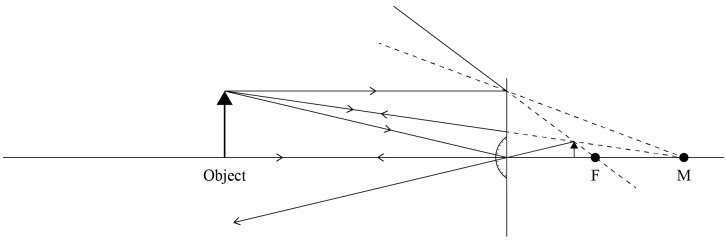


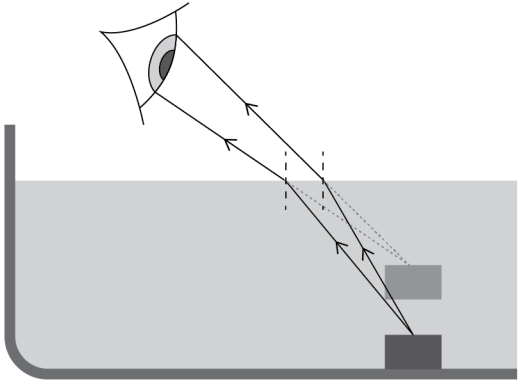
Assessment Schedule – 2020 from Panel meeting

Physics: Demonstrate understanding of waves (91170)

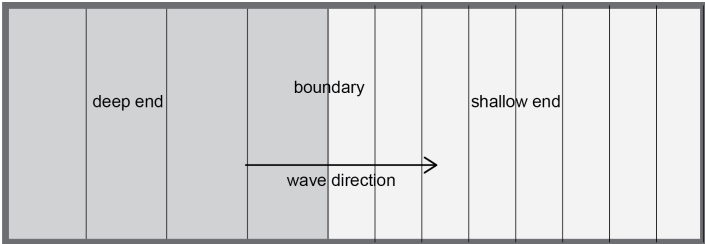
Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)		<ul style="list-style-type: none"> • TWO rays correct. 	<ul style="list-style-type: none"> • TWO rays correct with arrows. AND Correct image. 	
(b)	Upright, virtual, and diminished.	<ul style="list-style-type: none"> • All THREE correct. 		
(c)	<p>Plane mirror will produce a virtual image that will be the same size. Concave mirror will produce a real image that is inverted and diminished. In both cases, the field of view is smaller than in the convex mirror. So, neither is suitable to see the whole pool.</p>	<ul style="list-style-type: none"> • TWO correct descriptions of images formed. OR ONE correct description and justification. 	<ul style="list-style-type: none"> • Correct descriptions AND explanation that the field of view will be less. Explanation of disadvantage of plane (smaller field of view), and concave (inverted image). So, neither is suitable. 	
(d)(i)	$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$ $\frac{1}{0.5} = \frac{1}{d_i} + \frac{1}{2}$ $d_i = 0.67 \text{ m}$	<ul style="list-style-type: none"> • ONE part correct. 	<ul style="list-style-type: none"> • TWO parts correct. 	<ul style="list-style-type: none"> • ALL correct. (Allow minor mathematical error)
(ii)	$\frac{d_i}{d_o} = \frac{h_i}{h_o}, \text{ so } \frac{0.67 \times 1.7}{2} = h_i = 0.57 \text{ m}$			
(iii)	Image is: Inverted, diminished, real.			

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 the 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)	Refraction.	<ul style="list-style-type: none"> • Correct phenomenon. 		
(b)		<ul style="list-style-type: none"> • ONE ray drawn correctly bent. 	<ul style="list-style-type: none"> • Image located and drawn. 	
(c)	<p>As the ray leaves the water, it speeds up. The wavefront hits the boundary at an angle, and so the change in speed causes a change in direction. The eye traces the image back, assuming light cannot bend, and so the image appears at a shallower depth than the real object.</p>	<ul style="list-style-type: none"> • ONE valid point made, e.g. light changes speed and so direction due to boundary.) 	<ul style="list-style-type: none"> • Full explanation, e.g. interpretation by brain means you trace it back in a straight line. 	
(d)(i) (ii)	<p>Total internal reflection.</p> <p>Light moving from medium of greater refractive index to lower refractive index bends away from the normal. At the critical angle, light changes from refracting to all reflecting. The critical angle is given by:</p> $\sin x = \frac{1}{1.33} \quad \text{Critical angle} = 48.8^\circ = 49^\circ$	<ul style="list-style-type: none"> • Phenomenon named. 	<ul style="list-style-type: none"> • Phenomenon named and ALL correct points for conditions. OR Critical angle calculated. 	<ul style="list-style-type: none"> • Comprehensive answer linking phenomenon, calculation, and conditions.

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
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–	1a	2a	3a	4a	1m + 3a	2m + 2a	1e + 2m	1e + 2m + 1a

Q	Evidence	Achievement	Merit	Excellence												
THREE (a)	$v = f\lambda$ where $f = \frac{1}{T}$ $2.75 \times 2.3 = \lambda$ $\lambda = 6.3 \text{ m}$	<ul style="list-style-type: none"> Correct answer. 														
(b)(i) (ii)	 <p>At the boundary, the wave front slows down and so the waves are now closer together, so the wavelength decreases, and the amplitude of the wave increases as a result. Frequency remains unchanged.</p>	<ul style="list-style-type: none"> Diagram correctly drawn. OR TWO out of λ, f, A correct. 	<ul style="list-style-type: none"> ALL correct. 													
(c)	<table border="1"> <thead> <tr> <th>Characteristic</th> <th>Light</th> <th>Sound</th> </tr> </thead> <tbody> <tr> <td>Speed</td> <td>Faster</td> <td>Slower</td> </tr> <tr> <td>Type</td> <td>Transverse (or EMR)</td> <td>Longitudinal (or Mechanical)</td> </tr> <tr> <td>Medium</td> <td>Does not need a medium</td> <td>Needs a medium</td> </tr> </tbody> </table>	Characteristic	Light	Sound	Speed	Faster	Slower	Type	Transverse (or EMR)	Longitudinal (or Mechanical)	Medium	Does not need a medium	Needs a medium	<ul style="list-style-type: none"> ONE correct row. 	<ul style="list-style-type: none"> THREE correct rows. 	
Characteristic	Light	Sound														
Speed	Faster	Slower														
Type	Transverse (or EMR)	Longitudinal (or Mechanical)														
Medium	Does not need a medium	Needs a medium														
(d)	<p>Soundwaves from both speakers spread out. As the life guard walks along the far side, she receives sound waves from both speakers. Because the sound waves have different distances to travel from each speaker at some points, the waves arrive in phase, constructive interference occurs, and the lifeguard hears a loud sound. At other places, the waves arrive out of phase, destructive interference occurs, and the lifeguard hears a quieter sound.</p>	<ul style="list-style-type: none"> Makes ONE valid point in context. 	<ul style="list-style-type: none"> Partial explanation. 	<ul style="list-style-type: none"> Comprehensive explanation (including different distances travelled by the two waves). 												

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
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–	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 – 19	20– 24