OCR
RECOGNISING ACHIEVEMENT

GCE

Geology

Advanced Subsidiary GCE

Unit **F791:** Global Tectonics

Mark Scheme for January 2011

Oxford Cambridge and RSA Examinations

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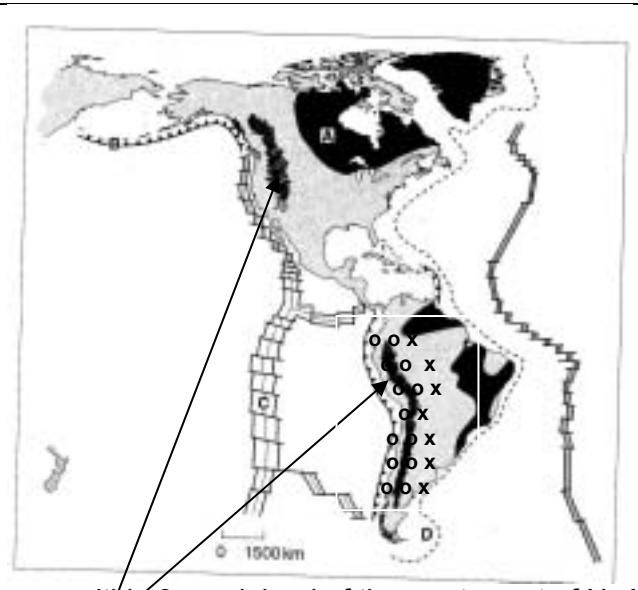
<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td>(i)</td><td>
<table>
<tr><th>feature</th><th>location</th></tr>
<tr><td>mid-ocean ridge</td><td>C</td></tr>
<tr><td>continental shelf</td><td>D</td></tr>
<tr><td>continental shield or craton</td><td>A</td></tr>
<tr><td>deep-ocean trench</td><td>B</td></tr>
</table>
</td><td>[2]</td><td>1 – 2 correct = 1
3 – 4 correct = 2</td></tr>
<tr><td></td><td></td><td>(ii)</td><td> 

area within 3 mm inland of the west coast of N. America / S. America / Andes / Rockies</td><td>[1]</td><td>see map
any section of fold mountain

accept Appalachians if correct on East coast of North America

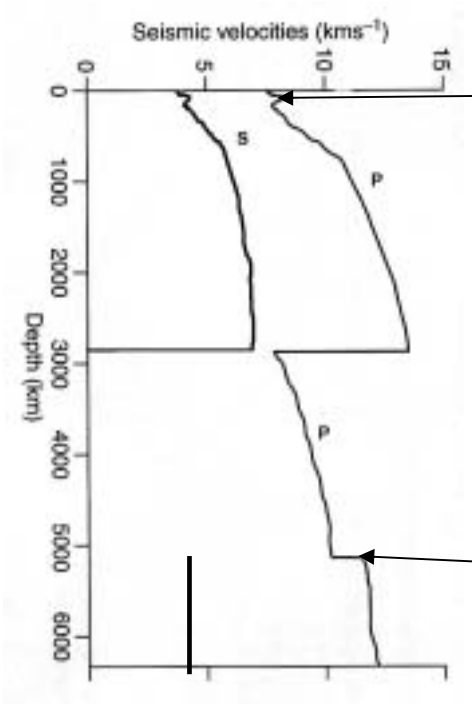
must be a shaded area and not a single point</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>shallow focus:
close to the West coast of South America

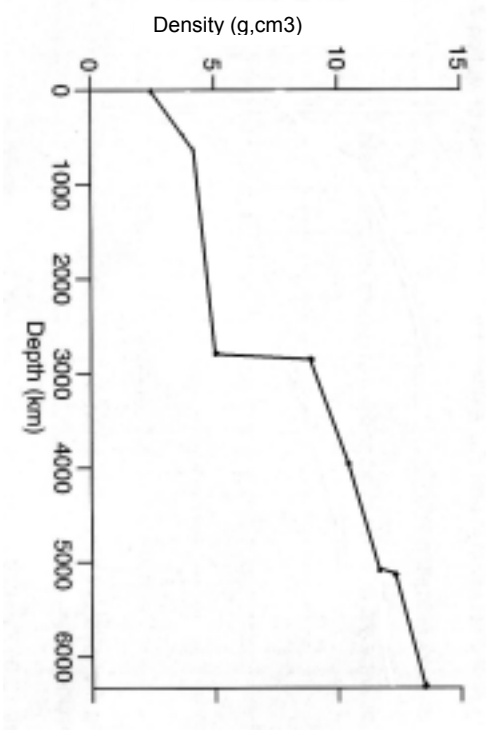
deep focus:
further inland of West coast of South America</td><td>[1]

[1]</td><td>see map
from trench to 3 mm inland
not MOR
2 - 10 mm inland
if wwr max 1</td></tr>
</table>

Question			Expected Answers	Marks	Additional Guidance
		(iv)	**shallow** – close to the <u>top</u> of the subducting plate / <u>top</u> of the Benioff zone / friction between the oceanic and continental plate **deep** – lower down the subducting plate / further down in the Benioff zone / friction between the subducting plate and the mantle / thrust / fault movement	**[1]** **[1]**	see the map ecf if given at the MOR due to faulting ecf in N America, same reasons as S. America 1 mark max if only discuss subduction or friction 1 mark max if general discussion of distance and subduction
	(b)	(i)	gently sloping / flat 0 - 200 m / shallow underlain by continental crust / area close to land / joins to the continental slope / part of the continent covered with (clastic / carbonate) sediments many marine organisms	**[1]**	allow anywhere in range 0 – 200 m need two points to get 1 mark
		(ii)	deep / up to 11 km narrow / linear feature / up to 150 km wide submarine valley / steep sided at edge of oceans / alongside fold-mountains / alongside island arcs negative heat flow / negative gravity anomaly	**[1]**	accept within the range 6 – 11km allow words to the effect of *longer than it is wide* need two points to get 1 mark
		(iii)	form linear belts / chains thickened crust / up to 90 km <u>very</u> high mountains / 3 – 8 km folding / antiforms / synforms / recumbent folds / nappes faulting / thrust / reverse faults metamorphism / metamorphic rocks intrusive igneous rocks / (granite) batholiths ophiolites / accretionary prism positive gravity anomaly	**[1]**	need two points to get 1 mark
		(iv)	away from plate margin / middle of plate / no plate boundary / no subduction / little stress building up / stable / no tectonic activity	**[1]**	do not accept old

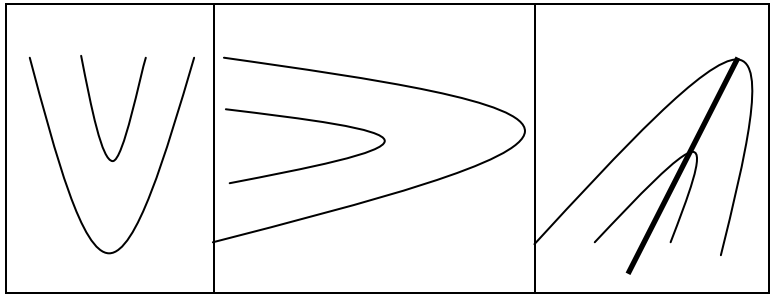
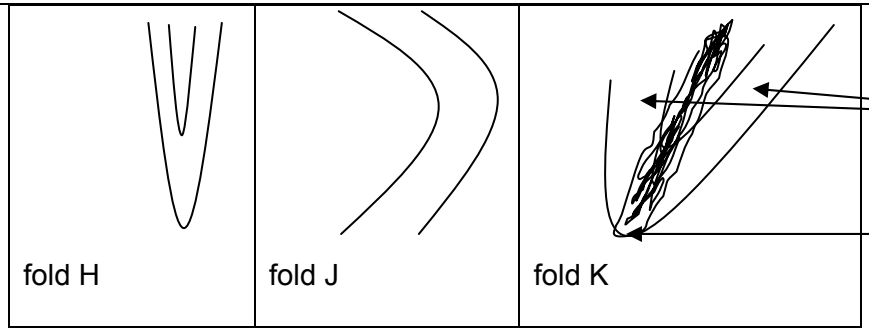
Question			Expected Answers	Marks	Additional Guidance
	(c)	(i)	submarine mountain / sunken volcano / at least 1 km above sea bed	[1]	must be submarine
		(ii)	deep area of the ocean / 3 – 7 km deep / <u>flat</u> area of ocean floor / between the continental slope and the MOR	[1]	not sea floor accept within 3 – 7 km range
			Total	**[13]**	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	 see the graph above correct line from surface to mantle – core boundary line going straight down at 2900 km correct line in the inner core	[any 2]	S wave graph line can be parallel to the P wave graph or nearly vertical if the line continues into the outer core then lose a mark
		(ii)	approximately 100 km below the surface / at the dip in the line	[1]	label as on the diagram above
		(iii)	they <u>slow down</u> / form the <u>LVZ</u> / <u>Low Velocity Zone</u>	[1]	
		(iv)	at the change in velocity about 5100 km as on the diagram above	[1]	where the P wave is horizontal must have a line or arrow

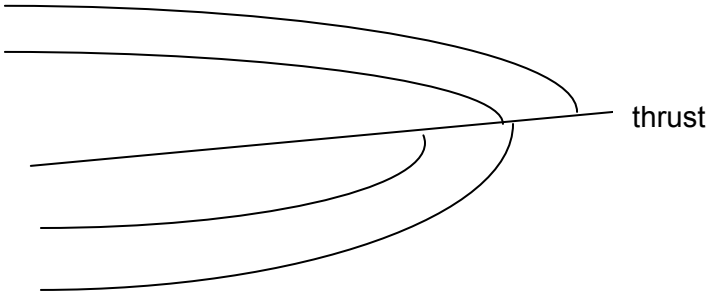
Question			Expected Answers	Marks	Additional Guidance
	(b)	(i)	 as on the graph above 3 - 4 points correct = 1 5 - 6 points correct = 2	[2]	points within 2 mm max 1 if no line
		(ii)	moved from the mantle to the outer core crossed the Gutenberg discontinuity change from peridotite / ultramafic / silicate / rocky / stony to Fe (Ni) / metallic	[any 2]	accept mantle is peridotite and outer core is iron (and nickel) = 2 marks must have the pair eg peridotite to Fe

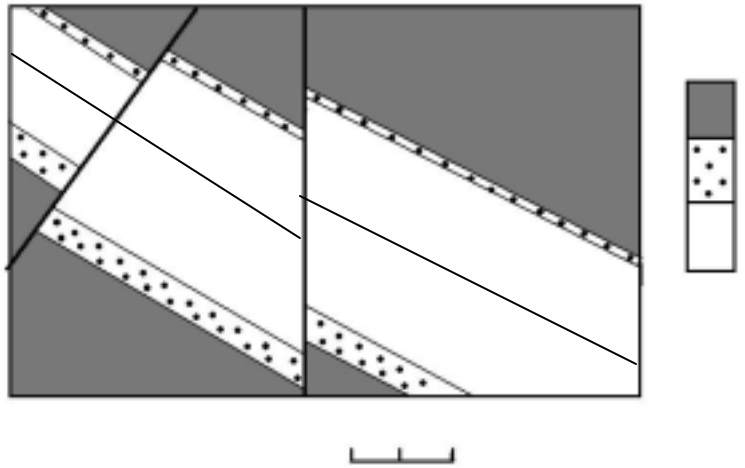
Question			Expected Answers	Marks	Additional Guidance
	(c)		flexible pipes / electricity cables prevents pipes from fracturing / stops fires cross-bracing / bird caging / shear walls to strengthen building / reduces torsion / reduces twisting / increases rigidity mass on roof of tall buildings / passive damping / damping / pendulum acts as a counterbalance as the building sways pyramid-like structure more stable / wider base flexible structure absorbs energy / absorbs sway base isolation / rubber / Teflon / ball bearings / rollers between building and foundations to absorb ground vibrations / separate building from ground / building stationary while ground moves building on a solid concrete raft / pumping liquid cement / deeper / wider / piled foundations / strengthen building foundations / reinforced foundations to provide greater support / stops shearing from foundations / firmer base	[4]	name or basic idea = 1 mark accept the name as part of the explanation detailed description / explanation / recognisable diagram = 1 mark max 2 for each method allow only 2 methods so max 4 'shock absorbers' max =1 'rubber foundations' max =1 general comments about reinforced concrete with steel rods = 1
			Total	**[13]**	

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	radiometric dating / U/Pb dating / K/Ar dating / Rb/Sr dating / use of half lives / parent isotopes and daughter isotopes	[1]	K-Ar, U-Pb, Rb-Sr accept "radioactive" dating accept diagrams as text
		(ii)	4.5 – 4.6 billion years / 4500 – 4600 Ma	[1]	any value within the range
		(iii)	3.7 – 4.3 billion years 3700 Ma – 4300 Ma	[1]	any value within the range
	(b)	(i)	diagram shows rocks youngest at the MOR / oldest further away from MOR diagram shows symmetrical pattern about the MOR text indicates rocks youngest at the MOR / oldest further away from MOR text indicates symmetrical pattern about the MOR	[any3]	accept labels as text no diagram then max 2 diagram could show magnetic stripes or sediment thickness or labelled ages
		(ii)	high heat flow at MOR / heat flow symmetrical about MOR caused by volcanic activity / rising magma / hot rising convection currents sediment thin at MOR / sediment thickest away from MOR / thickness symmetrical about the MOR time for sediment to form / time for planktonic organisms to accumulate magnetic stripes parallel to MOR / magnetic stripes symmetrical about the MOR reversals of the magnetic field / positive and negative reversals positive gravity anomaly excess mass / mountain range	[max 2]	describe = 1 mark explain = 1 mark not <u>rock</u> thickness max 2 for 2 points from one piece of evidence diagram can gain the description mark
			Total	[8]	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>(4)</td><td>(a)</td><td>(i)</td><td> 
as on the diagram</td><td>[1]</td><td>label not required
must be fold G
line must bisect the fold</td></tr>
<tr><td></td><td></td><td>(ii)</td><td><table><tr><th>fold type</th><th>letter</th></tr><tr><td>overfold</td><td>G</td></tr><tr><td>recumbent</td><td>F</td></tr><tr><td>upright</td><td>E</td></tr></table></td><td>[2]</td><td>1 correct = 1 mark
3 correct = 2 marks</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>fold H</td><td>[1]</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td> 

need both correct for 1 mark</td><td>[1]</td><td>limb outside the shaded area
trough within the shaded area</td></tr>
</table>

Question	Expected Answers	Marks	Additional Guidance
(c)	 recumbent fold = 1 mark thrust / fault = 1 mark	[1] [1]	does not need arrows fold structure must be displaced fault / thrust must be labelled thrust and fold axis no higher than 30° max 1 if the thrust and fold axis too steep but otherwise the diagram is correct
	Total	**[7]**	

Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	anticline	[1]	
		(ii)	because the oldest rock is in the core ecf dip arrows dip away from each other / beds different thicknesses either side of the fold	[1]	accept “middle of fold” for core of fold ecf
		(iii)	 need both parts to be correct to gain 1 mark	[1]	axial plane trace can be central or to the NE
		(iv)	any angle > 40°	[1]	max 90°
		(v)	thinner outcrop in the NE / wider outcrop in the SW.	[1]	
	(b)	(i)	the distances between the two sides of the fault are different on either side of the fault / the outcrop is displaced in opposite directions on each side of the axial plane / axial plane trace not displaced	[1]	accept alternative wording
		(ii)	left / NW / W	[1]	

Question			Expected Answers	Marks	Additional Guidance
		(iii)	the outcrop of the beds are closer on the downthrown side of an antiform / beds are younger on the downthrown side / ORA	[1]	accept alternative wording
	(c)	(i)	sinistral / strike-slip / tear / shear	[1]	the spelling must be correct including the hyphen in strike-slip if one correct term spelled correctly = 1
		(ii)	50 m +/- 5 m	[1]	
	(d)		slickensides	[1]	must have the exact spelling not slicken sides
			Total	[11]	

Question			Expected Answers	Marks	Additional Guidance
6			radon gas levels	[1]	mark diagrams as text
			tend to increase (prior to earthquake)	[1]	
			released because of (micro)cracks	[1]	max 2
			tilt meters / lasers / stress meters / strain gauges	[1]	
			shows deformation / indicate changes in ground level / changes in distances between two points	[1]	
			due to stress in the ground / strain in rocks	[1]	max 2
			animals have been seen to behave in a strange way	[1]	
			hide / run away / howl / snakes from burrows / China / Haicheng	[1]	specific animal behaviour
			changes in magnetism affects animals	[1]	max 2
			change in electrical conductivity / resistance	[1]	
			conductivity goes up / resistivity goes down	[1]	
			(micro)cracks allow influx of water	[1]	max 2
			seismic gap / recurrence patterns	[1]	
			map earthquakes along a fault / measure timing of historical earthquakes	[1]	
			areas with no earthquakes will have stored stress / areas with a number of earthquakes prone to activity / see when an earthquake is overdue	[1]	max 2
			water levels in wells change / ground water / water table	[1]	
			rises or falls	[1]	max 2
			microfractures opening / increases permeability	[1]	link to permeability / flow of water
			foreshocks / precursor earthquakes	[1]	
			pattern builds up prior to major earthquake / rocks start to fracture	[1]	
			only gives a short notice	[1]	max 2
			P wave velocity changes	[1]	
			decrease and then increase before the earthquake	[1]	
			due to change in incompressibility / rigidity / physical rock properties	[1]	max 2

Question			Expected Answers	Marks	Additional Guidance
			none of the techniques are reliable / accurate often use a combination of techniques	[1] [1]	allow once allow once
			Total	**[8]**	

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