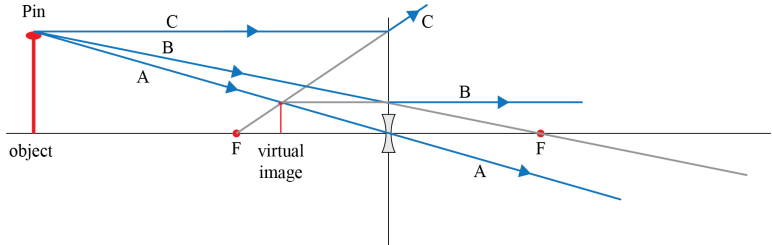


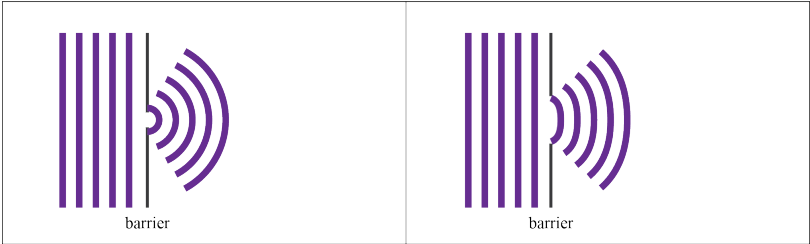
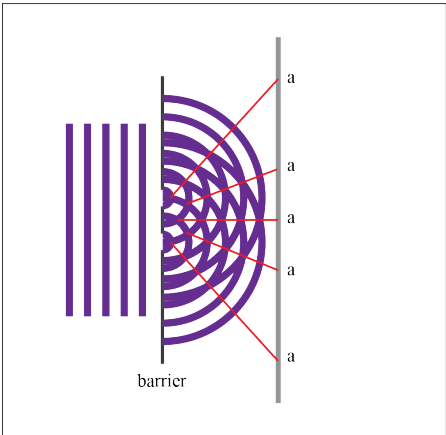
**Assessment Schedule – 2022**

**Physics: Demonstrate understanding of waves (91170)**

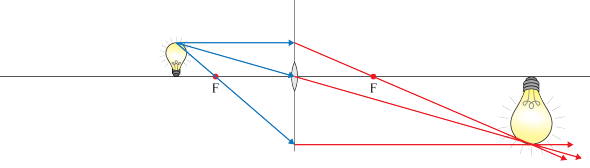
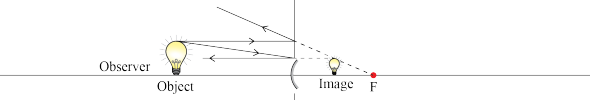
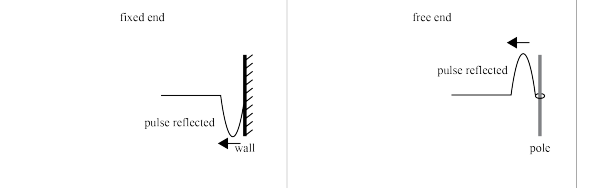
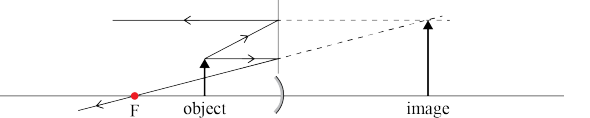
**Evidence Statement**

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	$1 \sin \theta = 1.52 \sin 32^\circ \quad \theta = 54^\circ$	<ul style="list-style-type: none"> <li><math>\theta = 54^\circ</math></li> </ul>		
(b)(i) (ii)	It slows down. $\frac{v_1}{v_2} = \frac{n_2}{n_1} \Rightarrow v = \frac{3.00 \times 10^8}{1.52} = 1.97 \times 10^8 \text{ m s}^{-1}$	<ul style="list-style-type: none"> <li>ONE of parts (i) and (ii).</li> </ul>	<ul style="list-style-type: none"> <li>BOTH of parts (i) and (ii).</li> </ul>	
(c)(i) (ii)	Total internal reflection. More optically dense to less optically dense medium, and incident angle must be greater than critical angle.	<ul style="list-style-type: none"> <li>ONE of parts (i) and (ii).</li> </ul>	<ul style="list-style-type: none"> <li>BOTH of parts (i) and (ii).</li> </ul>	
(d)	 $\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o} \Rightarrow \frac{1}{-3} = \frac{1}{7} + \frac{1}{d_i} \Rightarrow d_i = -2.1 \text{ cm}$ <p>The image formed is virtual and is located 2.1 cm in front of the lens. This can never appear on a screen.</p>	<ul style="list-style-type: none"> <li>TWO correct rays on a diagram that would help locate image.</li> </ul> OR Substitution into formula (accept using $f$ positive $d_i = 5.25 \text{ cm}$ ).	Any TWO: <ul style="list-style-type: none"> <li>Correct ray diagram</li> <li>Correct calculation performed.</li> <li>Explanation saying why image cannot be formed on a screen.</li> </ul>	<ul style="list-style-type: none"> <li>Full answer.</li> </ul>

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Very little Achievement evidence.	Some evidence at Achievement level, but most is at Not Achieved level.	A majority of the evidence is at Achievement level.	Most evidence is at Achievement level.	Some evidence is at Merit level.	A majority of the evidence is at Merit level.	Evidence is provided for most tasks. The evidence at Excellence level may have minor errors, or the evidence is weak.	Evidence is provided for most tasks. The evidence at Excellence level is accurate.
No relevant physics	1a	2a	3a	4a	2m + 1a	3m	1e + 1m + 1a	1e + 2m + a

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	$v = f\lambda \Rightarrow \lambda = \frac{3.00 \times 10^8}{7.5 \times 10^{14}} = 4.0 \times 10^{-7} \text{ m}$	<ul style="list-style-type: none"> <li>• Correct.</li> </ul>		
(b)	 <p>First gap diagram, clear curvature due to complete diffraction, as gap equivalent to wavelength. Larger gap, much less curvature. Wavelength same for both, before and after.</p>	<ul style="list-style-type: none"> <li>• Move curvature for small gap. OR Wavelength the same.</li> </ul>	<ul style="list-style-type: none"> <li>• Both diagrams correct showing same wavelength and more curvature for the small gap.</li> </ul>	
(c)	<p>Antinodes labelled or clearly shown.</p> 	<ul style="list-style-type: none"> <li>• Diagram showing at least one wave from each gap diffracting.</li> </ul>	<ul style="list-style-type: none"> <li>• At least two waves diffracting from each gap and at least one antinode or antinodal line correctly identified.</li> </ul>	
(d)	<p>Process is interference, waves from each gap need to travel a different distance to the screen. When the path difference is a multiple of a whole wavelength, the waves arrive in phase, and constructive interference occurs forming antinodes / bright spots. When waves arrive out of phase, destructive interference occurs and dark spots / nodes occur.</p>	<ul style="list-style-type: none"> <li>• ONE correct statement.</li> </ul>	<ul style="list-style-type: none"> <li>• TWO linked statements.</li> </ul>	<ul style="list-style-type: none"> <li>• Full explanation.</li> </ul>

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Very little Achievement evidence.	Some evidence at Achievement level, but most is at Not Achieved level.	A majority of the evidence is at Achievement level.	Most evidence is at Achievement level.	Some evidence is at Merit level.	A majority of the evidence is at Merit level.	Evidence is provided for most tasks. The evidence at Excellence level may have minor errors, or the evidence is weak.	Evidence is provided for most tasks. The evidence at Excellence level is accurate.
No relevant physics	1a	2a	3a	4a	2m + 1a	3m	1e + 1m + 1a	1e + 2m + a

Q	Evidence	Achievement	Merit	Excellence
THREE (a)		<ul style="list-style-type: none"> <li>Image located with at least TWO correct rays.</li> </ul>		
(b)(i)  (ii)	 <p>Diminished, upright, virtual.</p>	<ul style="list-style-type: none"> <li>ONE of parts (i) and (ii).</li> </ul>	<ul style="list-style-type: none"> <li>BOTH of parts (i) and (ii).</li> </ul>	
(c)		<ul style="list-style-type: none"> <li>ONE correct phase. OR Wavelength.</li> </ul>	<ul style="list-style-type: none"> <li>BOTH correct phases and wavelengths.</li> </ul>	
(d)(i)  (ii) (iii)	 <p>Object inside the focal point. Compared to a convex mirror, the virtual image is enlarged not diminished (both are upright / virtual).</p>	<ul style="list-style-type: none"> <li>ONE of parts (i), (ii), and (iii).</li> </ul>	<ul style="list-style-type: none"> <li>TWO of parts (i), (ii), and (iii).</li> </ul>	<ul style="list-style-type: none"> <li>All THREE.</li> </ul>

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Very little Achievement evidence.	Some evidence at Achievement level, but most is at Not Achieved level.	A majority of the evidence is at Achievement level.	Most evidence is at Achievement level.	Some evidence is at Merit level.	A majority of the evidence is at Merit level.	Evidence is provided for most tasks. The evidence at Excellence level may have minor errors, or the evidence is weak.	Evidence is provided for most tasks. The evidence at Excellence level is accurate.
No relevant physics	1a	2a	3a	4a	2m + 1a	3m	1e + 1m + 1a	1e + 2m + a

### Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 19	20 – 24