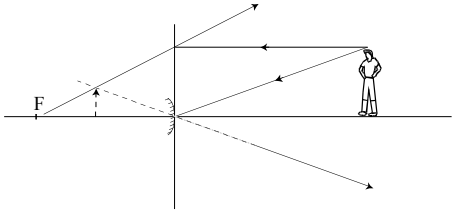
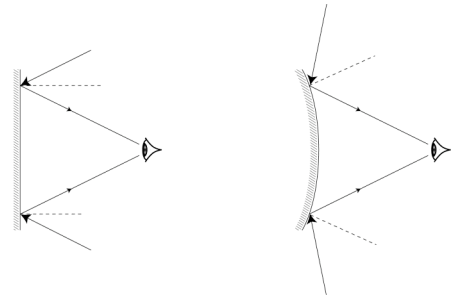
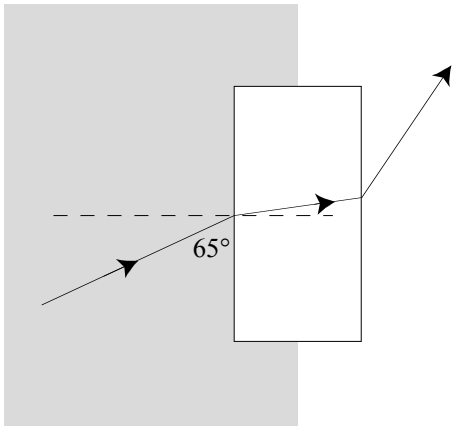
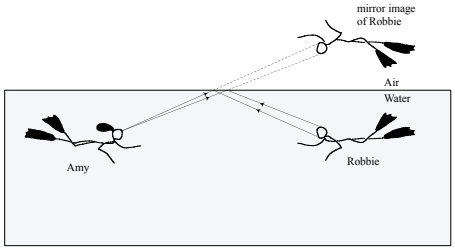
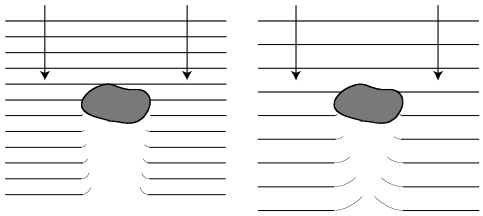
Assessment Schedule – 2005

Physics: Demonstrate understanding of waves (90254)

Evidence Statement

Q	Evidence	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1(a)		[1] Two rays reflected correctly from the mirror, arrows not required.	[1] Achieved plus correct full image. Arrows required on rays.	
1(b)	$m = \frac{0.6}{1.5} = 0.40$ **or** $\frac{d_i}{d_o} = \frac{1.6}{4.1} = 0.39$	[2] 0.4 ± 0.1, or consistent with 1(a). Ignore negative sign on magnification.		
1(c)	$d_o = 3$ m $f = -1.0$ m $-1/1 = 1/3 + 1/d_i$ $d_i = -3/4$ distance = 3 m + 0.75 m = 3.75 m n.b. $S_i \times S_o = f^2$ $0.25 \times 4 = (1)^2$	[2] Value of f calculated correctly. Negative sign not required.	[2] Value of d_i calculated correctly. S_i,(0.25) calculated correctly	[2] Correct distance between Robbie and his image, correct unit.
1(d)	 As shown in diagram, angle of incidence = angle of reflection. For curved mirror field of view is greater so you can see more.	[1] Correct incident rays for both diagrams **or** correct explanation.	[1] Correct incident rays and normals for both diagrams **and** correct explanation. Arrows not required.	
2(a)		[1] First deviation towards normal **or** second deviation away from normal.	[1] First deviation towards normal **and** second deviation away from normal. Incident and emergent ray not parallel.	

Q	Evidence	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
2(b)	$\theta_1 = 25^o$ $\theta_2 = 21^o$ $n_1 \sin\theta_1 = n_2 \sin\theta_2$ $n_1 \sin 25 = 1.5 \sin 21$ $n_1 = \frac{1.5 \sin 21}{\sin 25} = 1.2719$ $n_1 = 1.3$	[2] Correct formula selected and values substituted. Allow incorrect angles.	[2] Correct formula selected and correct values substituted.	[2] Correct method and answer.
2(c)	Absolute refractive index is a measure of how much light is slowed down (or bent) when it travels into a medium (from a vacuum).	[1] Correct answer. Must mention light speed slows down **or** light bends **or** optical density **or** from a vacuum.	[1] Correct answer. Must mention light speed slows down **or** light bends, **or** optical density, **and** from a vacuum.	
2(d)	Critical angle is the angle of incidence that gives an angle of refraction of (almost) 90°.	[1] Correct description of critical angle **or** angle of refraction of 90^0 **or** ray refracts along the boundary.		
2(e)	$n_1 \sin\theta_1 = n_2 \sin\theta_2$ $n_1 \sin\theta_c = n_2 \sin 90$ $n_1 \sin\theta_c = n_2$ $\sin\theta_c = \frac{n_2}{n_1}$ $\theta_c = \sin^{-1}(\frac{1}{1.5})$ $\theta_c = 42°$	[2] Correct formula selected and $\theta_2 = 90^o$.	[2] Correct method answer.	
2(f)	Two rays correctly drawn, extended back to locate image. Image laterally inverted.  	[1] Two rays from Robbie reflected from the boundary.	[1] Two internally reflected rays from the same part of Robbie drawn correctly **and** arrows from Robbie.	[1] Two internally reflected rays from the same part of Robbie drawn correctly: **and** arrows from Robbie **and** image is laterally inverted (ie upside down with head and feet in correct position).

Q	Evidence	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
3(a)	Radio waves can travel through vacuum and Sound waves can't **or** Radio waves are transverse and Sound waves are longitudinal **or** Radio waves are EMR and Sound waves are mechanical **or** Radio waves are faster **or** other correct physical difference.	[1] One difference identified correctly.		
3(b)	$T = 1/f = \frac{1}{91.0}$ MHz $= \frac{1}{91.0} \times 10^{6}$ $T = 1.10 \times 10^{-8}$ s	[2] Correct formula selected and substitution. Allow incorrect f of 91×10^{x}.	[2]Correct answer.	
3(c)	$\lambda = \frac{v}{f} = \frac{3 \times 10^{8}}{91.0}$ MHz $\lambda = 3.3$ m *n.b. Sig. Fig. question.*	[2] Correct answer. Allow value of f consistent with 3(b). [1] 2 sig figs.		
3(d)	$A = \frac{x}{4}$ $A = 0.25$ cm	[2] Correct answer.		
4(a)		[1] One diagram shows diffraction.	[1] Both diagrams show diffraction **plus** longer wavelengths diffract more **and** consistent wavelength.	
4(b)	Diffraction	[1] Correct answer.		
4(c)	Robbie is at an antinode. The waves from the two speakers arrive in phase causing constructive interference. This causes a loud sound. Amy is at a node. The waves from the two speakers arrive out of phase causing destructive interference. This causes a quiet sound.	[1] Correctly describes nodes **or** antinodes causing loud / quiet. **Or** correct reference to constructive **or** destructive interference.	[1] Correctly describes nodes **and** antinodes causing loud / quiet. **Or** correct reference to constructive **and** destructive interference.	[1] Correctly describes nodes **and** antinodes causing loud / quiet. **And** Robbie is at an antinode (constructive interference) **and** Amy is at a node (destructive interference).

Judgement Statement

Criterion 1:

Achievement	Achievement with Merit	Achievement with Excellence
FOUR opportunities answered at Achievement level or higher. 4 × A1	SEVEN opportunities answered with THREE at Merit level or higher. 4 × A1 *plus* 3 × M1	EIGHT opportunities answered with at least ONE at Excellence level and THREE at Merit level. 4 × A1 *plus* 3 × M1 *plus* 1 × E1

Criterion 2:

Achievement	Achievement with Merit	Achievement with Excellence
THREE opportunities answered at Achievement level or higher. 3 × A2	FIVE opportunities answered with TWO at Merit level or higher. 3 × A2 *plus* 2 × M2	SIX opportunities answered with at least ONE at Excellence level and TWO at Merit level. 3 × A2 *plus* 2 × M2 *plus* 1 × E2