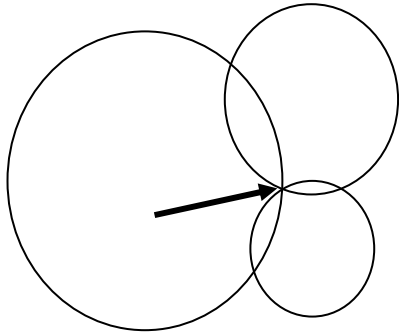


Question Number	Answer	Acceptable answers	Mark
1(a)	C		(1)

Question Number	Answer	Acceptable answers	Mark
1(b)(i)	<p>An explanation linking the following</p> <ul style="list-style-type: none"> the earthquake will be one of the points of intersection (1) (but) there are two points (of intersection) (1) 	<p>(might implies) further evidence needed possibly at a different place (NOT places)</p> <p>50:50 chance</p>	(2)

Question Number	Answer	Acceptable answers	Mark
1(b)(ii)		<p>any arrow clearly indicating the common point of intersection ignore ambiguous arrows</p> <p>a small circle or cross at the common intersection</p>	(1)

Question Number	Answer	Acceptable answers	Mark
1(c)	<ul style="list-style-type: none"> S- wave arrives at 17 minutes P-wave arrives 9.5 minutes (1 for both) difference in arrival time = 7.5 (minutes) (1) 	<p>7.0 to 8.0 inclusive 7.30/7:30 give full marks for correct answer, no working</p> <p>e.c.f from readings marked on graph or stated for a different distance on graph</p>	(2)

Question Number	Answer	Acceptable answers	Mark
1(d)	<p>A description including the following</p> <ul style="list-style-type: none"> vibration (1) in same direction as wave/energy moves (1) 	<p>up and down/side to side/shake</p> <p>backwards and forwards/back and forth scores 2</p>	(2)

Question Number	Answer	Acceptable answers	Mark
2(a)	A		(1)

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	(number of waves =) 7 (1) (distance between floats =) 7×0.8 (1)	Accept 5.6 (m) give full marks for correct answer, no working e.c.f from number of waves if clear 6.4 (m) for 1 mark	(2)

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	C		(1)

Question Number	Answer	Acceptable answers	Mark
2(b)(iii)	Any one from the following points <ul style="list-style-type: none"> • size (1) • mass (1) • speed (1) • direction of travel (1) 	small light slow fast momentum how far away weight power ke	(1)

Question Number	Answer	Acceptable answers	Mark
2(c)	<ul style="list-style-type: none"> • change of direction (1) • towards the normal (1) • λ shorter than in deep water (1) 	Ignore reflection of EITHER ray or wave must not reach normal if ray and wave contradict then no mark λ shorter for all complete waves in shallow water, at least 2λ drawn, judge by eye	(3)

Question Number	Answer	Acceptable answers	Mark
3(a)	C		(1)

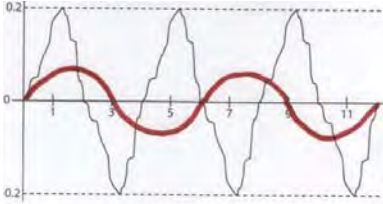
Question Number	Answer	Acceptable answers	Mark
3(b)	5 (cm)	5.0, +5, -5, ± 5 ignore unit	(1)

Question Number	Answer	Acceptable answers	Mark
3(c)	<ul style="list-style-type: none"> A difference in f or λ (however described) (1) <p>This difference correctly qualified by one of</p> <ul style="list-style-type: none"> Relationship to each other (1) Relationship to audible sound (1) Frequency or wavelength data (1) 	<p>Accept pitch for frequency</p> <p>IS has longer λ than audible (1)</p> <p>US > 20kHz (1)</p> <p>IS has lower f (than US) (2 marks)</p> <p>information shown on a labelled sketch of the sound spectrum</p>	(2)



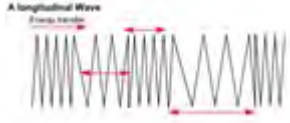

Question Number	Answer	Acceptable answers	Mark
3(d)	<p>An explanation linking the following points</p> <ul style="list-style-type: none"> corks as plates / water as mantle (1) water heated (underneath) (1) convection currents mentioned(1) 	<p>labels on diagram</p> <p>corks as crust / water as magma /lava</p> <p>reference to heat in the Earth</p> <p>arrow on diagram</p>	(3)

Question Number	Answer	Acceptable answers	Mark
3(e)	<p>An evaluation linking the following points</p> <ul style="list-style-type: none"> • (a) statement about either distance travelled or arrival times of any two waves (1) • (b) statement comparing any pair of S-P times (1) • correct comparison between (a) and (b) leading to conclusion (1) 	<p>quantitative or qualitative</p> <p>quantitative or qualitative</p> <p>quantitative</p> <p>e.g.</p> <p>station M is twice as far as station L, the S-P time is double, suggestion is OK. 3 marks</p> <p>e.g.</p> <p>station N is (about) $3\frac{1}{2}$ times as far as station L, but S-P time is $3\frac{1}{3}$ times, so maybe not. 3 marks</p>	(3)

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	12/3 (1) 4 (m) (1)	the wave shown is for 3 wavelengths any correct ratio give full marks for correct answer, no working	(2)

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	all amplitudes smaller (1) all wavelengths longer (1)	Accept smaller peak to trough distance wherever it is drawn all wavelengths shown must be longer than original can be any shape must be at least half a wavelength shown 	(2)

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	{ P-wave / ultrasound / infrasound / shock } (1)	P/primary/pressure (wave) IGNORE slinky/spring/push-pull	(1)

Question Number	Answer		Mark
4(b)(ii)	<p>Any two from:</p> <p>vibrations different direction (1)</p> <p>In longitudinal (vibrations) move in same direction as {wave/energy} moves (1)</p> <p>In transverse (vibrations) move at right angles to direction {wave/energy} moves (1)</p>	<p>In one is up and down, other is backwards and forwards / any two different motions</p>  <p>AND</p>  <p>in longitudinal (particles) move backwards and forwards</p>  <p>in transverse (particles) move up and down/ side to side</p> 	(2)

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	B		(1)

Question Number	Answer	Acceptable answers	Mark												
4(c)(ii)	<p>substitution (1) ie 340 / 1047</p> <p>evaluation (to at least 2 sf) (1) ie between 0.32 and 0.33 (m) inclusive</p> <p>conversion of m to cm (1)</p>	<p>No RA</p> <p>If incorrect value chosen for frequency cannot get substitution mark but can get evaluation mark and conversion mark</p> <p>frequency (Hz)</p> <p>evaluation(m)</p> <table> <tr><td>1290</td><td>0.26</td></tr> <tr><td>1245</td><td>0.27</td></tr> <tr><td>1200</td><td>0.28</td></tr> <tr><td>1174</td><td>0.29</td></tr> <tr><td>1109</td><td>0.31</td></tr> <tr><td>960</td><td>0.35</td></tr> </table>	1290	0.26	1245	0.27	1200	0.28	1174	0.29	1109	0.31	960	0.35	(3)
1290	0.26														
1245	0.27														
1200	0.28														
1174	0.29														
1109	0.31														
960	0.35														

Question Number	Answer	Mark
5(a)(i)	B	(1)

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	An explanation linking two of the following: <ul style="list-style-type: none"> • (uneven) heat (from the core) (1) • convection (currents) (1) • (that are in) the mantle (1) 		(2)

Question Number	Answer	Acceptable answers	Mark
5(b)	C		(1)

Question Number	Answer	Acceptable answers	Mark
5(c)(i)	Description to include: <ul style="list-style-type: none"> • (they can be) reflected (1) • (and/or) refracted (1) 	bounce off/back change direction/speed	(2)

Question Number	Answer	Acceptable answers	Mark
5(c)(ii)	Substitution (1) 1200/200 Evaluation (1) 6 (km/s)	Power of 10 error max 1 mark give full marks for correct answer, no working	(2)

Question Number	Answer	Acceptable answers	Mark
5(d)	An explanation linking <ul style="list-style-type: none"> • tsunamis are caused by underwater earthquakes / volcanic eruption (1) • are random/irregular (1) 	Underwater movements of the plates / landslip into the sea / meteorite strike into the sea can happen at any time / do not know when it will happen	(2)