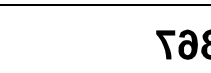
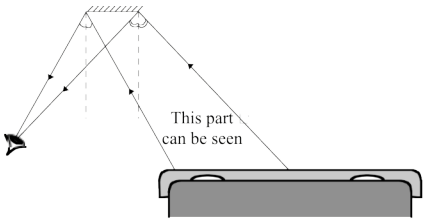
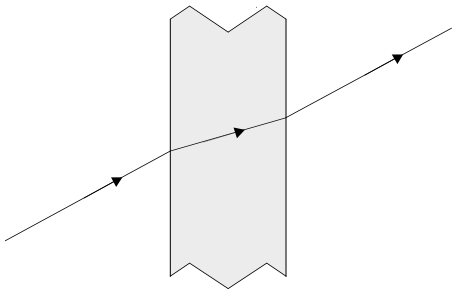
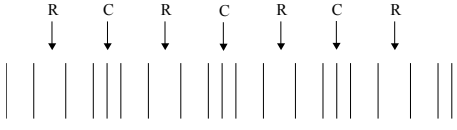
Assessment Schedule – 2005

Physics: Demonstrate understanding of wave and light behaviour (90182)

Evidence Statement

Q	Evidence	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1(a)		[1] Correct image shows the idea of lateral inversion.		
1(b)	Lateral Inversion.	[1] Correct answer.		
1(c)		[1] ONE ray is drawn correctly without direction even if other ray is wrong. (Rays can be anywhere on the wing-mirror.)	[1] TWO rays drawn and direction correct	[1] Merit **plus** normals, incident and reflected angles marked on diagram
1(d)		[1] The first ray enters bent towards normal, and the second ray emerges bent away from the normal. **OR** [1] If emerging and incident rays are parallel but refraction ray is wrong. If first refracted ray is perpendicular to the surface although rays are parallel, it's NA	[1] Correct diagram as shown. The emerging ray must be parallel to the incident ray.	
1(e)	$\lambda = \frac{v}{f} = \frac{330}{950} = 0.347$ m $= 0.35$ m	[2] Correct working and answer, but using frequency as 0.95 Hz (347 m), ***or*** incomplete calculation (final answer not written) **OR** If taken to 2dp 0.34, and rest of the working is correct.	[2] Correct working and answer.	
(f)		[1] Correct labelling shows a compression and a rarefaction.		

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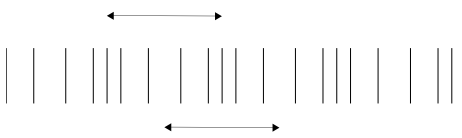
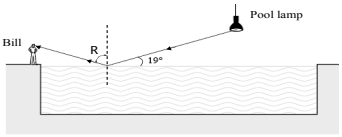
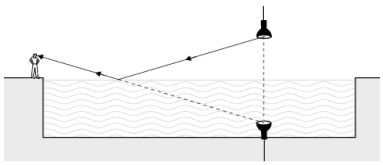
1(g)		[1] Correct wavelength shown (2.5 cm).		
1(h)	The wavelength is halved. Velocity of sound in air is constant. In the equation $v = f\lambda$, v is constant; doubling f will halve the wavelength. Accept inverse relationship $f \propto 1/\lambda$.	[1] Mentions decrease or short or similar wording.	[1] Mentions the wavelength is halved.	[1]Correct and clear explanation. For all statements (λ is halved, velocity is constant, $f \propto 1/\lambda$.)
2(a)		[1] Correctly labelled diagram as shown. Note: so long as the R is not on the ray.		
2(b)	$90 - 19 = 71°$	[2] Correct working and answer, **OR** answer only.		
2(c)	 **Rule:** **image distance = object distance**	(i) [1] Correct image position.	(ii) [1] Correct rule distance (image) = distance (object) **OR** $d_i = d_o$	
2(d)	$4.8 \times 2 = 9.6$ m	[2] Correct working and answer, **OR** answer only.		
2(e)	Amplitude $= \frac{1.50 - 1.40}{2}$ $= 0.050$ m	[2] Correct working and answer, **OR** answer only.		
2(f)	Frequency $= \frac{15}{12} = 1.25$ Hz	[2] Correct working.		
2(g)	There are 3 waves in 4.5 m $\lambda = \frac{4.5}{3} = 1.5$ m $v = f\lambda = 1.25 \times 1.5 = 1.875$ ms^{-1} $= 1.9$ ms^{-1}	[2] Correct working and answer for wavelength. $\lambda = 1.5$ m Alternative answer T = 12/15 = 0.8 s	[2] Correct steps but wrong answer due to wrong wavelength. Alternative answer $\lambda = 4.5/3 = 1.5$	[2] Correct working and answer. Alternative answer $v = f\lambda$, $\lambda/T = 1.5/0.80$ $= 1.9$ ms^{-1}

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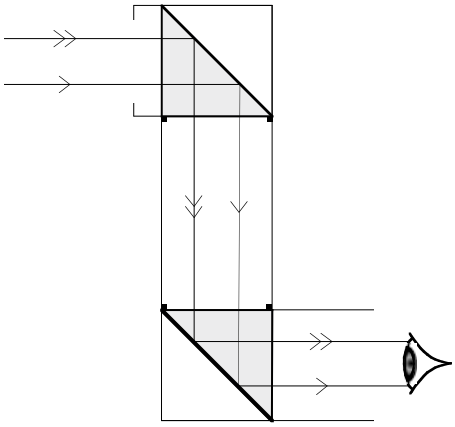
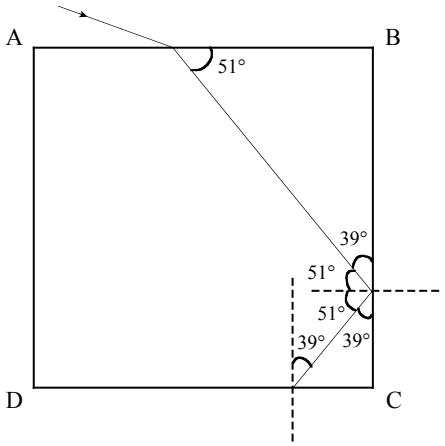
2(h)	Total distance = 2 × 104 m $v = \frac{d}{t}$ $v = \frac{2 \times 104 \text{ m}}{0.62 \text{ s}}$ $v = 335 \text{ ms}^{-1}$ $v = f\lambda$ $f = \frac{v}{\lambda} = \frac{335}{0.67} = 500 \text{ Hz}$	[2] Calculates the velocity as 167 ms^{-1} using d as 104 m.	[2] Correct working and answer for velocity, **OR** correct process but used v = 167 to find f as 250 Hz. (167/0.67 = 250 Hz)	[2] Correct working and answer.
3(a)			[1] Correct diagram.	
3(b)	The image is reflected twice		[1] Reflected twice.	
3(c)	 Either **full working** must be shown or **all** the **required angles are marked on the diagram.**	[2] Two rays drawn correctly with normals and wrong angles. If only one ray drawn with normal and angles **NA.**	[2] Calculated and correct working and answer for angle (51°) of reflection on side BC. **OR** [2] All required angles are marked on the diagram showing (51°).	[2] Calculated or marked on diagram the full working **OR** all required angles. (51° and 39°).
3(d)	Because **the angle of incidence at face BC is greater than the critical angle** of glass / air interface, **total internal reflection** takes place**. More dense to less dense**. So the ray is reflected internally.	[1] Any ONE of the explanations.	[1] Any TWO explanations including totally internally reflected at the face BC.	[1] All THREE correct explanations.

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3(e)	$\frac{n_1}{n_2} = \frac{v_2}{v_1}$ $\frac{1.31}{1.52} = \frac{1.97 \times 10^8}{v_1}$ $v_1 = 2.3 \times 10^8$ ms^{-1} Note: Do not accept use of 3×10^8 ms^{-1}	[2] Correct data input in the formula. 1.698×10^8 m Note: If substitution is wrong but calculation is correct NA.	[2] Correct working and answer. If answer is 2.2×10^8, it's A_2.	
	Total opportunities	**criterion 1: 10** **criterion 2: 9**	**criterion 1: 7** **criterion 2: 5**	**criterion 1: 3** **criterion 2: 3**

Judgement Statement

The following is a guide to the standard required for each grade in the two criteria.

Criterion 1:

Achievement	Achievement with Merit	Achievement with Excellence
FOUR opportunities answered at Achievement level or higher. 4 × A1	EIGHT opportunities answered with FOUR at Merit level or higher. 4 × M1 *plus* 4 × A1	NINE opportunities answered with at least ONE at Excellence level and FOUR at Merit level. 1 × E1 *plus* 4 × M1 *plus* 4 × A1

Criterion 2:

Achievement	Achievement with Merit	Achievement with Excellence
FOUR opportunities answered at Achievement level or higher. 4 × A2	SIX opportunities answered with TWO at Merit level or higher. 2 × M2 *plus* 4 × A2	SEVEN opportunities answered with at least ONE at Excellence level and TWO at Merit level. 1 × E2 *plus* 2 × M2 *plus* 4 × A2

Note: To gain Excellence overall there needs to be 3 × E with at least ONE E from each criterion.

Achievement	Achievement with Merit	Achievement with Excellence	
4 × A1	4 × M1 *plus* 4 × A1	4 × M1 *plus* 4 × A1	*plus* 3 × E with at least 1 from each category
4 × A2	2 × M2 *plus* 4 × A2	2 × M2 *plus* 4 × A2	