Question Number	Scheme	Marks
2 (a)	$S_{ff} = 25.5 - \frac{15^2}{10}$ $S_{df} = 433.5 - \frac{(25.7\times10)\times15}{10}$	M1
	$S_{ff} = 3$ $S_{df} = 48$	A1 A1
		(3)
(b)	f since the frequency depends on the depth (d) oe	B1
		(1)
(c)	$\frac{'48'}{\sqrt{1090.6\times'3'}} = 0.8391...$ awrt 0.839	M1 A1
		(2)
(d)	As the depth (d) increases the frequency (f) increases	B1ft
		(1)
(e)	$\beta = \frac{'48'}{1090.6}[= 0.04401...]$	M1
	$\alpha = \frac{15}{10} - '\beta'\times25.7[= 0.3688...]$	M1
	$f = 0.369 + 0.0440d$	A1
		(3)
(f) (i)	For every extra metre of depth, the frequency increases by '0.044' [kHz] oe	B1ft
(ii)	[Assuming the model is valid,] the frequency at the surface would be '0.369' [kHz] oe	B1ft
		(2)

	Notes	Total 12
(a)	**M1**	For a correct method to find either S_{ff} or S_{df} May be implied by a correct anwser
	A1	For $S_{ff} = 3$
	A1	For $S_{df} = 48$
(b)	**B1**	f identified with a correct reason e.g. f **and** is dependent on…/affected by…/changed by…/influenced by… determined by d or f **and** reference to d being controlled e.g. f since d is the variable that is controlled
(c)	**M1**	For a correct method to calculate the PMCC follow through their S_{ff} and S_{df} May be implied by awrt 0.839
	A1	awrt 0.839
(d)	**B1ft**	A correct interpretation follow through their part (c) e.g. As d increases f increases. Ignore any reference to numbers
(e)	**M1**	A correct method to find the gradient ft their S_{df} May be implied by awrt 0.04 or $\frac{240}{5453}$
	M1	A correct method to find the f intercept ft their β May be implied by awrt 0.37 or $\frac{4023}{10906}$
	A1	For a correct equation, with α =awrt 0.369 and β =awrt 0.044 Allow $\alpha = \frac{4023}{10906}$ and $\beta = \frac{240}{5453}$ Must be in terms of f and d only
(f) (i)	**B1ft**	A correct interpretation, follow through their β. Must have the units metre oe
(ii)	**B1ft**	A correct interpretation, follow through their α Allow $d = 0$ to imply 'at the surface'