OCR
Oxford Cambridge and RSA

GCE

Geology

Unit **F791:** Global Tectonics

Advanced Subsidiary GCE

Mark Scheme for June 2017

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

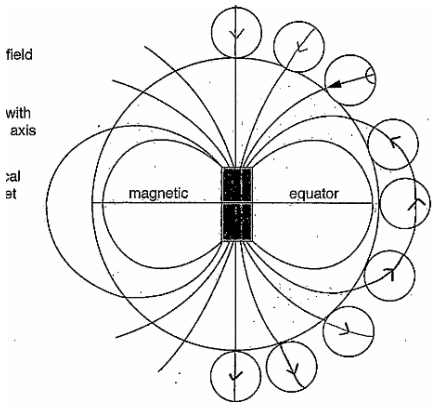
All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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

Annotation	Meaning
	Unclear
BOD	Benefit of doubt
CON	Contradiction
	Cross
ECF	Error carried forward
I	Ignore
NBOD	Benefit of doubt not given
PD	Poor diagram
R	Reject
SEEN	Noted but no credit given
	Tick
^	Omission mark
MR	Maximum response

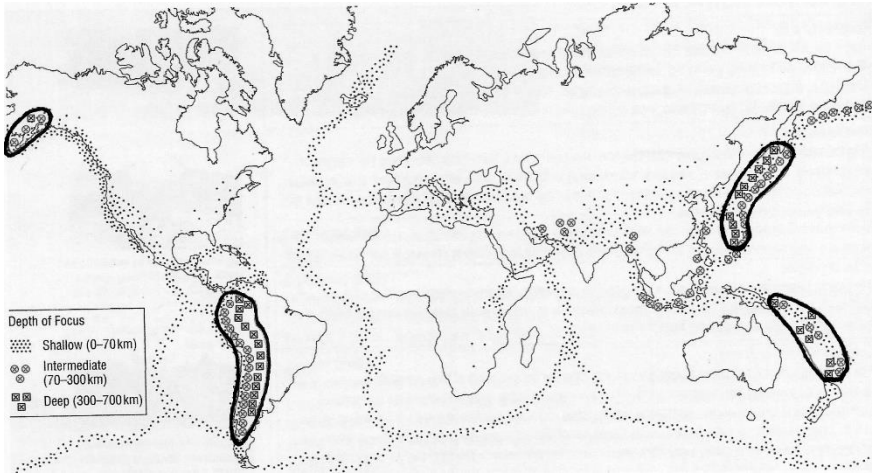
Question			Answer/Indicative content	Mark	Guidance
1	(a)	(i)	 **2 or 3 correct = 1** **4 or 5 = 2** **6 or 7 = 3** **8 = 4**	 1 1 1 1	**ALLOW** slight inaccuracy in inclination
		(ii)	angle / dip of lines of the magnetic field; angle / dip of a compass needle compared to the horizontal; angle / dip of the magnetic field from the horizontal	 1	**any 1**
	(b)	**(i)**	electricity iron / nickel rotational currents fluid magnetism / electricity electricity / magnetism self-exciting	 4	**ALLOW** iron **AND** nickel 8 correct = 4 marks 7 or 6 correct = 3 marks 5 or 4 correct = 2 marks 3 or 2 correct = 1 mark **ALLOW** electricity and magnetism to swap places
		(ii)	iron rich / magnetic minerals / magnetite in lava / magma / rock		**ACCEPT** domains line up

Question			Answer/Indicative content	Mark	Guidance
			align with Earth's magnetic field; lava cools (through the Curie Point) and becomes permanently magnetized / frozen compass / permanent remnant magnetism;	1 1	 **ALLOW** AW
	(c)		lava plains / lava domes / lava flows / (shield) volcanoes / volcanic features on surface / volcanic gases; radar / infrared / thermal imaging / mapping / gas sampling **AND** obtained by (Magellan) spacecraft / probe / orbiter / satellite;	1 1	 **DO NOT ACCEPT** photography or telescopes **ACCEPT** named gases
			Total	**13**	

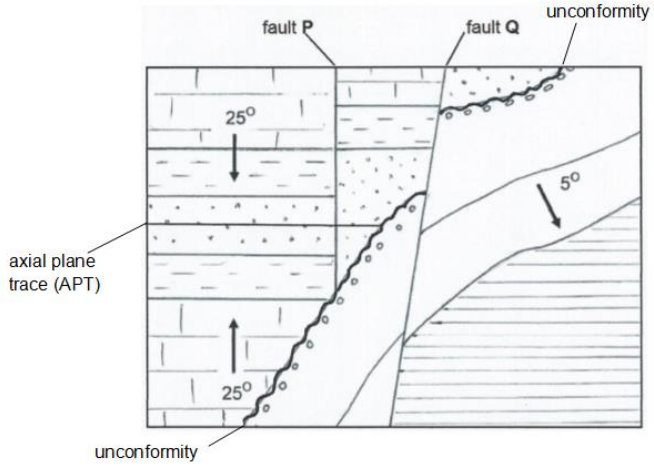
Question			Answer/Indicative content	Mark	Guidance
2	a		Japan 596÷935x100/100÷935x596 = 63.74% / 63.7% / 64% Kobe 312:21 then both sides divided by 21 = 14.86:1 / 14.9:1 / 15:1 correct working for either answer	1 1 1	**DO NOT ACCEPT** 63.6% **DO NOT ACCEPT** 14.8 or 14.85%
	b	(i)	loss of / damage to / destruction of / replacement of buildings / infrastructure / roads /railways / utilities / property / personal possessions; burial of the casualties; emergency services costs;	 1	**any 1** **ALLOW** AW and examples
		(ii)	**<u>ground levels;</u>** tiltmeters (using laser technology) / GPS / strain gauges; slope of ground changes / increases / decreases; ground deformation due to stress **OR** **<u>gas levels;</u>** gas detector / gas monitor / detected by radioactivity / by Geiger counter; radon levels increase; radon released due to the formation of microfractures / microcracks **OR** **<u>water levels in wells;</u>** probe measures water level; water levels change / increases / decrease; water released due to the formation of microfractures / microcracks **OR**	1 2	for monitoring method any 2 for description of the chosen method **ALLOW** <u>stress</u> as a named method and any 2 points from any of the descriptions

Question			Answer/Indicative content	Mark	Guidance
			<u>foreshocks</u> seismometer / seismograph; foreshock frequency increases; increased stress / release of strain energy **OR** **<u>P wave velocity</u>** seismometer / seismograph; P wave velocity decrease then increases; changes in rock incompressibility / rigidity / density **OR** **<u>resistivity / conductivity</u>** resistivity meter / Ohmmeter / probe; water increases conductivity / reduces resistivity of rock; porosity increase due to microfractures / microcracks **OR** **<u>coloured lights</u>** coloured lights in sky; changing electrical properties of (quartz and other) minerals under stress **OR** **<u>animal behaviour;</u>** disturbed / unusual behaviour of animals; animals may detect slight changes in Earth's magnetic field; animals may be able to detect foreshocks; Haicheng in China as an example **OR** **<u>seismic gap theory</u>** mapping of past epicentres; gaps / areas with no seismic activity; locked fault sections / accumulation of stress / strain energy;		**ACCEPT** any appropriate examples of animal behaviour
	c	**(i)**	circular motion;		**any 1**

Question			Answer/Indicative content	Mark	Guidance
			large amplitude; long wavelength; low frequency; long duration; horizontal movement; surface wave; slowest waves; most destructive	1	**ACCEPT** high amplitude
		(ii)	travel at / near surface / surface waves; cause ground movement / vibrations / circular motion; affect foundations of buildings; frequency similar to natural resonant frequency of buildings	1	**any 1**
	d		rock under / affected by / subjected to stress; opposing forces / shear / tensional / compressional stress acting on the rock: rock is deformed / strained / changes shape; stress overcomes strength / yield point reached; strain energy stored in the rock: rock fractures / breaks; two parts of rock move relative to each other / displacement occurs along a fault: (strain) energy stored in the rock released causing ground movement / vibration / earthquake; Elastic rebound theory	1 1 1 1 1 1	**DO NOT ALLOW** pressure **any 1** **ALLOW** rock fails / snaps **any 1** **any 1** **any 1** **ALLOW** labelled diagram(s) Labels marked as text **MAX 4**
			Total	**13**	

Question			Answer/Indicative content	Mark	Guidance
3	(a)	(i)	Eurasian; North American; Nazca; Scotia	2	3 or 4 correct **AND** 3 spelled correctly = 2 marks 2 correct = 1 mark **DO NOT ACCEPT** just American
		(ii)		1 1	**must be clearly labelled** **ALLOW** any area with dots **only** shaded and labelled for shallow earthquakes. **NOT** areas with dots and intermediate symbols together for intermediate and deep earthquakes, **ALLOW** any area shaded within the bold lines **NOT** areas with the intermediate symbol but lacking deep symbol.
	(b)	(i)	rising magma injected at MOR / volcanic activity at MOR / injection of dykes at MOR; lithosphere / plates forced / pushed apart; moves away from ridge due to gravity / gravitational sliding;	1 1	**ACCEPT** divergent plate margin instead of MOR **any 1**
		(ii)	oceanic lithosphere / plate subducted / sinks / goes down / at ocean trenches / at (ocean-continent) convergent margins; oceanic lithosphere is colder; oceanic lithosphere is denser; lithosphere / slab sinks and pulls rest of plate with it due to gravity;	1 1	**any 1** **DO NOT ACCEPT** crust **any 1**
		(iii)	balance between formation of ocean lithosphere / crust at MOR and its subduction at trenches;		**any 1**

Question			Answer/Indicative content	Mark	Guidance
			movement on convection currents in the earth / asthenosphere / mantle; sea floor spreading / ridge push / slab pull	1	**DO NOT ALLOW** continental drift AW
	(c)		continental plates only: H; K; L; oceanic plates only: E; F; N;	4	3 correct = 2 marks 2 correct =1 mark 3 correct = 2 marks 2 correct =1 mark max 1 if one continental and one oceanic correct
			Total	**13**	

Question			Answer/Indicative content	Mark	Guidance
4	(a)	(i)			see diagram must be clearly labelled
			axial plane trace of fold and one label	1	axial plane must be drawn on both sides of fault and centrally placed
			unconformity on either side of fault Q and one label	1	
		(ii)	065° **OR** 245° **OR** 035° **OR** 215°	1	**ALLOW** +/- 10° and just one direction stated must be 3 figures
		(iii)	bedding plane(s)	1	**DO NOT ALLOW** beds
	(b)	(i)	youngest: fault Q / eastern fault / sinistral / strike-slip / tear / wrench unconformity fault P / western fault / dip slip oldest: syncline / fold / synform	2	2 or 3 in correct sequence = 1 4 in correct sequence = 2 if WWR but correct = max 1

Question			Answer/Indicative content	Mark	Guidance
		(ii)	fault P is cross-cut / overstepped / overlapped by the unconformity / conglomerate; fault P only cross cuts / faults the folded beds / syncline fault Q cross cuts / faults the unconformity / conglomerate; fault Q cross cuts all beds	1 1	AW on top of **any 1** **any 1**
	(c)	**(i)**	75° (+/- 5°)	1	
		(ii)	fault breccia	1	
		(iii)	rock broken / fragmented by movement along fault plane / cataclasis	1	AW e.g. faulting
		(iv)	Slickensides mineralisation occurs on fault plane / surface; form parallel to the direction of movement; form due to grinding of rock surfaces moving against / scratching each other;	1 1	spelling must be correct for mark **any 1**
			Total	**13**	

Question			Answer/Indicative content	Mark	Guidance
5			**hotspot**		
			• surface expression of a mantle plume; • a volcano within a plate / intraplate location; • an area of high heat flow <u>within a plate / intraplate location</u>; • where islands appear above the surface at a MOR;	max 2	
			mantle plume		
			• <u>stationary</u> area of high heat flow in the mantle; • diapir / material / rock rising from great depths (in mantle) / core - mantle boundary / Gutenberg Discontinuity	max 2	
			Evidence		
			• <u>positive</u> heat flow <u>anomaly;</u> • positive gravity anomaly; • mafic / basaltic eruptions / shield volcanoes; • using (seismic) tomography; • seismic waves change velocity when they travel through material of a different temperature **OR** different density **OR** different rigidity **OR** different incompressibility **OR** different compressibility; • seismic velocity changes can indicate rising plumes / diapirs beneath hotspots	max 3	**ALLOW** seismic waves change with density plus example;
			explanation of island chains		
			• hotspot produces volcanic island / vent created through the lithosphere; • tectonic plates move over time **AND** the plume is stationary; • plate movement takes the volcano off the plume / hotspot; • volcano is eroded / becomes extinct / becomes a seamount / guyot; • islands become older away from the hotspot / plume	max 3	diagrams marked as text = max 3
			Total	**8**	

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