncertainty of protractor of 0.5° with conclusion consistent with their answer (1)	Example of Calculation $\sin r$(blue) = 1.517sin20 = 0.519 r (blue)=$\sin^{-1}$(0.519) = 31.3° $\sin r$(red) =1.509sin20 = 0.516 r (red)=$\sin^{-1}$(0.516) = 31.1° 31.3° - 31.1° = 0.2° 0.2° < 0.5° so protractor is unsuitable	3
(ii)	**Either** • Use of $\sin C = \frac{1}{n}$ (1) • 41.5° (1) • Compares their answer to 35° and concludes that red light is not totally internally reflected or conclusion consistent with their answer (1) **Or** • Use of $n_1 \sin\theta_1 = n_2 \sin\theta_2$ with 35° and n=1 (1) • 60° (1) • Compares their answer to 90° with conclusion that red light is refracted or conclusion consistent with their answer (1)	Example of Calculation $\sin C = \frac{1}{1.509} = 41.5°$ $C > 35°$ so red light is not totally internally reflected	3

Q2

Question Number	Acceptable Answers	Additional guidance	Mark
(i)	• Focus image of distant/far object on to a screen (1) • Measure distance from lens to screen (1) **Or** • Use parallel rays of light (1) • Measure distance from lens to the point where the rays converge (1)	MP2 dependent on MP1	2
(ii)	• Greater refraction (1) • To converge (parallel) rays at a point closer to the lens (1)		2
(iii)	• Photograph 2 has a greater magnification (1) • so v is greater (1) • since u is constant (1) • So f is greater (1) • Hence photograph 2 taken with lens of focal length 200 mm (1)	MP5 dependent on MP2 and MP4	5

Q3

Question Number	Answer		Mark
(a)	Human body contains water molecules **Or** body has same structure as food	(1)	
	So cells/tissues would gain internal energy (Accept cells/tissues would be heated)	(1)	2
(b) (i)	Waves spread out After passing through a gap **Or** after passing around an obstacle	(1) (1)	2
(b)(ii)	Use of $c = f\lambda$ with $c = 3.0 \times 10^8$ m s^{-1} $\lambda = 0.12$ m Example of calculation $\lambda = 3.0 \times 10^8$ m s$^{-1} \div 2.5 \times 10^9$ Hz $\lambda = 0.12$ m	(1) (1)	2
(b)(iii)	Diameter = 2mm	(1)	1
*(b)(iv)	(QWC – Work must be clear and organised in a logical manner using technical wording where appropriate) Diffraction greatest when wavelength is about the same as gap size Diameter of holes much greater than wavelength of light **and** diameter of holes less than microwave wavelength so no/little diffraction of light takes place **Or** so microwave radiation still diffracted through large angle but intensity is very small. MP3 must follow on from relevant part of MP2	(1) (1) (1)	3