

GCE

Geology

Unit **F791**: Global Tectonics

Advanced Subsidiary GCE

Mark Scheme for June 2014

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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.

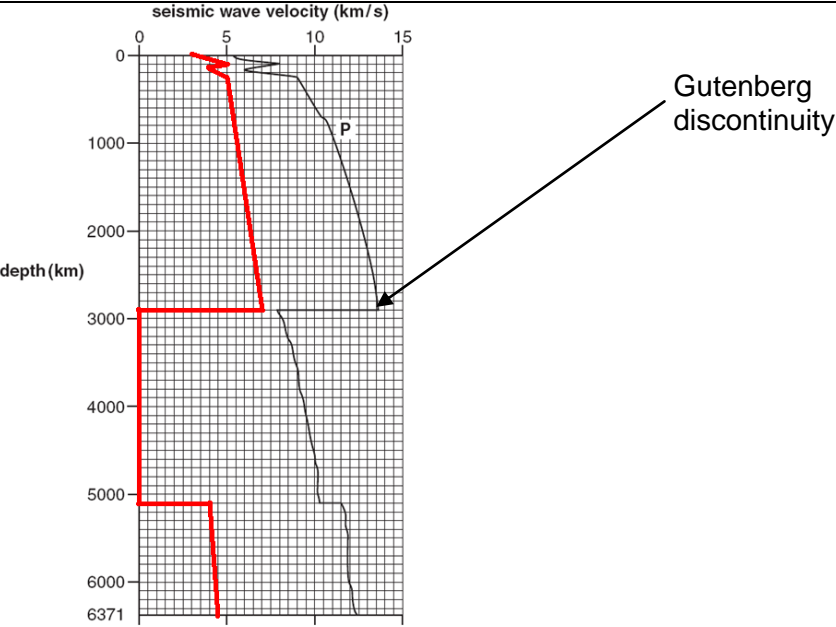
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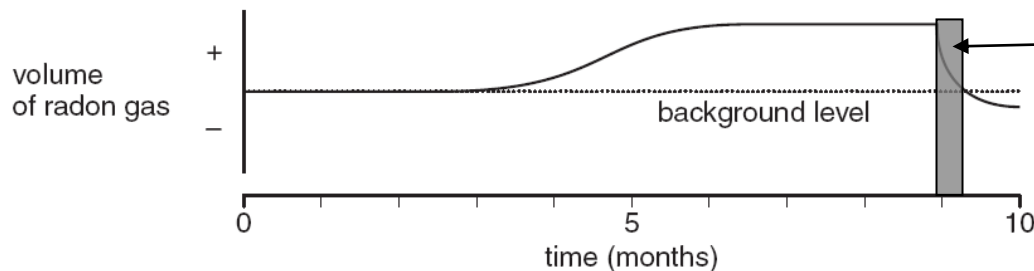
These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

Annotation	Meaning
	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt not 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)	radiometric	1	<p>ALLOW specific examples such as K/Ar OR Rb/Sr OR U/Pb</p> <p>DO NOT ALLOW carbon dating</p>
	(b) (i)	 <p>4 – 6 points correct = 1 mark 7 – 9 points correct = 2 marks line drawn correctly = 1 mark</p>	3	<p>ALLOW if no line between 2900 km and 5100 km</p> <p>ALLOW within half a square</p> <p>ALLOW line between 250 km - 2900 km AND/OR 5100 km - 6371 km as curve to match P wave graph</p> <p>DO NOT ALLOW lines with values greater than 7 km/s</p> <p>DO NOT ALLOW where the S wave line slows down before it reaches 2900 km</p>
	(ii)	arrow to line at 2900 km	1	<p>ACCEPT on P or S line label must be touching or within half a square</p>

Question		Answer	Marks	Guidance
	(iii)	<p>describe P waves slow down OR reduce velocity OR slow down then speed up OR description of velocity at specific depths – 8 km/s at 100 km to 6 km/s at 150 km</p> <p>explain because the rock is (5%) partially melted; because the rock is rheid; because the rock is less rigid</p>	1 1	<p>DO NOT ALLOW answers referring to density</p> <p>ACCEPT plastic or ductile for rheid any 1</p>
	(iv)	<p>S waves stop at 2900 km as they have reached the liquid outer core OR stops at outer core as it is less rigid OR cannot pass through the liquid outer core</p> <p>S waves start again at 5100 km as it is in the solid inner core OR starts at 5100 km as it is rigid;</p> <p>S waves start again at 5100 km as they are generated by P waves OR S waves generated by P waves in the inner core</p>	2	<p>any 2</p> <p>need both elements for each mark, description and explanation</p> <p>general statement about S waves stopping at outer core and starting at inner core but without explanation = 1</p> <p>general statement about outer core liquid and inner core solid = 1</p> <p>ALLOW correct depths as alternative to inner or outer core</p> <p>ACCEPT not transmitted for stop</p>
(c)	(i)	<p>mantle oceanic crust core continental crust</p>	2	<p>1 or 2 correct = 1 3 or 4 correct = 2</p>
	(ii)	<p>(observations of) <u>iron</u> meteorite; the Earth has a magnetic field; the Earth's gravitational field; the Earth's density</p>	1	<p>any 1</p> <p>DO NOT ACCEPT just meteorites ACCEPT metallic OR NiFe meteorites OR iron nickel ACCEPT correct descriptions of magnetism OR gravity OR density</p>
Total			12	

Question		Answer	Marks	Guidance
2	(a)	seismometer epicentre seismogram focus intensity magnitude	4	0 - 2 correct = 0 3 correct = 1 4 correct = 2 5 correct = 3 6 correct = 4
	(b) (i)	 <p>between 8.9 to 9.3 months where radon level starts to drop</p>	1	must have an arrow within the shaded area on the graph
	(ii)	more radon released due to (micro)fractures; stress OR pressure OR tensional forces cause (micro)fractures; gas <u>percolates</u> OR <u>migrates</u> up to the surface along fractures; gas accumulates in water wells when tensional forces pre earthquake allows release; (micro)fractures close up after the earthquake so less radon escapes	2	any 2 DO NOT ALLOW strain as alternative to stress ALLOW cracks as an alternative to fractures each point must have a description and explanation
	(c)	tiltmeter measures change in - angle of ground OR gradient of ground OR bulge in ground OR swell in ground OR high degree of accuracy (1mm); lasers measure the distance OR elevation OR altitude between two points; GPS OR satellite measurements show the change in position between two points	1	any 1 DO NOT ALLOW answers without reference to measurements between two locations


Question		Answer	Marks	Guidance
	(d) (i)	tear fault OR strike slip fault OR dextral	1	ACCEPT transform OR wrench
	(ii)	<p>some sections (Dixon's Bluff) show no movement (locked) AND other sections (Mee Ranch) show movement;</p> <p>locked sections do not release energy OR creeping sections regularly release energy OR locked sections are storing more (strain) energy OR creeping sections do not store energy;</p> <p>some rock types (competent) can store more strain energy OR some (incompetent) store less;</p> <p>areas with more friction need more force to move ORA;</p> <p>seismic gap theory linked to sections;</p> <p>creeping sections may be lubricated by water</p>	2	<p>any 2</p> <p>ACCEPT stuck for locked</p> <p>ACCEPT stress or pressure instead of energy</p>
	(iii)	Dixon's Bluff	1	
	(e)	<p>stored stress exceeds the strength of the rock;</p> <p>energy released as rock fractures (breaks) and moves OR energy released as seismic waves OR energy released causes vibrations OR energy released causes ground movement AW ;</p> <p>elastic rebound when stress is released suddenly and ground moves back</p>	2	<p>any 2</p> <p>ACCEPT stress or pressure instead of energy</p> <p>ALLOW general statement about stress becomes too much and break releasing energy = 1</p> <p>If explanation uses <u>plates</u> rather than rocks max = 1</p>

Question	Answer	Marks	Guidance
(f)	<p><u>Unconsolidated sand</u> vibrates more which causes buildings to collapse OR be destroyed OR be unstable;</p> <p>amplifies the waves which causes buildings to collapse OR be destroyed OR be unstable;</p> <p>liquefaction causes structures to tilt or sink or subside;</p> <p>water in unconsolidated sand will rise to the surface which undermines the buildings which sink</p> <p><u>Consolidated sandstone</u> absorbs energy OR is stable OR strong and rigid OR competent OR will support buildings OR vibrates less OR amplifies less OR no liquefaction</p>	<p>1</p> <p>1</p>	<p>any 1</p> <p>DO NOT ALLOW causes damage as part of the explanation</p> <p>ACCEPT landslides as an effect</p> <p>the sandstone mark can be for a reverse argument</p>
	Total	16	

Question			Answer	Marks	Guidance
3	(a)	(i)	craton OR shield 	1	the spelling must be correct
		(ii)	away from a plate margin OR no build up of stress	1	ALLOW middle of a plate OR stable rocks DO NOT ALLOW middle of continent
	(b)	(i)	(thin) oceanic crust being pulled apart OR crust being pulled apart at MOR OR due to rising magma at MOR OR movement along the <u>transform</u> faults OR movement along the <u>normal</u> faults OR movement along faults at the axial rift	1	ALLOW no collision at MOR OR no subduction at MOR ALLOW dip slip or step fault instead of normal fault ACCEPT divergent plate margin OR constructive plate margin instead of MOR
		(ii)	movement on reverse faults OR movement on thrusts OR movement on faults caused by compression OR collision of Indian and Eurasian plates	1	DO NOT ALLOW rising magma
		(iii)	describe earthquakes form a Benioff zone OR go from <u>shallow in East (E) to deep in West (D)</u> explain due to subducting plate AND due to friction between two plates cross section diagram subduction of Pacific plate going under Japan and at least two labels (subduction zone, Benioff zone, trench, arrows showing movement, volcanoes, island arc, rising magma, partial melting, oceanic crust, two named plates)	1 1 1	mark labels as text Pacific plate must be subducting from E to D (to the left) diagram needs at least two labels DO NOT ALLOW unlabelled symbols unless they are the same as those used on the map DO NOT ALLOW Benioff zone and subduction zone on diagram and text
	(c)	(i)	 label in this zone	1	zone as indicated by the map

Question		Answer	Marks	Guidance
	(ii)	Aleutian Islands OR the Caribbean OR New Zealand OR Phillipines OR Japan OR Indonesia	1	ACCEPT any other valid answer circle does not have to include every island
	(iii)	C Eurasia(n)	1	DO NOT ALLOW Asian
		Total	10	

Question		Answer	Marks	Guidance
4	(a)	faults have (relative) movement AND joints have no movement OR faults show displacement AND joints show no displacement	1	need both parts for 1 mark
	(b)	(i) contracts AND fractures OR tension AND fractures OR contracts AND tension OR contracts towards centre <u>diagram</u> showing arrows contracting inwards OR shows the hexagonal shape OR polygonal and at least one label: hexagonal, polygonal, joint, cooling centre, tension	1 1	DO NOT ALLOW contracts towards centre on diagram and explanation shape labels may be from the text
		(ii) batholith forms at depth OR under pressure; erosion OR overlying rocks removed OR pressure is reduced; rock expands <u>diagram</u> of joints parallel to top of the batholith and at least one label: joints, fractures	1 1	any 2
	(c)	(i) <u>bedding plane</u> = any boundary between beds <u>cleavage plane</u> = any plane within the shale parallel to axial plane <u>joint</u> = fracture within the sandstone	1 1 1	label lines must touch the feature or be within 1 mm
		(ii) incompetent = shale showing plastic deformation OR because it has cleavage planes OR because it has minor folds OR has no faults OR has no joints OR does not fracture OR varies in thickness	1	need both the correct rock AND explanation ACCEPT ductile for plastic
		(iii) plane drawn bisecting the fold through the hinge lines	1	label line must touch the feature or be within 1 mm

Question	Answer	Marks	Guidance
	<p>(iv) <u>fold</u> asymmetrical; synform OR syncline; overturned OR overfold OR inverted south limb; closed</p> <p><u>fault</u> reverse fault; dip-slip fault; in trough of fold OR along the fold axis; downthrown to the South OR upthrown to the North hanging wall to the North OR footwall to the South</p> <p><u>measurements</u> north limb dipping between 50 – 90° OR south limb dipping at 5 - 35° throw (displacement) of fault 20 – 45 cm; fault dip 40° - 60°; bed thickness of sandstone 40 – 75 cm OR shale thickness 40 – 200 cm</p>	<p>1</p> <p>1</p> <p>1</p>	<p>any 2 points for 1 mark</p> <p>any 2 points for 1 mark</p> <p>any 1 measurement for 1 mark</p>
	<p>(v) compression OR compressive OR compressional </p> <p>from North OR to the South OR from the right OR to the left</p>	<p>1</p>	<p>need both parts to be correct for 1 mark</p> <p>compression must be spelled correctly</p> <p>ACCEPT North to South OR right to left OR Northerly</p>
	Total	14	

Question	Answer	Marks	Guidance
	<p>ANY FOUR DESCRIPTIONS WITH EXPLANATION</p>		<p>any two sections max 3 all four sections must be answered for maximum marks only accept parallel once only accept symmetrical once only accept match either side of the ridge once</p>
<p>5</p>	<p>description positive and negative magnetic anomalies at MOR OR normal and reversed magnetic anomalies at MOR; magnetic anomalies are parallel to the MOR OR symmetrical about the MOR OR match either side of the MOR</p> <p>explanation Earth's magnetic field has reversed OR switched OR flipped; Igneous rocks magnetised as they form at the MOR OR description of formation of palaeomagnetism (iron minerals lined up, Curie point, direction of iron particles is frozen)</p>	<p>1 1 1 1</p>	<p>ACCEPT annotated diagram as text for description</p> <p>max 3</p>
	<p>description sediment thickens with distance from MOR; parallel to MOR OR symmetrical about MOR OR match either side of the MOR</p> <p>explanation new oceanic crust forms at the MOR ORA; no time for the sediment to accumulate at MOR ORA; ooze accumulates slowly from plankton</p>	<p>1 1 1 1 1</p>	<p>ACCEPT annotated diagram as text for description</p> <p>max 3</p>

Question	Answer	Marks	Guidance
	<p>description rocks become older as they move away from the MOR; parallel to MOR OR symmetrical about MOR OR match either side of MOR</p> <p>explanation new igneous rock forms at the MOR; igneous rocks are split apart and move away from MOR in opposite directions; due to ridge push OR rising convection currents OR diverging convection currents</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>ACCEPT annotated diagram as text for description</p> <p>max 3</p>
	<p>description volcanic activity at the MOR; high heat flow at the MOR OR positive heat flow anomaly at the MOR</p> <p>explanation rising magma from the upper mantle; due to partial melting of the upper mantle; rising convection currents</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>ACCEPT annotated diagram as text for description</p> <p>DO NOT ACCEPT rising convection currents more than once</p> <p>max 3</p>
	<p>description normal faults forming the axial rift parallel to the MOR; transform faults form at 90° to the MOR</p> <p>explanation normal faults due to tensional forces; transform faults due to different rates of spreading</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>ACCEPT annotated diagram as text for description</p> <p>max 3</p>
	<p>description positive gravity anomaly over the MOR OR gravity rises over the MOR OR match either side of the MOR</p> <p>explanation due to excess mass at the MOR OR mountains OR rising magma below volcanoes</p>	<p>1</p> <p>1</p>	<p>ACCEPT annotated diagram as text for description</p> <p>max 2</p>
	Total	8	

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