

**Geology**

Advanced Subsidiary GCE

Unit **F791**: Global Tectonics

**Mark Scheme for June 2012**

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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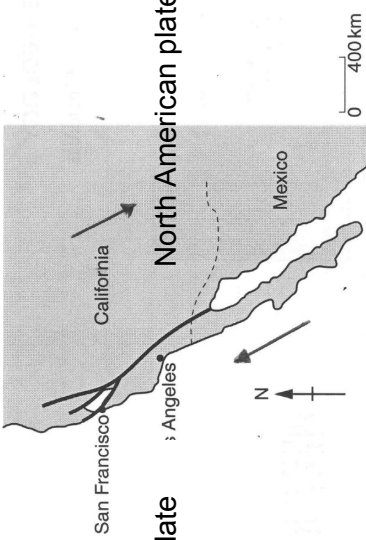
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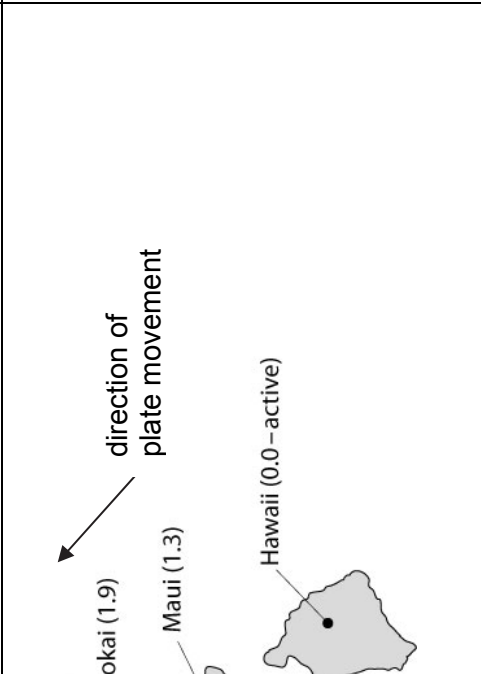
## Annotations

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt <b>not</b> given
	error carried forward
	information omitted
	ignore
	reject

Highlighting is also available to highlight any particular points on the script.

Question	Answer	Marks	Guidance
1 (a) (i)	Conservative	1	
(ii)	San Andreas (Fault) / strike slip / transform	1	<b>ALLOW</b> Hayward (Fault) or any other correctly named fault
(iii)	 <p>Pacific plate</p> <p>North American plate</p> <p>as shown, Pacific plate moving NW and N American plate making SE</p>	1	<p>need <b>two</b> correct arrows in correct direction</p> <p><b>ALLOW</b> both arrows to the NW but needs a label showing Pacific faster than the North American plate <b>OR</b> Pacific arrow larger</p>
(iv)	(North) American plate to the east of the fault Pacific plate labelled to the west of the fault <b>OR</b> anywhere in the ocean.	1	need both correct for one mark as on the map above
(b) (i)	(seismic) tomography	1	<b>DO NOT ALLOW</b> topography

Question	Answer	Marks	Guidance
(ii)	(hot) convection currents rise <b>OR</b> (hot) convection currents diverge <b>OR</b> (hot) convection currents pull plates apart <b>OR</b> (hot) convection currents cause divergent plate margins <b>OR</b> ridge push pushes plates apart <b>OR</b> rising magma pushes plates apart  (cold) convection currents converge and sink <b>OR</b> (cold) convection currents cause convergent plate margins <b>OR</b> slab pull moves plates apart  <b>ALTERNATIVE ANSWER</b>  hot rising convection currents <u>and</u> cold falling convection currents idea of lithosphere being moved by the convection currents <b>OR</b> slab pull <u>and</u> ridge push	1  1  1 1	mark annotated diagrams as text  if mention convection currents just rise and sink then 1 mark max  location and effect = 1
(c)	(i) area of the mantle which is excessively hot <b>OR</b> rising magma from deep in the mantle <b>OR</b> mass of magma rising through the mantle	1	accept magma rising from a specific depth in the mantle between 100 – 2900 km
(ii)	volcanic activity at a fixed point <b>OR</b> hotspot point above a mantle plume <b>OR</b> stationary mantle plume <b>OR</b> eruption of lava forms volcanic islands <b>OR</b> volcanic activity at a hotspot  plate moves over the mantle plume <b>OR</b> idea of islands moving away from the hotspot produces a line of increasingly old volcanoes <b>OR</b> seamounts are old eroded volcanoes <b>OR</b> seamounts are sunken volcanic islands	1  1	mark diagrams as text  <b>ALLOW</b> annotations on map
(d)	(i) 10 cm/year +/- 0.8 cm/year correct working  <u>distance</u> 510km or 51 000 000 cm <u>time</u> 5.1Ma or 5 100 000 years	1 1	If 470km then 9.2 if 480km then 9.4 if 490km then 9.6 if 500km then 9.8 if 510km then 10.0 if 520km then 10.2 if 530km then 10.4 if 540km then 10.6 if 550km then 10.8

Question	Answer	Marks	Guidance
(ii)	 <p>direction of plate movement</p> <p>arrow pointing to NW</p>	1	
(iii)	basalt	1	<b>ALLOW</b> mafic / basic / basaltic
	<b>Total</b>	<b>14</b>	

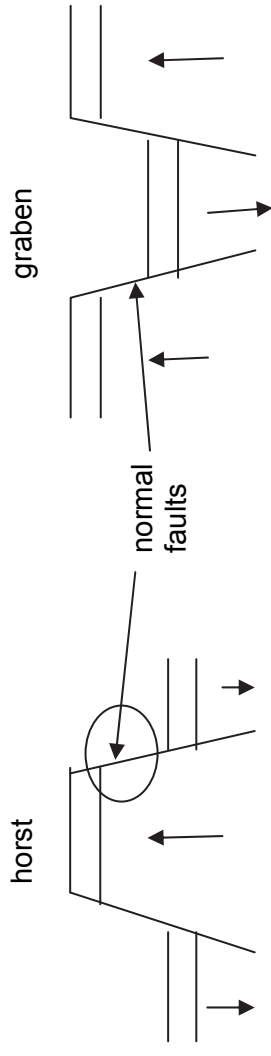
Question	Answer	Marks	Guidance								
2 (a) (i)	collection of samples of rock / soils / dust <b>OR</b> samples could be dated <b>OR</b> samples could be analysed <b>OR</b> samples composition determined <b>OR</b> showed the surface was made of basalt <b>OR</b> mapped the craters <b>OR</b> evidence of volcanic activity	1	<b>ALLOW</b> anorthosite as rock type								
(ii)	maria <b>OR</b> dark area dark area <b>OR</b> (basalt) lava flows <b>OR</b> low lying flat areas <b>OR</b> cratered area highlands <b>OR</b> light area light coloured <b>OR</b> plagioclase rich rock <b>OR</b> anorthosite <b>OR</b> mountainous area	1  1	both areas named = 1 <b>OR</b> correct rock in correct area = 1 <b>OR</b> name and description = 1 dark and light with no name then 1 max only accept dark area and light area once								
(b) (i)	<u>asteroid belt</u>	1	must be correctly spelt								
(ii)	<table border="1"> <tr> <td>meteorite type</td> <td>meteorite description</td> </tr> <tr> <td>carbonaceous chondrite</td> <td>contains water and organic compounds</td> </tr> <tr> <td>iron</td> <td>composed of a metallic alloy</td> </tr> <tr> <td>stony</td> <td>composed of silicate minerals</td> </tr> </table>	meteorite type	meteorite description	carbonaceous chondrite	contains water and organic compounds	iron	composed of a metallic alloy	stony	composed of silicate minerals	2	1 <b>OR</b> 2 correct = 1 mark 3 correct = 2 marks
meteorite type	meteorite description										
carbonaceous chondrite	contains water and organic compounds										
iron	composed of a metallic alloy										
stony	composed of silicate minerals										
(c)	mantle  core	1  1	<b>ACCEPT</b> outer or inner core								
	<b>Total</b>	<b>8</b>									

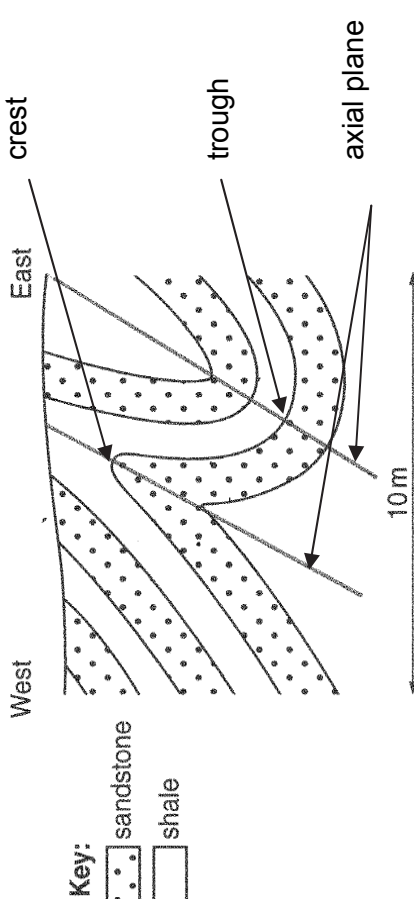
Question	Answer	Marks	Guidance
3 (a)	<p>overlap due to deposition <b>OR</b> overlap due to formation of deltas;</p> <p>gap due to erosion;</p> <p>sea level changes;</p> <p>fit is at the edge of the continental shelf <b>OR</b> 200 – 1000 m submarine contour <b>OR</b> at bottom of continental slope;</p>	2	<p>any 2</p> <p><b>ACCEPT</b> due to erosion <b>OR</b> deposition linked to change in shape</p> <p>erosion and deposition with no detail = 1 max</p>
(b)	<p>cratons <b>OR</b> shields <b>OR</b> areas of metamorphic rocks found on both continents match or join up;</p> <p>age 2000 – 1000 Ma <b>OR</b> same age rocks <b>OR</b> Precambrian;</p> <p>glacial deposits <b>OR</b> tillites found on both continents match or join up;</p> <p>300 - 350 Ma rocks <b>OR</b> same age <b>OR</b> Carboniferous;</p> <p>same age sequence of sedimentary rocks <b>OR</b> lake clays <b>OR</b> evaporites <b>OR</b> coal <b>OR</b> desert sandstones found on both continents match or join up;</p> <p>formed in a different climatic zone shows movement;</p>	2	<p>Do not award a mark for just stating <i>they join up</i></p> <p>any 2</p> <p>2 marks max if two rock types described</p> <p>1 mark max for ages</p> <p><b>ACCEPT</b> any other reasonable rock type</p>
(c)	<p>same trend / orientation / direction / alignment / pattern of mountain belts across the join of the continents;</p> <p>structures such as <u>faults</u> <b>OR</b> <u>faults</u> match up;</p> <p>same rock types in the mountain belt match up</p> <p>fold mountains drawn and labelled on the map continuously on both continents</p>	1	<p>any 1 mark for description</p> <p>Do not award a mark for just stating they match or join up</p>
(d)	<p>direction of striations shows movement of ice <b>OR</b> striations outwards shows movement from ice cap;</p>	1	<p>1 mark for drawing and labelling on map</p> <p><b>ACCEPT</b> any reasonable area drawn over the join</p> <p>any 1 mark for description</p>

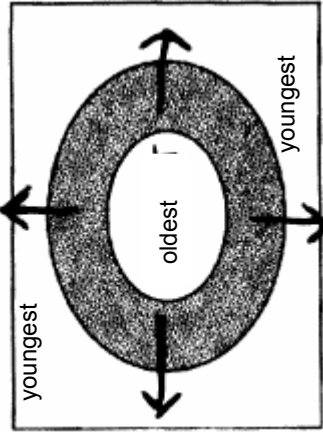
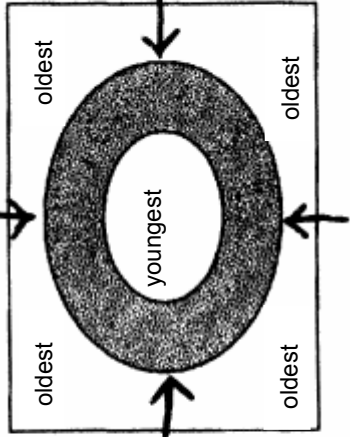


Question	Answer	Marks	Guidance
	Carboniferous ice sheet across Africa and South America <b>OR</b> both continents were closer to the pole;  drawn and labelled on the map by arrows radiating out or pointing west	1	1 mark for drawing and labelling on map must be drawn only in southern parts of the two continents
(e)	Gondwanaland	1	must be spelled correctly <b>ALLOW</b> Gondwana
(f) (i)	<p>continental slope</p> <p>height (km)</p> <p>sea level</p> <p>depth (km)</p> <p>abyssal plain</p> <p>percentage surface area of the Earth (cumulative frequency)</p>	2	2 - 5 points correct = 1 mark 6 - 7 points correct = 2 marks
(ii)	the continental slope labelled from just below sea level (200m) to about 3km depth the abyssal plain labelled from 3km – 6km depth	1	1 mark for cumulative frequency curve
	<b>Total</b>	<b>14</b>	as on the graph

Question	Answer	Marks	Guidance
4 (a) (i)	symmetrical synform <b>OR</b> symmetrical anticline	1	for name <b>ALLOW</b> 1 mark for description of age relationships any 1
	both <u>limbs</u> dipping at 40° <b>OR</b> with a dip of 40° both sides fold axis trending NW - SE <b>OR</b> fold axial plane trace trending NW – SE;; open fold; upright fold axis;	1	
(ii)	compression <b>OR</b> compressional	1	<b>DO NOT ALLOW</b> compressive
(b) (i)	strike slip <b>OR</b> tear fault sinistral <b>OR</b> left lateral; fault trends NE – SW;	1	<b>ALLOW</b> 1 mark for description of age relationships any 1
(ii)	51 m +/- 18 m	1	this range covers measurements using sandstone or igneous rocks and use of all possible divisions of the scale
(c)	horst shows upthrown block between 2 faults graben shows downthrown block between 2 faults	1	labels could be arrows to show upthrow and downthrow the faults must be obvious showing a clear displacement <b>ALLOW</b> 1 mark max for two correct diagrams with no labels for 2 marks need 2/3 of faults, arrows or marker bed shown for 1 mark need 1/3



Question	Answer	Marks	Guidance
(d) (i)	<p>both axial planes must be drawn and at least one labelled</p>  <p>Key:  <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px);"></span> sandstone  <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; background-color: white;"></span> shale</p>	1	axial plane lines must extend through a minimum of three beds
(ii)	<p>see diagram above</p> <p>crest at top of antiform</p> <p>trough at bottom of synform / at lowest point of the fold</p> <p>limb on sides of fold</p>	2	limb in any part of fold that is not the crest or trough 1-2 correct = 1 mark 3 correct = 2 marks
(iii)	West	1	<b>ALLOW</b> left
(iv)	overfold	1	

Question	Answer	Marks	Guidance
(e)	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>DOME</b></p>  </div> <div style="text-align: center;"> <p><b>BASIN</b></p>  </div> </div> <p>correct shape for both (circular or oval) = 1  oldest and youngest correct for both = 1  at least 3 correct dip arrow directions for both = 1</p>	3	<p>if a cross section is drawn then max 1 if antiform drawn for dome <b>AND</b> synform drawn for basin</p> <p>if a 3D diagram is drawn then max 1 if dome and basin are correct</p>
<b>Total</b>		<b>16</b>	

Question	Answer	Marks	Guidance
5	<p><b>convergent plate margin description</b></p> <ul style="list-style-type: none"> <li>• Benioff zone <b>OR</b> linear zone of earthquakes parallel to the plate margin <b>OR</b> below fold mountains at continental – continental plate margin;</li> <li>• shallow focus (0-70km) close to the trench <b>OR</b> at the top of the subduction zone <b>OR</b> intermediate and deep focus further away from the trench (70 – 700km) <b>OR</b> shallow to deep (0-700km) <b>OR</b> shallow to intermediate below continental – continental margin;</li> <li>• occurs towards the top edge of the subducting plate <b>OR</b> on faults below continental-continental margin;</li> <li>• can be high <u>magnitude</u> <b>OR</b> infrequent;</li> </ul> <p><b>convergent plate margin explanation</b></p> <ul style="list-style-type: none"> <li>• produced by friction <b>OR</b> movement of the subducting plate;</li> <li>• produced by movement on reverse faults <b>OR</b> thrusts;</li> <li>• formed by compressional stress;</li> <li>• shallow earthquakes produced by the movement of magma;</li> </ul> <p>diagram to show a convergent plate margin;</p> <p><b>divergent plate margins description</b></p> <ul style="list-style-type: none"> <li>• shallow focus (0 – 70km);</li> <li>• occur along the edge of the rift <b>OR</b> close to the centre of the MOR <b>OR</b> along normal faults;</li> <li>• occur along transform faults;</li> <li>• frequent <b>OR</b> low <u>magnitude</u>;</li> </ul> <p><b>divergent plate margins explanation</b></p> <ul style="list-style-type: none"> <li>• produced by movement along normal faults <b>OR</b> transform faults;</li> <li>• rising magma causes small earthquakes;</li> <li>• different rates of sea floor spreading causes earthquakes;</li> <li>• formed by tensional stress; <b>OR</b> where plates move in opposite directions</li> </ul> <p>diagram to show a divergent plate margin.</p>	2	<p>accept annotated diagrams as text</p> <p>any 2 marks for the description</p> <p>any 2 marks for the explanation</p> <p>1 mark for the labelled diagram must include earthquakes or Benioff Zone</p> <p>max 5 marks for convergent margins</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>1 mark for the labelled diagram must include earthquakes</p> <p>max 5 marks for divergent margins</p>
	<b>Total</b>	<b>8</b>	

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