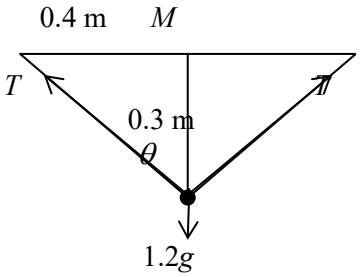
Question Number	Scheme	Marks
ALT (e)	$1.5 = 4\sin\left(\frac{1}{5}\pi t\right) \quad \Rightarrow t_A = \frac{5}{\pi}\sin^{-1}\left(\frac{1.5}{4}\right)$ M1A1 $2.5 = 4\sin\left(\frac{1}{5}\pi t\right) \quad \Rightarrow t_B = \frac{5}{\pi}\sin^{-1}\left(\frac{2.5}{4}\right)$ A1 ${}_A t_B = t_B + t_A = \frac{5}{\pi}\sin^{-1}\left(\frac{2.5}{4}\right) + \frac{5}{\pi}\sin^{-1}\left(\frac{1.5}{4}\right) = 1.6862..$ 1.7 or better A1	
6(a)	$T = \frac{\lambda x}{l} \Rightarrow 30 = \frac{\lambda \times 0.3}{0.5}$	M1A1
	$\lambda = 50$ *	A1* (3)
(b)		
	Extension = 0.5 m (used in (b) or (c))	B1
	$T = \frac{50 \times 0.5}{0.5} = (50)$	M1A1ft
	$\text{R}(\uparrow) \quad 2T\cos\theta - 1.2g = 1.2a$	M1
	$100 \times \frac{3}{5} - 1.2 \times 9.8 = 1.2a$	A1ft
	$a = 40.2 \quad a = 40$ or 40.2 m s^{-2} (positive)	A1 (6)
(c)	E.P.E. $= \frac{1}{2} \times 50 \times \frac{0.5^2}{0.5}$	B1ft (any correct EPE)
	$1.2g \times 0.3 + \frac{1}{2} \times 1.2v^2 = \frac{1}{2} \times 50 \times \frac{0.5^2}{0.5} - \frac{1}{2} \times 50 \times \frac{0.3^2}{0.5}$	M1A1A1
	$v^2 = \frac{1}{0.6}\left(25 \times \frac{0.5^2}{0.5} - 25 \times \frac{0.3^2}{0.5} - 1.2g \times 0.3\right) \quad (= 7.452)$	DM1
	$v = 2.730... \quad = 2.7$ or $2.73\,\text{m s}^{-1}$	A1 (6)

Question Number	Scheme	Marks
		[15]
(a)		
M1	Use HL with $T = 30$	
A1	Correct equation	
A1*	Obtain **given** value for λ from fully correct working	
(b)		
B1	Correct extension, seen explicitly or used in (b) or (c) Extension 0.25 if half string used.	
M1	Use HL to form an equation using $\lambda = 50$ and their extension.	
A1ft	Correct equation, ft their extension	
M1	Attempt a vertical equation of motion. Must have 3 terms with T resolved a could be negative.	
A1ft	Correct equation with their value of T	
A1	Correct value of the acceleration (positive). Must be 2 or 3 sf.	
(c)		
B1ft	Either EPE correct, follow through their extension.	
M1	Energy equation, from C to the ceiling. PE, KE and 2 EPE terms required. EPE of the form $k\frac{x^2}{l}$.	
A1	Both EPE terms correct.	
A1	Completely correct equation	
DM1	Solve for v^2 or v	
A1	Correct value for v. Must be 2 or 3 sf (unless penalised in (b)).	