Assessment Schedule – 2008

Physics: Demonstrate understanding of wave systems (90520)

Evidence Statement

Judgements in italics indicate replacement evidence and so are not counted for sufficiency.

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	$v = f\lambda$, $\lambda = 2.4$ m $\Rightarrow v = 35 \times 2.4 = 84$ m s^{-1}	[2] Correct answer		
(b)	$f = 3 \times 35 = 105$ Hz	[2] Correct answer.		
(c)	Wavelength has been decreased to $^1/_3$ its original length.	[1] Wavelength decreased.	[1] Correct factor for the decrease in wavelength.	
(d)	Tightening the string changes the speed of the wave. Changing the speed (at fixed frequency) changes the wavelength. Thus a whole number of half-wavelengths no longer fit into the string length. OR Tightening the string changes the speed of the wave. Changing the speed (at fixed string and hence wavelength) changes the required frequency. Thus the generator frequency is no longer the resonant frequency.	[1] The speed of the wave changes / wavelength changes / resonant frequency changes.	[1] Lack of fit linked to a change in speed or a change in wavelength / lack of resonance linked to a change in the required frequency for resonance	[1] Lack of fit linked to a change in wavelength caused by a change in speed / lack of resonance linked to a change in the required frequency for resonance caused by a change in speed.
(e)	$v = f\lambda$ = (answer to (b)) $\times$ 1.8 = 105×1.8 = 190 m s^{-1}	[1] Correct wavelength.	[2]Correct answer consequential with (b).	
TWO (a)	The wavelength of the sound wave decreases because the source of waves moves forward between emitting one wavefront and the next. As the speed of the wave stays constant, if λ decreases, f increases.	[1] Correct idea of decreasing wavelength / "bunching up".	[1] Decreasing wavelength stated and linked to increasing frequency PLUS: because speed is constant / very good description of why wavelength has changed.	[1] Decreasing wavelength explained and linked to decreasing frequency because wave speed is constant.
(b)	$f = f' \dfrac{v_w}{v_w - v_s}$ $\Rightarrow 304 = 287 \dfrac{340}{340 - v_s}$ $\Rightarrow v_s = 19.0$ m s^{-1}	[2] Correct calculation but uses $v_w + v_s$ [1] Recognises $v_w - v_s$ must be used.	[2] Correct answer.	
(c)	The distance between the siren and teacher stays constant.	[1] Correct idea		
(d)	$f_b = f_1 - f_2$ $5 = 287 - f$ $f = 282 = 287 \dfrac{340}{340 + v}$ $v = 6.0$ m s^{-1}	[1] Recognises apparent frequency is 282 Hz		[2] Correct answer.

THREE (a)	$x = \frac{0.0102}{8} = 1.275 \times 10^{-3}$ m $= 1.28 \times 10^{-3}$ m	[1] Answer rounded to 3 sf and correct units given in 1(a), 1(b) and 3(a) or (b).	[2] Correct answer.	
(b)	$\lambda = \frac{dx}{L}$ $\Rightarrow 6.3 \times 10^{-7} = \frac{d \times 1.275 \times 10^{-3}}{2.14}$ $\Rightarrow$ d $= 1.0574 \times 10^{-3}$ $= 1.06 \times 10^{-3}$ m	[2] Correct answer consequential with rounded or unrounded answer to (a).		
(c)	$d = \frac{L\lambda}{x}$ (x is inversely proportional to d), so smaller x means larger d, the threads are more widely spaced.	[1] Threads are more widely spaced.	[1] Wider thread spacing linked to narrower fringe spacing / lesser diffraction angle	
(d)	The new threads don't change the spacing, so the spacing of the fringes in the pattern will be the same. The narrower gaps will mean less light gets through, so they will be dimmer. The narrow gaps will increase diffraction so more fringes will be visible.	[1] Overall decrease in brightness because of narrower gaps described / one change or similarity in the pattern of fringes described.	[1]One change or similarity in the pattern of fringes described and explained.	[1] One change or similarity in the pattern of fringes described and explained plus either the other change or similarity in the pattern of fringes described or the overall brightness described in terms of narrower gaps.
(e)	$\lambda = \frac{dx}{L}$, $\frac{d}{L}$ constant so $\frac{\lambda}{x}$ must also be constant $\Rightarrow \frac{\lambda_R}{8x_R} = \frac{\lambda_G}{8x_G}$ $\Rightarrow \lambda_G = \frac{\lambda_R \times 8x_G}{8x_R}$ $= \frac{6.70 \times 10^{-7} \times 3.2}{4}$ $= 5.36 \times 10^{-7}$ m	[1] Recognition that d and L are not significant	[2] Answer correct except for incorrect handling of units.	[2] Correct answer

Judgement Statement – 2008

Achievement	Achievement with Merit	Achievement with Excellence
5 × A1	3 × A1 + 3 × M1 or 4 × A1 + 2 × M1 + 1 × E2	3 × A1 + 2 × M1 + 1 × E1
3 × A2	3 × A2 + 2 × M2	3 × A2 + 2 × M2 + 1 × E2