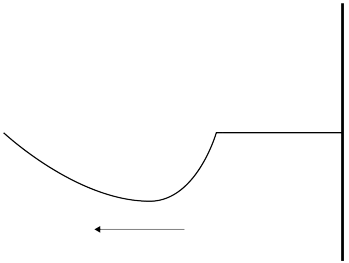
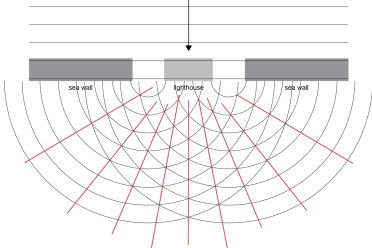


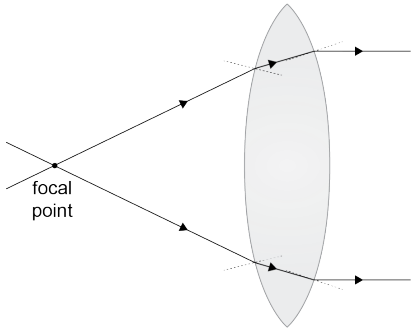
**Assessment Schedule – 2021**

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

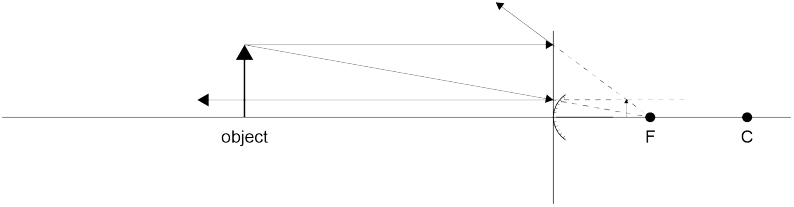
**Evidence Statement**

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	Total internal reflection.	<ul style="list-style-type: none"> <li>• Correct.</li> </ul>		
(b)	$n_1 \sin \theta_1 = n_2 \sin \theta_2$ $1.52 \sin \theta_1 = 1 \sin 90^\circ$ $\theta_1 = 41.14^\circ = 41.1^\circ$	<ul style="list-style-type: none"> <li>• Correct equation stated / implied.</li> </ul>	<ul style="list-style-type: none"> <li>• Correct answer.</li> </ul>	
(c)		<ul style="list-style-type: none"> <li>• Same wavelength or inverted.</li> </ul>	<ul style="list-style-type: none"> <li>• Same wavelength and inverted.</li> </ul>	
(d)(i)  (ii)	 <ul style="list-style-type: none"> <li>• Correct diagram.</li> <li>• Identifies diffraction and interference of waves.</li> <li>• Waves that are in phase constructively interfere, resulting in large waves.</li> <li>• Waves 180° out of phase cause destructive interference of waves causing no / small waves (pd formula OR diagram)..</li> </ul>	<ul style="list-style-type: none"> <li>• TWO bullet points.</li> </ul>	<ul style="list-style-type: none"> <li>• THREE bullet points.</li> </ul>	<ul style="list-style-type: none"> <li>• Comprehensive answer linking reasoning to effect.</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.
–	1a	2a	3a	4a	1m + 3a	2m + 2a	1e + 2m	1e + 2m + 1a

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	Convex lens and light at focus	<ul style="list-style-type: none"> <li>• Correct answers.</li> </ul>		
(b)	 <p>The diagram shows a convex lens with a focal point on the left. Two light rays originate from the focal point, pass through the lens, and emerge as parallel rays on the right. Dashed lines represent the normals at the points where the rays enter the lens.</p>	<ul style="list-style-type: none"> <li>• Rays bend towards normal at first boundary or away at second boundary.</li> </ul>	<ul style="list-style-type: none"> <li>• Complete diagram.</li> </ul>	
(c)(i)  (ii)	$\frac{n_2}{n_1} = \frac{v_1}{v_2}$ $n_2 = n_1 \frac{v_1}{v_2} = \frac{1 \times 3 \times 10^8}{2 \times 10^8} = 1.5$ $n_2 \sin \theta_2 = n_1 \sin \theta_1$ $1.5 \sin \theta_2 = 1 \sin \theta_1$ $\theta_2 = 19.5^\circ = 20^\circ \text{ (or } 19^\circ)$	<ul style="list-style-type: none"> <li>• Shows 1.5. OR angle calculated.</li> </ul>	<ul style="list-style-type: none"> <li>• BOTH correct.</li> </ul>	
(d)(i)  (ii)  (iii)	$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$ <ul style="list-style-type: none"> <li>• <math>\frac{1}{5} = \frac{1}{7} + \frac{1}{d_i}</math> <math>d_i = 17.5 \text{ cm}</math></li> <li>• <math>m = \frac{d_i}{d_o} = \frac{17.5}{7} = 2.5</math></li> <li>• Image is real, inverted, and enlarged.</li> </ul>	<ul style="list-style-type: none"> <li>• ONE bullet point.</li> </ul>	<ul style="list-style-type: none"> <li>• TWO bullet points.</li> </ul>	<ul style="list-style-type: none"> <li>• All THREE bullet points.</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.
–	1a	2a	3a	4a	1m + 3a	2m + 2a	1e + 2m	1e + 2m + 1a

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	Diminished, upright, and virtual.	<ul style="list-style-type: none"> <li>• Correct answer.</li> </ul>		
(b)	When the object is “far” away, concave mirrors will always form images that are: <ul style="list-style-type: none"> <li>• inverted</li> <li>• diminished.</li> </ul>	<ul style="list-style-type: none"> <li>• ONE bullet point.</li> </ul>	<ul style="list-style-type: none"> <li>• BOTH bullet points.</li> </ul>	
(c)		<ul style="list-style-type: none"> <li>• ONE correct ray</li> </ul>	<ul style="list-style-type: none"> <li>• TWO correct rays and image drawn.</li> </ul>	
(d)	$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o} \rightarrow \frac{1}{-20} = \frac{1}{d_i} + \frac{1}{500}$ $d_i = -19.2 \text{ cm}$ $\text{Magnification} = \frac{d_i}{d_o} = \frac{19.2}{500} = 0.038$ $\text{Height} = 0.038 \times 1.5 = 0.057 \text{ m (OR } 0.058 \text{ m – depends on rounding)}$	<ul style="list-style-type: none"> <li>• Recognises focal length is negative.</li> <li>OR</li> <li>Uses 20 to find <math>d_i</math> (20.8 cm).</li> </ul>	<ul style="list-style-type: none"> <li>• Finds <math>d_i = 19.2</math>.</li> <li>OR</li> <li>Finds <math>m</math> using <math>f = 20</math>.</li> <li>(consequential error</li> <li><math>M = 0.042</math></li> <li><math>h_i = 0.0625 \text{ m}</math>)</li> </ul>	<ul style="list-style-type: none"> <li>• Complete 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.
–	1a	2a	3a	4a	1m + 3a	2m + 2a	1e + 2m	1e + 2m + 1a

*Other combinations are also possible. (Using a=1; m=2; e=3). However, for M5 or M6, at least one Merit question needs to be correct. For E7 or E8, the Excellence needs to be correct.*

### Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 18	19– 24