OCR
RECOGNISING ACHIEVEMENT

GCE

Geology

Advanced Subsidiary GCE

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

Mark Scheme for January 2011

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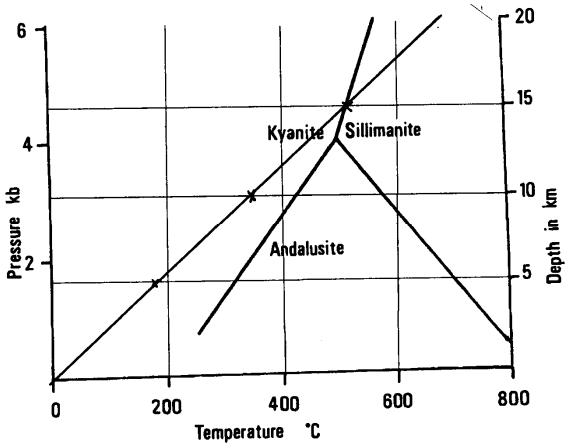
Question			Expected Answers	Marks	Additional Guidance
1	(a)		conglomerate with round grains and breccia with angular grains scale to show grains greater than 2 mm in diameter	[1] [1]	need a clear difference between grains shapes but accept subrounded / sub angular – label not needed just shape.
	(b)	(i)	**sedimentary rock** rock made of clasts / grains / detrital material / fragments of pre – existing rocks and / or fossils fragmental rock formed mechanically / biologically rock formed from consolidated sediment / undergone lithification (deposited in layers) **matrix** smaller particles of sand / silt / clay that binds the rock together / that enclose larger grains fine sediment in which larger grains embedded / surrounded / held together.	any 1 any 1	Do not allow cement
		(ii)	sandstone / grit / orthoquartzite / quartzite / greywacke arenaceous / sand size / medium / coarse sand / 1.5 + / - 0.4 mm sub angular / sub rounded poorly sorted	[1] 2 max	1 mark for name do not allow desert sandstone 2 marks for 3 descriptors 1 mark for 1 or 2 descriptors Grain size not just <2 mm
	(c)		B contact C regional B low pressure / no directed stress and C high / medium pressures / high directed stress	[1] [1] [1]	pressure will be varied answers in terms of low / medium. The mark is for clear difference of pressure
	(d)	(i)	limestone fossils broken up / bioclastic / crinoid stem sections / broken shells calcite cement / crystalline cement / biosparite	[1] any 1	1 mark for name 1 mark for 1 or 2 descriptors
		(ii)	marble / calcite crystals / sugary texture / granoblastic / interlocking mosaic of crystals / fossils destroyed labelled sugary texture / granoblastic / interlocking mosaic of crystals drawn	[1] [1]	drawing must show interlocking mosaic not grains fossils must not be present
			Total	[14]	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	Aleutians / Caribbean	[1]	accept any islands in the Caribbean
		(ii)	Mount Mazama it produced the greatest volume of pyroclastics / the most pyroclastics	[1] [1]	pyroclasts must be a comparative amount or 45 km ^{3} quoted
	(b)	(i)	rhyolite / obsidian	[1]	must be fine grained
		(ii)	**pyroclastic flows** as nuée ardentes / high velocity / gaseous froth / flows down valley / forms ignimbrites / welded tuffs / pumice / low density rock / when mixed with water forms lahars **ash** made of fine particles / covers hugh areas / forms tuff / fine grained rock / in layers / when mixed with water forms lahars **bombs / blocks** / larger material / lapilli / close to vent / forms agglomerate / forms volcanic breccia	[1] [1] [1]	where two products are listed with no description max 1 mark do not allow lahars unless described as pyroclastic flow with water added
	(c)	(i)	180 km + / - 20 km	[1]	
		(ii)	description: extends to east / gets thinner to east / none or very little in the west / thickest close to the crater / finer material further away and coarser close explanation: wind blowing from west / material deposited as heavier than air lateral euption towards the north east energy reduces with distance so material deposited in size order	[1] any 1	1 mark for description and 1 for explanation allow general description quoting numeric detail from map
		(iii)	Portland received no ash as wind did not blow that way / Yakima about 15 mm of ash as on leeward (downwind) side / lateral eruption was away from Portland	[1]	
		(iv)	close to the vent / crater / cone	[1]	

Question			Expected Answers	Marks	Additional Guidance
		(v)	earthquake swarm / harmonic tremor / seen on seismograms of lots of small earthquakes / precursor earthquake tremors / seismic activity increasing / magma moves up before eruption gas composition changes / more SO_2 produced / gas emissions monitored more gas produced / change in composition before an eruption changes in ground level / doming / bulging / rising ground / changes on tiltmeters / detected by laser measurements ground rises before an eruption / as magma moves up boreholes or wells monitored for change in water level water levels rise and/or suddenly drop right before an eruption / due to increased gas pressure.	**max 4**	2 marks for each pair 1 mark for method description and 1 mark for what changes before an eruption
	(d)	(i)	diagram of volcano showing crater with lake inside detail of collapse of volcano into old magma chamber / collapse along faults  	**[1]** **[1]**	diagram can be very simple labels are essential for full marks unlabelled diagram max 1
		(ii)	violent eruption / pyroclasts erupted magma chamber partially empty volcanic cone collapses into magma chamber remaining magma compressed and erupted / vents blocked leaves large depression rainwater forms lake	**max 2**	any 3 or 4 points in sequence for 2 marks any 2 for 1 mark
			Total	**[20]**	

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	clay minerals / named clay mineral eg montmorillonite	[1]	accept mica / muscovite / chlorite
		(ii)	water	[1]	
		(iii)	shale	[1]	do not allow slate or mudstone
		(iv)	compaction / weight of overlying sediment / pressure from above particles randomly arranged / held in water particles align at 90° to maximum pressure / parallel to each other reduces porosity reduction in bed thickness / formation of laminated beds	any 3	
	(b)	(i)	sillimanite	[1]	
		(ii)	temperature 500° C pressure 4 kb	[1]	allow 490 – 500 and 3.9 – 4.1
		(iii)	 line correct plotted through 175 at 5km, 350 at 10 km 525 at 15 km	[1]	line drawn within 1mm
		(iv)	kyanite and sillimanite	[1]	ecf mineral E

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td></td><td></td><td>(v)</td><td>schist and gneiss

these are regional metamorphism / index minerals / med to high temp and pressure / depth

OR
gneiss at high T and P max 1
and schist at medium T and P max 1</td><td>[1]

[1]</td><td>ecf allow slate and schist and med to low temp and pressure
rocks must match with reason</td></tr>
<tr><td></td><td>(c)</td><td></td><td>area around 200^{o}C and 2kb</td><td>[1]</td><td></td></tr>
<tr><td></td><td>(d)</td><td></td><td><table><tr><th>metamorphic term</th><th>definition</th></tr><tr><td>index mineral</td><td>3</td></tr><tr><td>4</td><td>a line on a map joining points of equal metamorphic grade</td></tr><tr><td>1</td><td>a measure of the intensity of metamorphism</td></tr><tr><td>polymorph</td><td>5</td></tr></table></td><td>[1]
[1]
[1]
[1]</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[17]</td><td></td></tr>
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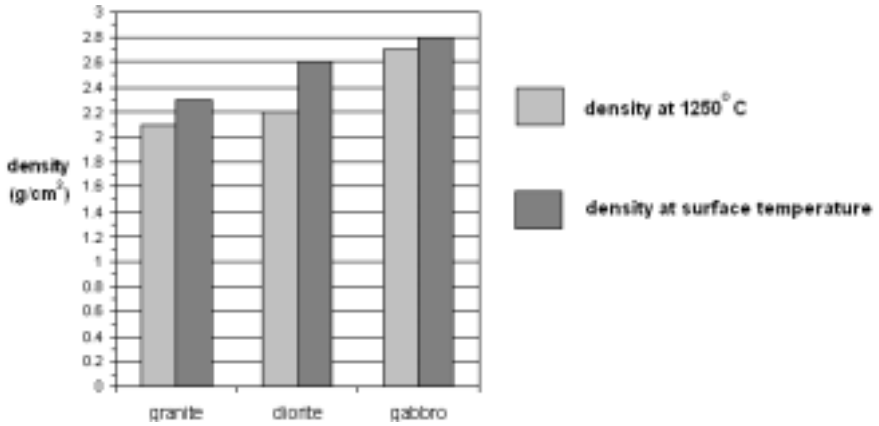
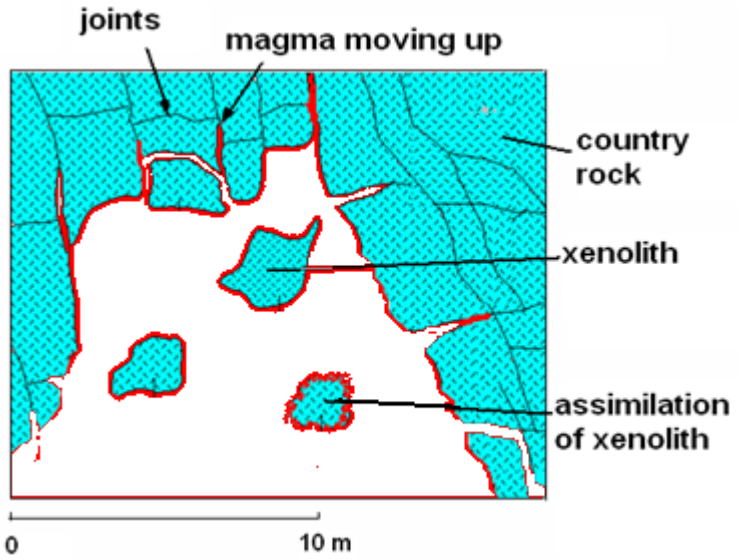
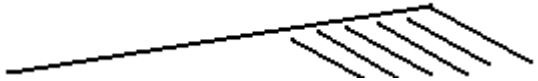
Question			Expected Answers	Marks	Additional Guidance
4	(a)	(i)		[2]	1 mark for diorite 1 mark for gabbro accurate to 0.1 position of bars horizontally not an issue
		(ii)	granite	[1]	
		(iii)	at surface material is a solid while at high temp it is a liquid / magma / melted / partially melted	[1]	accept if explanation given in terms of particles
		(iv)	pressure increases at depth / is very difficult to recreate in laboratory / change in pressure locally or regionally depth of magma affects density for magma at 1250°C	Any 1	must be an explanation not just a variable
	(b)	(i)	granite >66% gabbro 45 – 52%	[1]	accept granite from 66 – 78 must have both for mark
		(ii)		max 3	4 correct 3 marks 2 / 3 correct 2 marks 1 correct 1 mark If all boxes ticked 0 mark
		(iii)	coarse (crystal) grain size / interlocking crystals / crystalline / equigranular / porphyritic	[1]	

Question			Expected Answers	Marks	Additional Guidance
	(c)	(i)	batholith	[1]	accept pluton
		(ii)	diagram to show thick continental crust and melting at base of crust magma forms batholiths / diapirs / magma less dense than rock/ diagram showing low density mama rising into country rock max 1 OR diagram of edge of batholith with stoping for 1 mark xenoliths for assimilation 1 mark  explanation <u>stoping</u> where magma moves up along joints etc separating masses of country rock <u>assimilation</u> where xenoliths / masses of country rock are gradually melted / xenoliths form from these blocks and fall into magma	[1] [1] [2] any 2	2 marks for the labelled diagram and 2 for explanation mark detailed labels as text
			Total	[15]	

Question			Expected Answers	Marks	Additional Guidance
5	(a)		water erodes / picks up all the debris / rock material / sediment / pebbles / boulders transport is very rapid / material carried as thick sludge / muddy flow / high energy event deposited quickly - in hours / days so no sorting / as velocity drops / as energy drops deposited in wadis / in valleys / alluvial fan	any 2	
	(b)	(i)	NW to SE / top left to bottom right / parallel to F G dotted line pointing right	[1]	
		(ii)	F G Must be asymmetrical 	[1]	ecf from arrow if drawn other way angle at F end must be lower than at G max angle 37^{o}
		(iii)	lines parallel to lee face / curved especially at base	[1]	ecf from arrow if drawn other way
		(iv)	well sorted red colour / iron oxide / hematite coating iron oxide cement / quartz cement frosted grains all grains are quartz well rounded / spherical diagram to show well rounded grains about 1 mm in size	any 3 [1]	1 mark minimum for diagram – if labelled could be more – treat labelled diagram as text
	(c)	(i)	chemical weathering of rocks / carbonation / hydrolysis Na, Ca, K as solutes / minerals dissolved in water / ions in water transported in solution to playa lake	any 2	
		(ii)	calcite first (allow gypsum if anhydrite second) gypsum / anhydrite halite K salts last 1 mark max for general statement least soluble first and most soluble last	max 2	2 marks for 4 or 3 minerals 1 mark for 1 or 2 minerals in order if order reversed max 1
	(d)		hot and arid	[1]	needs both temperature and no water
			Total	[14]	

Question	Expected Answers	Marks	Additional Guidance
6	**Describe with the aid of labelled diagrams the formation of desiccation cracks, salt pseudomorphs, graded bedding and ripple marks.**		each sedimentary structure must have environments for full marks. If no environments mentioned max 9
	desiccation cracks forms in arid / desert environment / edge of playa lake or sea mud dries out as water evaporated V shaped crack opens / as clay contracts / shrinks infilled with sediment labelled diagram to show V shaped cracks	**any 2** **1** **max 3**	each point can have a mark if it is described and not just listed
	salt pseudomorphs forms at edge playa lake / shallow sea in arid area salt crystals / halite form on sediment due to evaporation of saline water influx of water dissolves salt crystal leaves cubic hole / mould infilled with sediment (in shape of cube) labelled diagram to show cubic shapes / hopper crystals	**any 2** **1** **max 3**	
	graded bedding in lake or sea or river where current slows / from turbidity current on abyssal plain or deep sea larger / heavier grains deposited first finer / lighter grains deposited last settles out from current labelled diagram to show grading of grains	**any 2** **1** **max 3**	do not allow fining up sequence – must be within a bed
	ripple marks sand transported in high energy conditions / by river / sea / wind asymmetrical if uni directional current in river symmetrical if bi directional current in sea / tidal / beach sand grains move by saltation labelled diagram with steeper side or equal sides	**any 2** **1** **max 3**	diagram should link to specific type of ripple described
	Total	**[10]**	

Question			Expected Answers	Marks	Additional Guidance
7	**Describe and explain the processes operating in the rock cycle at the surface. You may use diagrams to illustrate your answer.**				Processes must be linked to the products for full marks
			rock cycle as processes at the surface general diagram or list	**[1]**	Processes must be described and explained not just listed to gain mark.
			weathering is the breakdown of rock in-situ list of all 3 weathering methods chemical, mechanical, biological chemical weathering produces solutes and insoluble residue / minerals detail of a method mechanical weathering produces rock fragments detail of a method biological weathering produces fine rock fragments / method described	**any 3**	
			erosion is the removal of weathered material / wearing away of land surface or rocks / the removal of material by transport produces rock fragments erosion by abrasion and attrition / by the action of transported fragments abrasion modifying the sediment making it more rounded / smaller attrition makes grains smaller more rounded	**any 3**	
			transport is the mode by which weathered material is taken from one place to another / is moved description of a transport method water / wind / ice / gravity list of 3 methods water / wind / ice / gravity detailed description of solution / suspension / saltation / traction list of 3 methods from solution / suspension / saltation / traction	**any 3**	Allow long transport time causes rounding and size reduction if grains if not given under erosion
			deposition when transporting agent loses energy and deposits its load description of method eg delta precipitation of calcite from sea water to form limestones	**any 2**	
			extrusion igneous rock / lava that reaches the surface crystallizes	**[1]**	
			uplift at the surface as a result of earth movements	**[1]**	
			Total	**[10]**	

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