2015 Geology

Higher

Finalised Marking Instructions

Part One: General Marking Principles for: Geology Higher

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question.

(a) Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. If a specific candidate response does not seem to be covered by either the principles or detailed Marking Instructions, and you are uncertain how to assess it, you must seek guidance from your Team Leader/Principal Assessor.

(b) Marking should always be positive ie, marks should be awarded for what is correct and not deducted for errors or omissions.

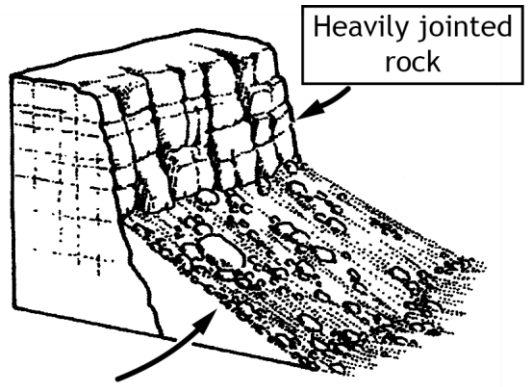
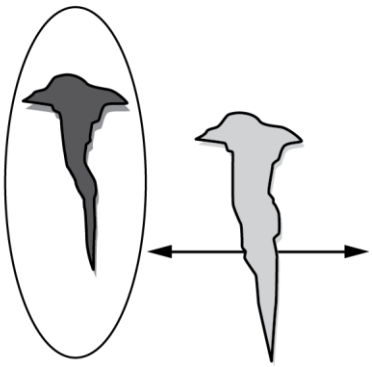
GENERAL MARKING ADVICE: Geology Higher

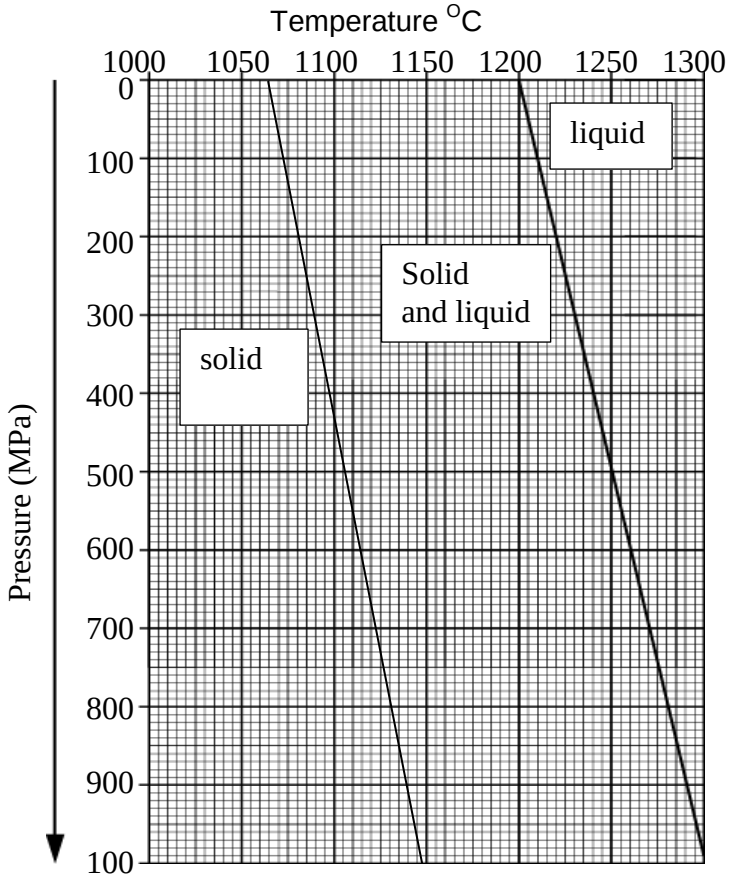
The marking schemes are written to assist in determining the "minimal acceptable answer" rather than listing every possible correct and incorrect answer. The following notes are offered to support Markers in making judgements on candidates' evidence, and apply to marking both end of unit assessments and course assessments.

Part Two: Marking Instructions for each Question

Section A

Question			Expected Answer(s)	Max Mark	Additional Guidance
1.	**(a)**		**Rock P –** Granite. **Reason –** consists of microcline, quartz and biotite, coarse grained interlocking texture. **Rock Q** – Dolerite. **Reason** – consists of plagioclase, pyroxene, medium grained interlocking texture. **Rock R** – Arkose. **Reason** – consists of grains of eroded quartz, held together by cement but also has more than 25% microcline feldspar.	**3**	
1.	**(b)**		**Give only the letters** B, C and F.	**3**	
1.	**(c)**		Life **Reason 1** The diagram shows that the bivalves are in a burrowing position. **Reason 2** There is a normal distribution of ages as measured by length.	**2**	

Question			Expected Answer(s)	Max Mark	Additional Guidance
2.	**(a)**		**Give only the letters** B and E.	**2**	
2.	**(b)**		Steep face with jointing. Cliff face possibly at a high altitude which will result in a wet climate and temperatures frequently below freezing. Rain water will seep into the joints which will freeze when the temperature drops below zero degrees centigrade. When water freezes, it expands by up to 9% exerting large pressures on the rock. This can even happen in summer at altitude especially at night. Repeated freeze thaw action splits the rock into large angular fragments which fall or slide due to gravity. They collect at the foot of the cliff as a scree (tallus) slope with the larger fragments having a tendency to go farther due to their greater momentum.  	**3**	
2.	**(c)**		High temperature minerals are unstable which makes them more likely to be chemically weathered. These minerals split along cleavage planes and are therefore destroyed during transport.	**2**	

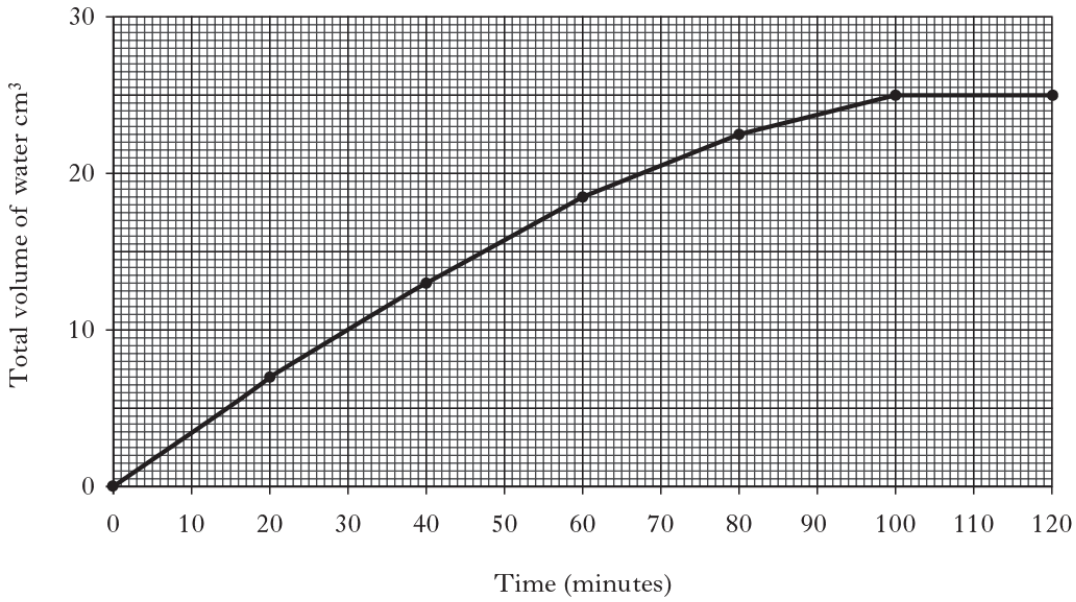
Question			Expected Answer(s)	Max Mark	Additional Guidance
3.	(a)	(i)		1	
3.	(a)	(ii)	Positive. As pressure increases so does melting temperature.	1	
3.	(a)	(iii)	**3 areas labelled correctly – one mark for all.** A – Solid and liquid B – Solid only C – Liquid only	1	
3.	(b)		Drop in pressure due to spreading oceanic plate. Incomplete melting. Minerals melt at different rates and therefore contribute different amounts to melt generating magma with different composition from original rock. Credit mention of tectonic setting where this may occur – eg mid oceanic ridge.	2	

<table>
<tr><th colspan="3">Question</th><th>Expected Answer(s)</th><th>Max Mark</th><th>Additional Guidance</th></tr>
<tr><td>4.</td><td></td><td></td><td><table><tr><th>Ore mineral</th><th>Chemical name</th></tr><tr><td>Chalcopyrite</td><td>Copper and iron sulphide</td></tr><tr><td>Malachite</td><td>Hydrated copper carbonate</td></tr><tr><td>Galena</td><td>Lead sulphite</td></tr><tr><td>Siderite</td><td>Iron carbonate</td></tr><tr><td>Cassiterite</td><td>Tin oxide</td></tr><tr><td>Chromite</td><td>Iron and chromium oxide</td></tr></table>5 – 6 correct = 3 marks
3 – 4 correct = 2 marks
2 correct = 1 mark</td><td>3</td><td></td></tr>
<tr><td>5.</td><td>(a)</td><td></td><td>1·6 cm/year OR 0·8cm/year for one plate.</td><td>2</td><td></td></tr>
<tr><td>5.</td><td>(b)</td><td></td><td>Magnetic minerals in basalt align themselves to polarity of Earth when erupted and are then locked into position as the lava solidifies.

Polarity of the Earth is reversed every 1 million years (approximately). This is reflected in the alignment of the magnetic minerals within the basalt of the oceanic floor.</td><td>2</td><td></td></tr>
<tr><td>5.</td><td>(c)</td><td></td><td>Convection currents in the mantle.

Ridge push slab pull.</td><td>2</td><td></td></tr>
</table>

Question			Expected Answer(s)	Max Mark	Additional Guidance
6.	**(a)**		**A** … Ridge **B** … Basic magma **C** … Lithospheric mantle **D** … Oceanic crust **E** … Regional metamorphism **F** … Intermediate/acidic magma **5 – 6 correct = 3 marks** **3 – 4 correct = 2 marks** **1 – 2 correct = 1 mark**	**3**	
6.	**(b)**		Contamination: upper crustal rock becomes incorporated into the melt as it slopes through the crust. Magma mixing: magma chamber may be invaded by magma with a different chemistry. Fractional crystallisation: Early formed crystals may sink to the bottom of the magma chamber, removing them from the melt. If melt rises, the early formed crystals will be left behind and the subsequent melt will be devoid of them.	**2**	

Question			Expected Answer(s)	Max Mark	Additional Guidance
7.	**(a)**	**(i)**		**2**	
7.	**(a)**	**(ii)**	25/125 x 100 = 20%	**1**	
7.	**(b)**	**(i)**	**Answer** – Sandstone **Reason** – Larger and better connected pore spaces. Sand grains do not pack well together due to shape.	**2**	
7.	**(b)**	**(ii)**	**Sample** – C **Reason** – Pore spaces not well connected as it takes a relatively long time for water to be absorbed.	**1**	

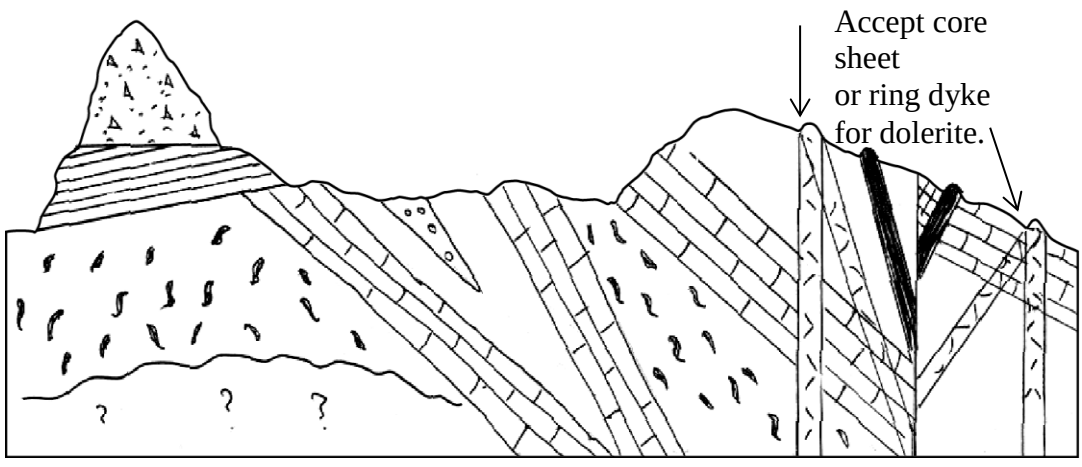
Section B

Question			Expected Answer(s)	Max Mark	Additional Guidance
8.	**(a)**		Credit should be given for reference related to plate tectonics and any mention of earthquakes that do not fit into theory eg glacial earthquakes, intra plate earthquakes.	**6**	
8.	**(b)**		Credit should be given for reference to earthquake depth, Benioff Zone, mapping plate boundaries, Moho, Conrad, core-mantle, Taylor-Guttenburg discontinuities, shadow zones.	**6**	
8.	**(c)**		Credit should be given to any reference to the composition of the mantle, outer and inner core. Any reference to how the study of earthquake waves, meteorites, volcanic activity etc has helped to further our knowledge of the composition of the Earth should be credited.	**3** **(15)**	
9.			**Maps and diagrams must be used.** Mark out of 15. Max mark of 12 if no area named. It is possible to obtain full marks for the first 3 bullet points if enough detail provided. **Difficult to define a clear, detailed scheme, but probably: least emphasis on first and last categories.**	**15**	

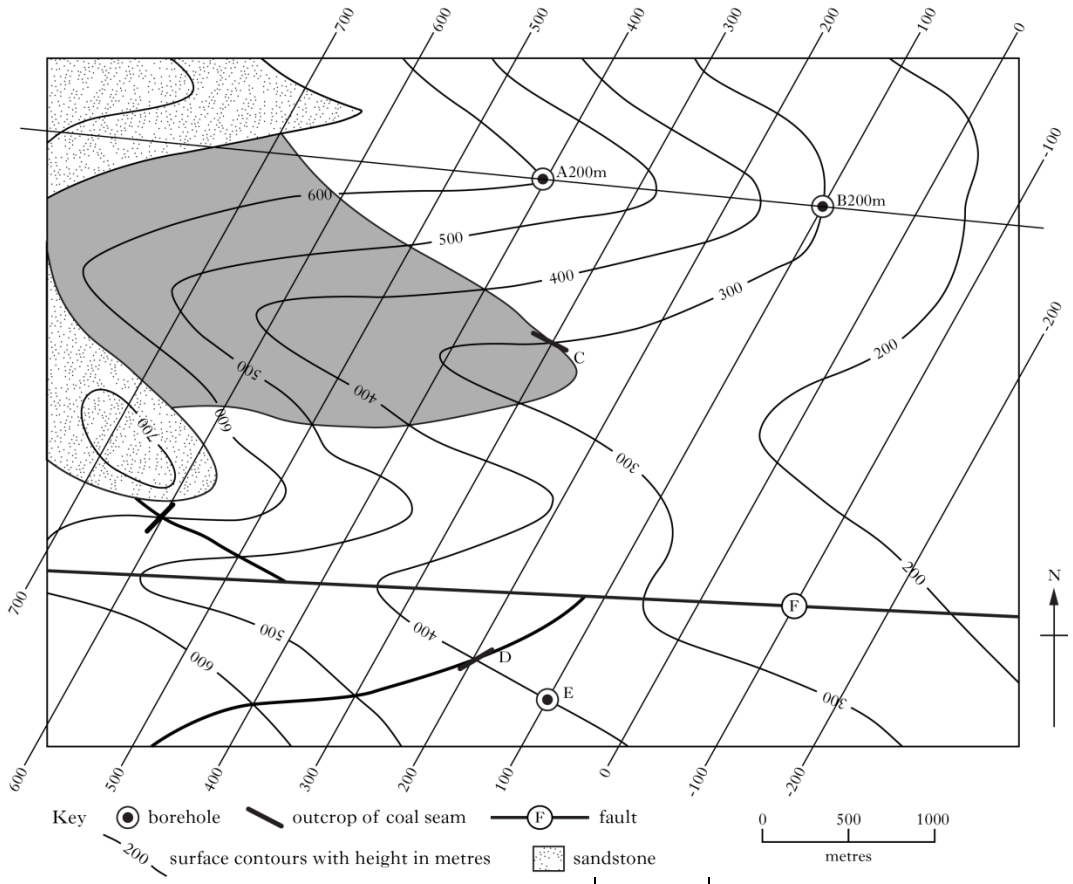
Question			Expected Answer(s)	Max Mark	Additional Guidance
10.	**(a)**		**Credit will be given for the use of maps and diagrams.** • Colliding plates, crustal compression and thickening may be initially associated with subduction zones. Thickened crust causes heat build-up. Pressure and heat combine to change the structure and mineral content of a vast crustal area. • Crustal compression will cause crustal shortening producing faults, nappes and thrust faults. • Grade describes intensity of metamorphism. As grade increases, rock types, minerals, grain size and rock texture change. low : medium : high grade. • Index minerals chlorite : biotite : garnet. • Type locality is Scottish southern Highlands (Barrovarian zones). • All rocks affected eg sandstone, quartzite (metaquartzite), quartz schist, limestone, marbles pelites, slate, phyllite, talc schist, mica schist, garnet mica schist, gneiss, migmatite, basalt, amphilbolite, greenschist.	**8**	
10.	**(b)**		• Low pressure/high temperature causing mineral change. Granitic intrusions aided by volatiles and metasomatism. • Temperature declines rapidly away from intrusion. • Zone of metamorphosed rock is called an aureole. The larger the intrusion, the larger the aureole (normally). • Metamorphic grade increases towards the intrusion. • All igneous intrusions can be discussed ie stocks, sills, dykes along with baked and chilled margins. • Xenoliths of country rock may be present in the intruded rock showing various stages of metamorphism.	**5**	

Question			Expected Answer(s)	Max Mark	Additional Guidance
10.	**(b)**		**Cont …** • Expect mention of metamorphic change eg mudstone, spotted rock, hornfels, slate, spotted slate, slaty cleavage, foliation disappears, splintery rock, fine grained, medium grained, coarse grained, minor recrystallisation, total recrystallisation. • Possibly reference to economic significance eg hydrothermal veins, skarns in dolomitic limestone's etc. Credit example mentioned – eg Skiddaw Granite, Comrie Diorite.		
10.	**(c)**		• Formation of slickensides, polished surface and grooves. • Fault breccia, angular fragments of unaltered rock. • Thrust fault, sheer zone, extreme strain, mylonite, recrystallisation during stress.	**2** **(15)**	

Section C

Question			Expected Answer(s)	Max Mark	Additional Guidance
11.			Quartz Andesite is gas charged. As it moves to higher parts of the crust the pressure is less, resulting in the lava degassing. On reaching the surface, the gas escapes violently from the lava. As the lava cools, these gas bubbles will be trapped as the lava solidifies.	**3**	
12.			Compressional forces caused reverse faulting. Grey layer displaced upwards on right hand side of photo (hanging wall). Acidic micro dyke intruded later along fault plane?	**2**	
13.	**(a)**		3	**1**	
13.	**(b)**		**Answer** − East **Reason** − Basalt cone sheet is smaller on this side.	**2**	
13.	**(c)**		Chemical reaction within limestone. Limestone has many routes for volatiles from the granite to flow through such as jointing and bedding planes.	**2**	
13.	**(d)**			**6**	

Question			Expected Answer(s)	Max Mark	Additional Guidance
13.	**(e)**		**Give only the letters** A and F.	**2**	
13.	**(f)**		Volatiles from granite are able to penetrate deep into some rocks and less so in others (gneiss). The shape of the granite may be different below the surface. Country rocks may have different conductivities.	**2**	
13.	**(g)**		**Give only the letter** C.	**1**	
13.	**(h)**		**(Give only the letters)** **YOUNGEST** A **F** I D **G** B **C** H E **OLDEST**	**6**	

Question			Expected Answer(s)	Max Mark	Additional Guidance
14.					
14.	**(a)**		PLEASE SEE DIAGRAM FOR Q.14	**1**	
14.	**(b)**	**(i)**	PLEASE SEE DIAGRAM FOR Q.14	**3**	
14.	**(b)**	**(ii)**	PLEASE SEE DIAGRAM FOR Q.14	**3**	
14.	**(b)**	**(iii)**	**Angle of dip** − 11·3^{o} **Direction of dip** − SE **Working:** 100/500 = 0·2 =>11·3	**2**	
14.	**(c)**	**(i)**	PLEASE SEE DIAGRAM FOR Q.14	**1**	

Question			Expected Answer(s)	Max Mark	Additional Guidance
14.	**(c)**	**(ii)**	PLEASE SEE DIAGRAM FOR Q.14	**1**	
14.	**(c)**	**(iii)**	100 metres	**1**	
14.	**(d)**		PLEASE SEE DIAGRAM FOR Q.14	**1**	

[END OF MARKING INSTRUCTIONS]