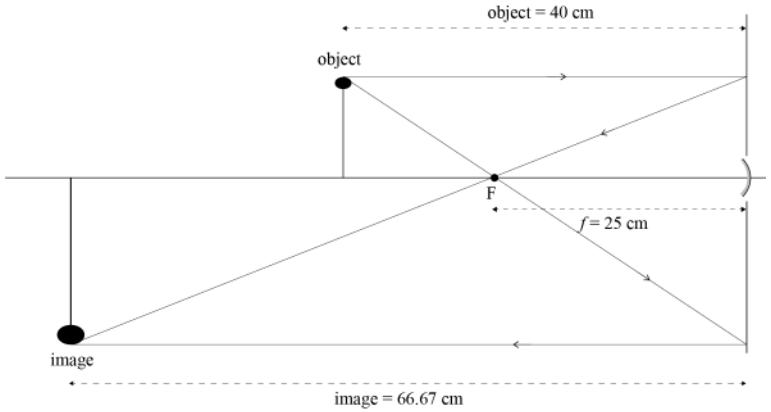
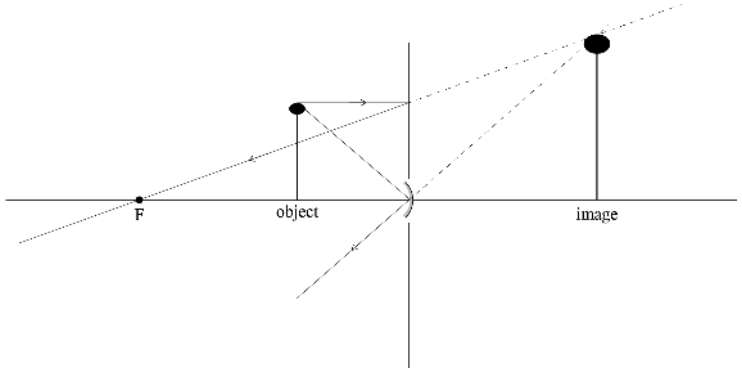
Assessment Schedule – 2023

Physics: Demonstrate understanding of waves (91170)

Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	A real image can be projected on to a piece of paper, or real image is one in which rays actually cross (converge) or (because it's in context), forms in front of the mirror.	• Any point.		
(b)		• ONE correct ray.	• BOTH rays correct with arrows.	
(c)	$\frac{1}{f}=\frac{1}{d_i}+\frac{1}{d_o}$ $\frac{1}{25}=\frac{1}{d_i}+\frac{1}{40}\Rightarrow d_i=66.7\text{ cm}$ $\text{magnification}=\frac{66.7}{40}=1.67=1.7$	• Correct d_i or magnification calculated from measurement.	• Correct answer from formula.	

(d)	 $f = 25\,\text{cm}$ $d_o = 10\,\text{cm}$ Using $\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{25} = \frac{1}{10} + \frac{1}{d_i}$ $\Rightarrow d_i = -16.7 = -17\,\text{cm}$ Hence $\frac{d_i}{d_o} = \text{M} = \frac{-16.7}{10} = -1.7$ Image is virtual, enlarged, upright.	• One correct ray including arrows. OR Image is virtual. • Formed $\frac{1}{25} = \frac{1}{10} + \frac{1}{d_i}$ OR Found $d_i = -17$ cm	• Correct ray diagram (with arrows). OR M = –1.7	• Correct diagram (with arrows) • Correct explanation • Correct calculation 2 bullet points, 1E. 3 bullet points, 2E

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	**N1**	**N2**	**A3**	**A4**	**M5**	**M6**	**E7**	**E8**
No relevant evidence.	1a	2a 1m	3a 1a + 1m 1a + 1e 1e	4a 2a + m 2a + 1e	2m 1m + 1e 2e + 1a	3m 2e + 1m 1e + 1m +1a	2a + 1m + 1e 2m + 1e	1a + 2m + 2e

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	Refraction (of light).	• Correct answer.		
(b)	$1.33\sin\theta = 1\sin 50°$ Therefore $\theta = 35.2°$	• Finds angle based on $\theta = 40°$. Therefore 28.9°.	• Correct answer.	
(c)(i)	$\frac{v_1}{v_2} = \frac{n_2}{n_1}$ Therefore $\frac{3\times10^8\times1}{2.42} = 1.24\times10^8$ m s^{-1}	• Correct speed or no effect on frequency.	• Correct speed AND No effect on frequency.	
(ii)	The frequency of the light is not changed.			
(d)	• $2.42 \sin 24.4° = 1 = 1 \sin 90°$ Total internal reflection occurs when: • light moves from a more optically dense medium into a less optically dense medium. • and the angle of incidence is greater that the critical angle. • The critical angle is the angle of the incident ray that is required for the (transmitted) ray of light to refract along the boundary (at 90º to the normal).	• Correct SHOW calculation OR Describes ONE condition of total internal reflection.	• Correct SHOW calculation. AND Explains the conditions required of total internal reflection.	THREE points 1E FOUR points 2E (This is a show question.)

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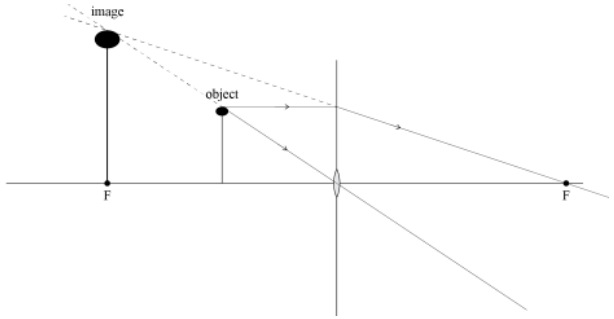
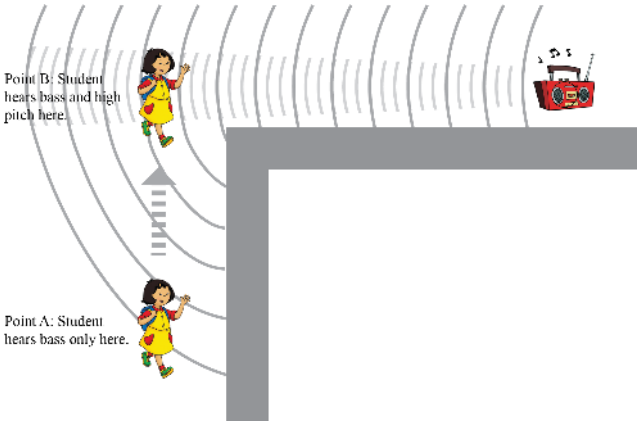
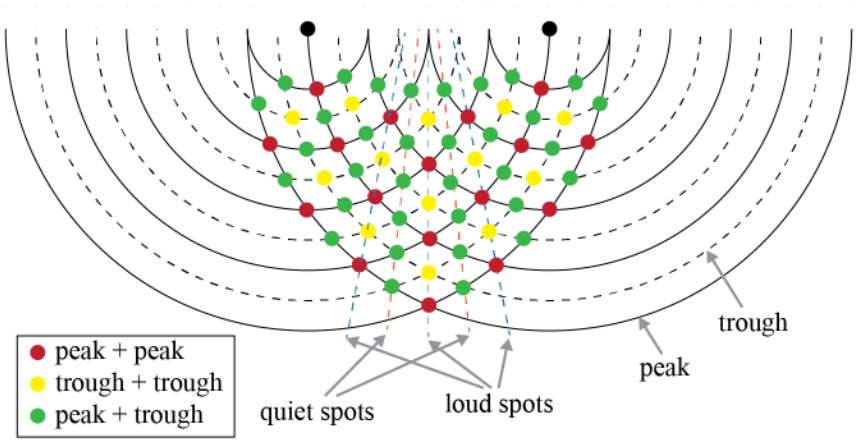
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No relevant evidence.	1a	2a 1m	3a 1a + 1m 1a + 1e 1e	4a 2a + m 2a + 1e	2m 1m + 1e 2e + 1a	3m 2e + 1m 1e + 1m +1a	2a + 1m + 1e 2m + 1e	1a + 2m + 2e

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	The thinner lens has a longer focal length than the thicker lens.	• Correct answer.		
(b)		• Real rays drawn or appearance of image described as virtual, enlarged and upright.	• Image rays extrapolated back to then produce enlarged, virtual image. Complete answer.	
(c)	Sound can diffract around a corner, but this is most significant with longer wavelengths. The low pitch sound of the base guitar is lower in frequency and so diffracts the most and so is heard more clearly than the higher pitched electric guitar. 	• Sound is diffracted around the corner. OR Bass guitar is different frequency than electric guitar.	• Diffraction. AND Low frequency waves diffract most and so are heard more easily. OR Diagrams showing the effect of diffraction by wavelength.	

(d)	 • Two sources of sound one from each door. • The sound diffracts it passes through the door. • The diffracted waves interfere with each other. • Where two crests meet there is constructive interference. • Where crest meets trough there is destructive interference, nodes form. • This creates loud and quiet patches. (Links amplitude to loudness.)	• Either a diagram showing diffraction and then interference (without labels). OR TWO bullet points.	• THREE bullet points. OR Fully labelled diagram.	1E Three bullet points and a partial diagram. 2 E Four bullet points completed (with suitable links made) (diagram not required).

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No relevant evidence.	1a	2a 1m	3a 1a + 1m 1a + 1e 1e	4a 2a + m 2a + 1e	2m 1m + 1e 2e + 1a	3m 2e + 1m 1e + 1m +1a	2a + 1m + 1e 2m + 1e	1a + 2m + 2e

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 18	21 – 24