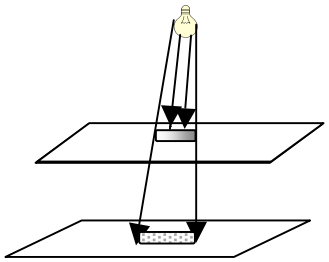
Assessment Schedule – 2008

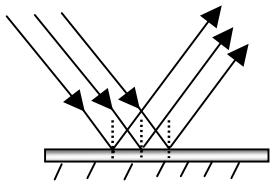
Demonstrate understanding of wave and light behaviour (90182)

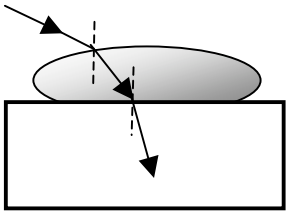
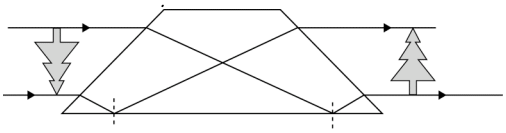
Evidence Statement

Note: Minor computational errors will not be penalised. A wrong answer will be accepted as correct provided there is sufficient evidence that the mistake is not due to a lack of understanding. Such evidence includes:

- the last written step before the answer is given has no unexpanded brackets or terms and does not require rearranging.
- the power of any number that is multiplied by a power of 10 is correct.

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)		[1] Correct ray diagram and image. Arrows not required.		
(b)	Cellphone is opaque / does not let light pass through it. Light passes though area round the phone and falls on the floor to create a dark shadow.	[1] Either statement is given.	[1] Both statements are given.	
(c)	$T = \frac{1}{f} = \frac{1}{1750} = 5.71 \times 10^{-4}$ s	[2] Correct answer using 1.75 kHz (= 0.57 s)	[2] Correct working and answer.	
(d)	$\lambda = \frac{v}{f} = \frac{330}{1750} = 0.188$ m = 0.19 m	[2] Correct working but incorrect answer using f as 1.75 kHz (= 188.5 m)	[2] Correct working and answer.	
(e)	The speaker / speaker cone vibrates and the air particles near the cone vibrate at the same frequency. This sets up compressions and rarefactions in the air, which carry the sound energy / wave through the air to Jordan's ear.	[1] The speaker sets up vibrations in air, causing sound waves.	[1] The speaker sets up vibrations in air. The air particles transmit these vibrations to Jordan's ear.	[1] Explanation shows a **clear** understanding of the phenomenon. Compressions / rarefractions.
(f)	$v_{\text{optic fibre}} = \frac{3.0 \times 10^8}{1.55} = 1.935 \times 10^8$ ms^{-1} $t = \frac{d}{v_{optic}} = \frac{100 \times 10^3}{1.935 \times 10^8} = 5.2 \times 10^{-4}$ s	[2] Correct answer for v in optic fibre	[2] Correct process and given the answer for time using d = 100 km (= 5.2×10^{-7} s)	[2] Correct working and answer.

TWO (a)	$\lambda = 0.30 \times 2 = 0.60$ m $v = f\lambda = 2.5 \times 0.60 = 1.5$ m s^{-1}	[2] Correct answer for λ OR correct working for v using λ as 0.30 m. $v = 0.75$ ms^{-1}	[2] Correct working and answer.	
(b)	1. Both are longitudinal waves OR In both, the particles vibrate parallel to the direction of wave transmission. 2. Both are mechanical waves.	[1] Either statement is given.		
(c)	Amplitude = 5.6/2 = 2.8	[2] Correct answer.		
(d)	The particles vibrate at 90° to the direction of wave motion.	[1] Correct description.		
(e)	$v = \frac{d}{t} = \frac{4500}{1.5\times10^{-5}} = 3.0\times10^{8}$ m s^{-1} $\lambda = \frac{4500}{5} = 900$ m $f = \frac{v}{\lambda} = \frac{3.0\times10^{8}}{900} = 333333.33$ Hz = 333 kHz OR f = number/second $= \frac{5}{1.5}\times10^{-5} = 333$ k Hz	[2] Correct answer for v or λ.	[2] Correct answer for v and λ OR Correct answer in Hertz.	[2] Correct working and answer in kilohertz.
(f)	1. As the air is slowly removed by the vacuum pump, the sound fades away and when all air is removed, very little / no sound is heard. 2. Sound requires a medium to travel. When air is removed, less and less particles are present until no medium is available for sound to travel.	[1] Mentions sound disappears.	[1] Statement 1 is given. AND needs medium.	[1] Correct description and explanation.
THREE (a)		[1] All rays are reflected in parallel, but angles of reflection and incidence are not shown as equal.	[1] All rays are correctly reflected in parallel, shown by drawing normal.	
(b)	90 – 52 = 38°	[2] Correct answer.		

(c)		[1] Correct bending of ray at either boundary is shown OR both but no normals.	[1] Correct bending of ray shown at both boundaries.	
(d)	$\frac{n_{air}}{n_{juice}} = \frac{v_{juice}}{v_{air}} \Rightarrow \frac{1.00}{1.43} = \frac{v_{juice}}{3.00\times10^8}$ $v_{juice} = 2.097 \times 10^8 \text{ m s}^{-1}$ $\frac{n_{juice}}{n_{glass}} = \frac{v_{glass}}{v_{juice}} \Rightarrow \frac{1.43}{1.54} = \frac{v_{glass}}{2.097\times10^8}$ $v_{glass} = 1.95 \times 10^8 \text{ m s}^{-1}$	[2] Correct substitution for either of the steps. **OR** Used $\frac{3.00\times10^8}{1.54}$ to get the correct answer but no explanation given to why it is used.	[2] Correct process, but failed to get the correct answer due to incorrect mathematical process.	[2] Correct working and answer. The working must be shown in two steps. **OR** Used $\frac{3.00\times10^8}{1.54}$ to get the correct answer AND gives a reason for why it is used.
(e)		[1] Shows an understanding that light is reflected at the base to form an inverted image.	[1] Correct drawing, but angles of incidence and reflection are almost correct.	[1] Correct diagram to produce the inverted image.

Total opportunities	**criterion 1: 9** **criterion 2: 8**	**criterion 1: 6** **criterion 2: 6**	**criterion 1: 3** **criterion 2: 3**

Judgement Statement – 2008

Achievement	Achievement with Merit	Achievement with Excellence
5 × A1	3 × M1 + 3 × A1	2 × E1 + 2 × M1 + 3 × A1
4 × A2	4 × M2 + 2 × A2	2 × E1 + 2 × M2 + 3 × A2