

Geology

Advanced Subsidiary GCE

Unit **F792**: Rocks – Processes and Products

Mark Scheme for June 2013

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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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Annotations

Annotation	Meaning
	Unclear
	Benefit of doubt
	Contradiction
	Cross
	Error carried forward
	Ignore
	Benefit of doubt not given
	Poor diagram
	Reject
	Noted but no credit given
	Tick
	Omission mark
	Maximum response

Annotation	Meaning
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
()	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

Question		Answer	Marks	Guidance
2	(a) (i)	F mafic H intermediate G silicic	2	3 correct = 2 marks 1 or 2 correct = 1 mark DO NOT ALLOW silica for silicic ALLOW basic for F and acidic for G
	(ii)	porphyritic basalt	1 1	ECF from (a)(i) ALLOW term porphyritic if used in (a)(iii)
	(iii)	augite and/or olivine crystals OR phenocrysts formed slowly ; augite and / or olivine crystals OR phenocrysts formed in the magma chamber; augite and / or olivine crystals OR phenocrysts formed first; augite and / or olivine crystals OR phenocrysts forms large crystals (4mm OR medium size); groundmass cooled rapidly; groundmass form fine crystals (0.5mm); groundmass cooled at the surface; groundmass cooled last;	1 1	any two points for phenocryst formation ALLOW 1 mark for two stages of cooling OR general correct statement of large crystal slow cooling and fine fast cooling. any two points for groundmass formation
	(iv)	granite	1	ECF from (a)(i)
	(v)	Ca rich plagioclase forms (in F) at higher temperature while Na rich plagioclase forms (in G) at lower temperatures; Ca rich plagioclase (in F) forms first on the continuous reaction series and Na rich plagioclase (in G) forms later on the continuous reaction series; the feldspar changes from Ca rich plagioclase (in F) to Na rich (in G) on the continuous reaction series OR lower down the reaction series.	1	any one point

Question		Answer	Marks	Guidance
	(b)	drawing showing labelled rounded amygdales / vesicles infilling crystals OR calcite OR quartz drawn and labelled OR infilling vesicle	1 1	
	(c)	(i)	J lava flow K sill	1 both need to be correct for mark
		(ii)	reddened top shows weathering at top of the lava flow; uneven top to the flow; eroded clasts of igneous rock in bed above; vesicles at the top; only 1 baked margin below; xenoliths only from rock below.	3 any three points ALLOW no baked margin above
		(iii)	2 baked margins both top and bottom; sandstone xenoliths can only come from above OR the sandstone xenoliths fell into the magma OR two different types of xenoliths at top and bottom OR xenoliths at both top and bottom; no vesicles present	2 any two points
			Total	16

Question		Answer	Marks	Guidance
3	(a)	(i)	1	DO NOT ALLOW any erosional terms
		(ii)	1	
	(iii)	2	any two points accept either plagioclase or K feldspar or named feldspar 1 mark for general point of minerals (not rock) dissolved and clay left behind	
	(iv)	2	any two points	
(b)		granite 2 as it has more joints	1	
		greater surface area of rocks to be weathered OR water can penetrate further into the rock OR more water enters the rock allowing chemical weathering	1	
(c)		water enters cracks OR joints in rock must be shown on diagram;	1	if no diagram max mark is 2
		water freezes and forms ice so <u>expands</u> ; ice melts so <u>contraction</u> ; rock breaks down due to stresses of expansion and contraction OR rock fractures due to <u>repeated</u> stresses OR joint/crack widens due to <u>repeated</u> freezing and thawing OR rock breaks down due to <u>repeated</u> freezing and thawing.	2	any two points mark detailed labels as text DO NOT ALLOW diurnal changes

Question	Answer	Marks	Guidance
(d)	temperature changes from day to night OR <u>repeated</u> frequent temperature changes OR differential thermal expansion; rock expands when hot and contracts when cool OR <u>repeated</u> expansion and contraction; surface layers peel off OR onion skin weathering breaks up the rock OR sheet like fragments break off OR rock breaks off in layers OR outside layers of rock peel off; different minerals in rocks have different expansion and contraction rates. OR plutonic igneous rocks are exposed at the surface; rock splits along horizontal pressure release joints; sheets of rock break off parallel to the surface.	2	any two points ALLOW diagram to show surface layers flaking off ALLOW alternative answers on pressure release
(e)	roots of plants burrowing organisms	1 1	DO NOT ALLOW animals digging
	Total	15	

Question		Answer	Marks	Guidance	
4	(a)	L tuff M pahoehoe lava N agglomerate P pillow lava Q ignimbrite	5		
	(b)	(i)	R mafic OR shield OR basaltic OR Hawaiian S intermediate OR composite OR strato volcano OR andesitic	1 1	
		(ii)	crater at top of vent above line at top of vent vent within vertical white area	1 1	if vent is labelled near to the crater the labels must show a clear distinction
		(iii)	R hotspot OR divergent OR MOR S convergent OR oceanic-continental OR oceanic-oceanic OR subduction zone	1 1	ALLOW R constructive and S destructive
		(iv)	low viscosity lava OR mafic OR basaltic - means - low angle OR broad shallow sides OR long flows OR can travel much further high viscosity lava OR intermediate OR andesite - means - high angle OR steep sides OR short flows OR cannot travel far	1 1	ALLOW 1 mark for general statement of viscosity correctly linked to each volcano ALLOW runny for low viscosity

	(c)	<p>ash enters atmosphere (and can stay up for years) causing cooling; ash reflects sunlight from causing cooling particles causing cooling OR stops heat reaching the surface;</p> <p>sulfur dioxide gas released enters atmosphere and forms sulfate particles; sulfate aerosols reflect heat energy causes cooling for several years OR worldwide effect of no summers;</p> <p>carbon dioxide may cause global warming if very large amounts are produced.</p>	2	<p>any two points</p> <p>DO NOT ALLOW ash blocking the sun making it dark for short term weather</p>
	(d) (i)	as magma moves up it releases gases so <u>increase</u> in gases (like CO ₂ and SO ₂) OR the ratio of CO ₂ to SO ₂ changes	1	DO NOT ALLOW radon gas must have explanation not just statement
	(ii)	swelling of the volcano is <u>due to magma</u> moving up OR slope steepening can indicate the start of a landslip which releases magma	1	must have explanation not just statement
	(iii)	<p>earthquake swarms OR harmonic tremor OR short period earthquakes OR long period earthquakes OR a sequence of many small magnitude earthquakes often precede an eruption</p> <p>magma vibrates in the vent as it moves up OR magma pushes against overlying rock below the surface OR magma fracturing brittle rock OR magma pushes through a blocked/new vent OR long period earthquakes form from increased gas pressure</p>	1 1	<p>1 mark for general point of earthquakes caused by magma moving up in the vent</p> <p>DO NOT ALLOW just rising magma DO NOT ALLOW harmonic tremor or short period caused by gas pressure</p>
		Total	19	

Question		Answer	Marks	Guidance
5	(a) (i)	a turbidity current is a high velocity current that flows down a slope carrying dense <u>sediment</u> OR currents caused by an excess density of suspended <u>sediment</u> load moving downslope at high speed OR a current of rapidly moving, <u>sediment</u> -laden water moving down a slope through water OR oceanic gravity currents which derive their motive force through suspended <u>sediment</u> OR an underwater current flowing swiftly downslope owing to the weight of <u>sediment</u> it carries OR an underwater avalanche of <u>sediment</u>	1	AW ALLOW description of sediment
	(ii)	$\frac{140}{59} = 2.37$	1	answers should be to 2 decimal places
	(iii)	$\frac{41}{77} = 0.53$	1	answers should be to 2 decimal places
	(iv)	current slows down as the slope flattens out OR as meets the abyssal plain OR between cables 1 and 2 current is on a slope so fast while between cables 3 and 4 it is on flat abyssal plain so slow; current slows with distance from the epicentre OR current slows with distance as it loses energy; current slows as sediment is deposited.	2	any two points
	(b) (i)	from base of coarse sandstone at 12cm to base of clay at 97cm OR to top of bed T at 50cm	1	
	(ii)	greywacke high % of rock fragments with <u>clay matrix</u>	1 1	ALLOW clay matrix and one non diagnostic descriptor of poor sorting / angular grains / K feldspar / texturally immature / compositionally immature / arenaceous OR ALLOW three non-diagnostic descriptors of rock fragments / poor sorting / angular grains / K feldspar / texturally immature / compositionally immature / arenaceous

Question		Answer	Marks	Guidance
	(iii)	graded bedding coarse grains at the bottom and fine grains at the top OR dense grains at the base and less dense grains above	1 1	
	(iv)	bed T turbidite formed from high energy turbidity current fine sand and silts formed at medium energy end of turbidity current shale deposited from suspended sediment low energy	1 1 1	1 mark for general statement of energy levels decreasing up 1 mark for general statement of sequence of rocks fining up
	(v)	flute casts drawn as U shaped structures with closed end up current; scour structure with deep end at closed end; explanation of scouring / erosion at base of turbidity current; hollow infilled with sediment.	3	any three points max 2 marks with no diagram drawing must have current direction clearly shown DO NOT ALLOW erosion of rock
(c)	(i)	plankton OR small organisms in the surface layers of the ocean die and sink / accumulate / deposited on the sea floor to form ooze OR biogenic skeletal material, made of silica or calcite sinks / accumulate / deposited on the sea floor	1	ALLOW specific named plankton
	(ii)	1mm per thousand years to 30mm (3cm) per thousand years (0.001mm per year to 0.03mm per year 1000mm per Ma to 30,000mm per Ma 100cm per Ma to 3,000cm per Ma 1m per Ma to 30m per Ma)	1	ALLOW few mm per thousand years
Total			18	

Question	Answer	Marks	Guidance
6	<p>igneous always crystalline OR minerals interlocked in a mosaic OR crystallised from magma; crystals not usually lined up OR unfoliated OR distinctive igneous textures given; three main minerals from quartz, feldspar, augite, olivine, mica, hornblende OR minerals specific to igneous rocks, augite / olivine; no beds - forms lava flow, dyke, sill, batholith; fossils absent; hard - not easily split or broken. (May be crumbly when rotted by weathering);</p> <p>sedimentary fragmental made of grains OR fragments or fossils cemented together and / or can be crystalline; three main minerals from clay minerals, quartz, K feldspar, calcite, mica, rock fragments OR minerals specific to sedimentary rocks clay minerals / glauconite; deposition in beds OR sedimentary structures are common; fossils may be present; may be soft and crumbly but some sedimentary rocks are difficult to break if crystalline or well cemented;</p> <p>metamorphic always crystalline / recrystallised OR minerals interlocked in a mosaic OR granoblastic; crystals usually lined up / aligned OR foliated; main minerals quartz, K feldspar, mica, garnet, calcite OR mineral specific to metamorphic rocks—garnet / andalusite / kyanite / sillimanite; no beds apart from relict beds; fossils absent apart from relict fossils / deformed fossils; hard - but may split in layers.</p>		<p>max 4 for igneous</p> <p>where diagrams are used such as to show crystalline structure, mark as text if fully labelled</p> <p>max 4 for sedimentary</p> <p>where diagrams are used such as to show grain structure mark as text if fully labelled</p> <p>max 4 for metamorphic</p> <p>where diagrams are used such as to show foliation mark as text if labelled</p> <p>ALLOW specific foliated texture such as schistosity or gneissose banding or porphyroblastic as an alternative to foliation</p>

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