2013 Geology

Higher

Finalised Marking Instructions

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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.

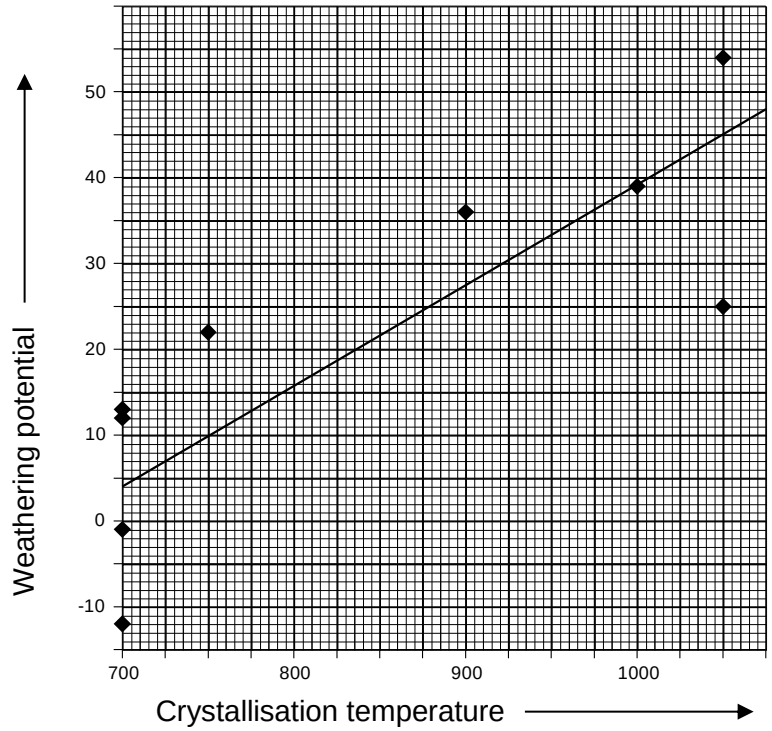
GENERAL MARKING ADVICE: Geology Higher

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

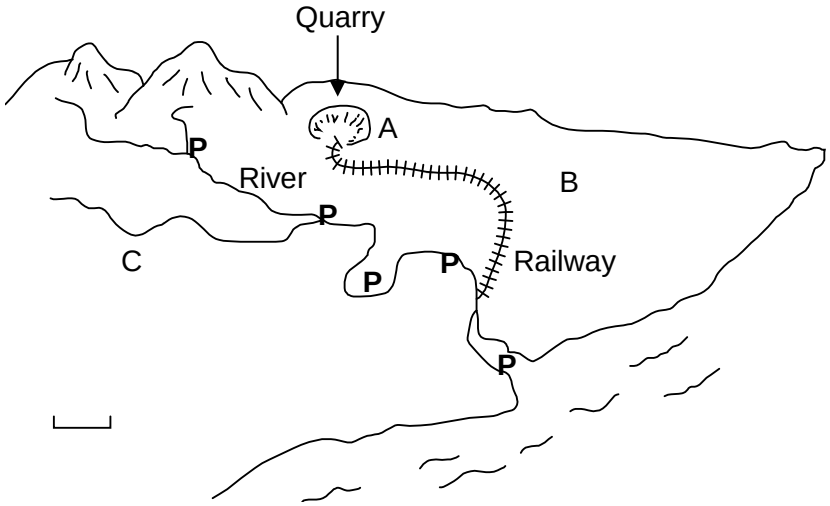
<table>
<tr><th colspan="3">Question</th><th>Expected Answer/s</th><th>Max Mark</th><th>Additional Guidance</th></tr>
<tr><td>1</td><td></td><td></td><td>
<table>
<tr><td>Mineral or rock</td><td>Name of mineral or rock</td></tr>
<tr><td>Mineral A</td><td>Plagioclase</td></tr>
<tr><td>Mineral B</td><td>amphibole</td></tr>
<tr><td>Mineral C</td><td>pyroxene</td></tr>
<tr><td>Mineral D</td><td>Olivine</td></tr>
<tr><td>Rock 1</td><td>Basalt (porphyritic)/ andesite</td></tr>
<tr><td>Rock 2</td><td>Olivine Gabbro/ peridotite</td></tr>
</table>
</td><td>3</td><td>5-6 = 3 marks
3-4 = 2 marks
1-2 = 1 mark</td></tr>
<tr><td>1</td><td>b</td><td></td><td>Porphyritic</td><td>1</td><td></td></tr>
<tr><td>1</td><td>c</td><td></td><td>Rock 1 Two stage cooling; cooling first in the chamber then eruption caused the remainder to cool rapidly

Rock 2 All of this cooled in the magma chamber, very lowly cooling, Olivine crystals cooled first as best formed</td><td>4</td><td></td></tr>
</table>

Question			Expected Answer/s	Max Mark	Additional Guidance
2	a	i ii		2 1	
2	a	iii	Mean crystallisation temp = 838ºC; mean susceptibility = 21·1 Credit line going through mean and roughly parallel to plots As crystallisation temp goes up, susceptibility to weathering increases	1	

Question			Expected Answer/s	Max Mark	Additional Guidance
2	b		**Physical weathering process -** Key concept is that end product is the same but smaller. **Description –** Detailed description of the following processes • Frost shattering • Exfoliation • Salt crystallisation Chemical weathering process end product is different from what you started with; a solution will be produced Rocks and minerals are reformed **Description –** Detailed description of the following process • Solution • Hydrolysis • Oxidation	4	

Question			Expected Answer/s	Max Mark	Additional Guidance
3	**a**		236·48 +/- 2	**1**	
3	**b**		NaC1 very soluble; water would need almost complete evaporation $CaCO_3$ not very soluble; any evaporation would lead to precipitation and crystallisation	**1**	
3	**c**		Shallow water; replenishing continues in shallow basin High evaporation; hot dry climate	**2**	
4	**a**		Give only the letter **B**	**1**	
4	**b**	**i**	Give only the letter **D**	**1**	
4	**b**	**ii**	Give only the letter **D**	**1**	

Question			Expected Answer/s	Max Mark	Additional Guidance
5	**a**		54·67% Viable because cut off grade is exceeded in this quarry	**2**	
5	**b**		25000 (25000 more than crustal average)	**1**	
5	**c**		**Factor 1:** stock market value going up or down **Factor 2:** new technology; cheaper to mine; alternative minerals that are cheaper	**2**	
5	**d**			**1**	accept any confluence, meander or where river enters the sea
5	**e**		Expensive and bulky to transport and it has a low value (not worth transporting very far)	**1**	

<table>
<tr><th colspan="3">Question</th><th>Expected Answer/s</th><th>Max Mark</th><th>Additional Guidance</th></tr>
<tr><td>6</td><td>a</td><td></td><td>Give only the letter A</td><td>1</td><td></td></tr>
<tr><td>6</td><td>b</td><td></td><td>
<table>
<tr><th></th><th>Decay Scheme</th><th>Half life (millions of years)</th><th>Number of parent isotope atoms</th><th>Number of daughter isotope atoms</th><th>Age (millions of years)</th></tr>
<tr><td>Rock P</td><td>Uranium 238 -Lead 207</td><td>710</td><td>16</td><td>240</td><td>2840</td></tr>
<tr><td>Gneiss</td><td>Rubidium 87 - Strontium 87</td><td>50,000</td><td>248</td><td>8</td><td>3125</td></tr>
</table>
16 + 240 (rock P) 256 > 128 > 64 > 32 > 16 = 4·0 half lives × 710 million Years

248 + 18 (gneiss) 256 > 8/128 = 0·0625 half lives × 50 000 Million Years
</td><td>2</td><td></td></tr>
<tr><td>6</td><td>c</td><td>i</td><td>A Garnet
B Quartz
C Biotite or Mica
Name the rock Garnet mica schist- accept schist</td><td>4</td><td></td></tr>
<tr><td>6</td><td>c</td><td>ii</td><td>Shistosity. Accept crystalline alignment</td><td>1</td><td></td></tr>
<tr><td>6</td><td>c</td><td>iii</td><td>Platy minerals grow as directed pressure is being applied to the rock; they align at right angles to the direction at which the pressure is applied</td><td>2</td><td></td></tr>
</table>

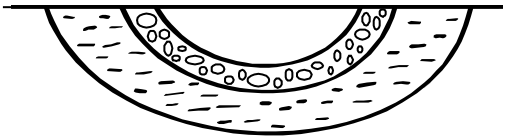
Section A: Total (40) marks

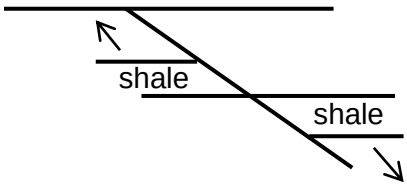
Question			Expected Answer/s	Max Mark	Additional Guidance
7	**a**		Discussion points can include: origin of Andesite magma; pyroclastic flows; wet basalt – melting point lowering; nuees ardentes, subduction zones, specific locations (eg Andes) **5-6 marks**		
7	**b**		Discussion points can include: pillow lavas, origin of basalt, obsidian, partial dry melting, ophiolites, dunite, rift valleys, sea floor spreading, specific locations (eg mid oceanic ridges), paleomagnetism **3-4 marks**		
7	**c**		Large plutons, subsidence, empty magma chambers, structural collapse, cone sheets, ring dykes, specific location (eg Ardnamurchan, Krakatoa) **3-4 marks**		
7	**d**		Tiltmeters, gas collection and analysis, lava sampling, satellite imaging, fieldwork on previous eruptions, seismic data. **3-4 marks**		
				15	

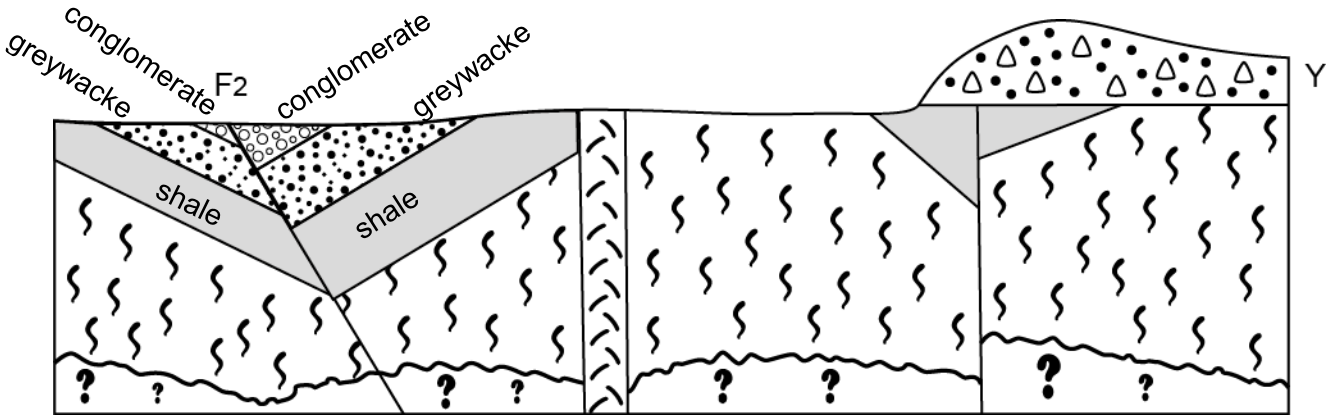
Question			Expected Answer/s	Max Mark	Additional Guidance
8	**a**		Lustre, streak, density, colour, cleavage, hardness **8-9 marks**		
8	**b**		PPL, XPL, birefringence, anisotropic. Isotropic, extinction, cleavage pattern, twinning, pleochroism **7-8 marks**		
				15	

Question			Expected Answer/s	Max Mark	Additional Guidance
9	**a**		Tear, normal, reverse, thrust, transform, footwall, hanging wall, strike slip, dio slip, slickensides, fault/breccia, mylonite **5-7 marks**		
9	**b**		Anticline, syncline, basin dome, symmetrical, nappe, asymmetrical, overfold, parallel, similar, isoclinal, recumbent **5-7 marks**		credit correct labelling of parts of the fold
9	**c**		Jointing in sills, dykes, laccoliths, lapoliths, stocks, necks, ring dykes, cone sheets, columnar, jointing, lava tubes, autobrecciation Cooling rates related to depth and size of intrusion **2-4 marks**		jointing caused by folding and shrinking
			Full marks cannot be obtained if diagrams not provided	**15**	

Question			Expected Answer/s	Max Mark	Additional Guidance
10	**a**		Give only the letter **C**	**1**	
10	**b**		Transported by the wind, suspended in air, erosion during transport will be more severe than grains transported and eroded in water.	**1**	
10	**c**		Huge cross bedding indicative of sand dune bedding suggesting desert conditions Silica iron cement suggests very dry conditions	**2**	
11	**a**	**i**	Tear	**1**	
11	**a**	**ii**	Reason: vertical basalt dyke has been displaced	**1**	
11	**a**	**iii**	Reason: displacement does not match; movement before basalt intrusion, then later movement after intrusion	**1**	
11	**a**	**iv**	100 metres	**1**	
11	**b**		Reason: grain size medium in dolerite – it is a larger dyke cooler slower	**1**	
11	**c**		Reason: pyroclastic material fell into a body of water, heavy particles fell to the bottom quicker as they are more dense.	**1**	

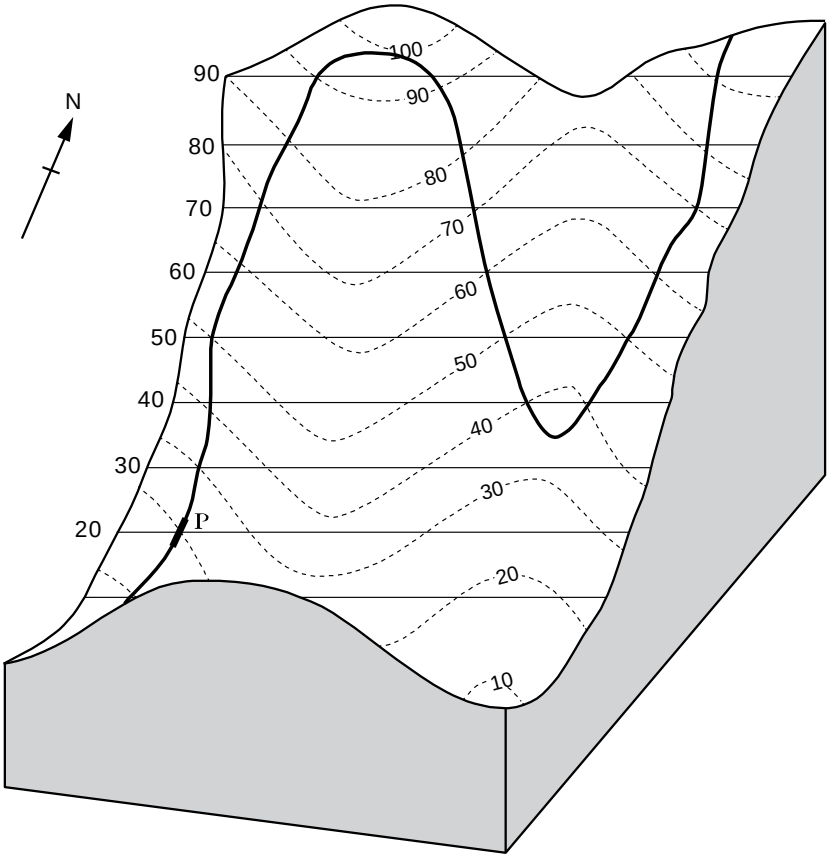
Question			Expected Answer/s	Max Mark	Additional Guidance
11	**d**	**i**	Youngest: Conglomerate Oldest: Shale Explanation: syncline – oldest rock on outside of sequence 	**3**	
11	**d**	**ii**	Explanation: angle at which it reaches the surface; shallow angle will result in a wide outcrop pattern after erosion 	**2**	
11	**e**	**i**	South	**1**	
11	**e**	**ii**	Reason: wider outcrop pattern in the north. South has a narrower outcrop pattern	**1**	

Question			Expected Answer/s	Max Mark	Additional Guidance
11	**e**	**iii**	Type of fault normal: hanging wall has moved down 	**1**	
11	**f**		Two – (gneiss > shale); (eroded surface > tuff)	**1**	
11	**g**		Cross section solution	**6**	



Question			Expected Answer/s	Max Mark	Additional Guidance
11	**h**		Youngest C H F D G E A B Oldest	**3**	5-6 = 3 marks 3-4 = 2 marks 1-2 = 1 mark

Question			Expected Answer/s	Max Mark	Additional Guidance
12	a b		See below	4	



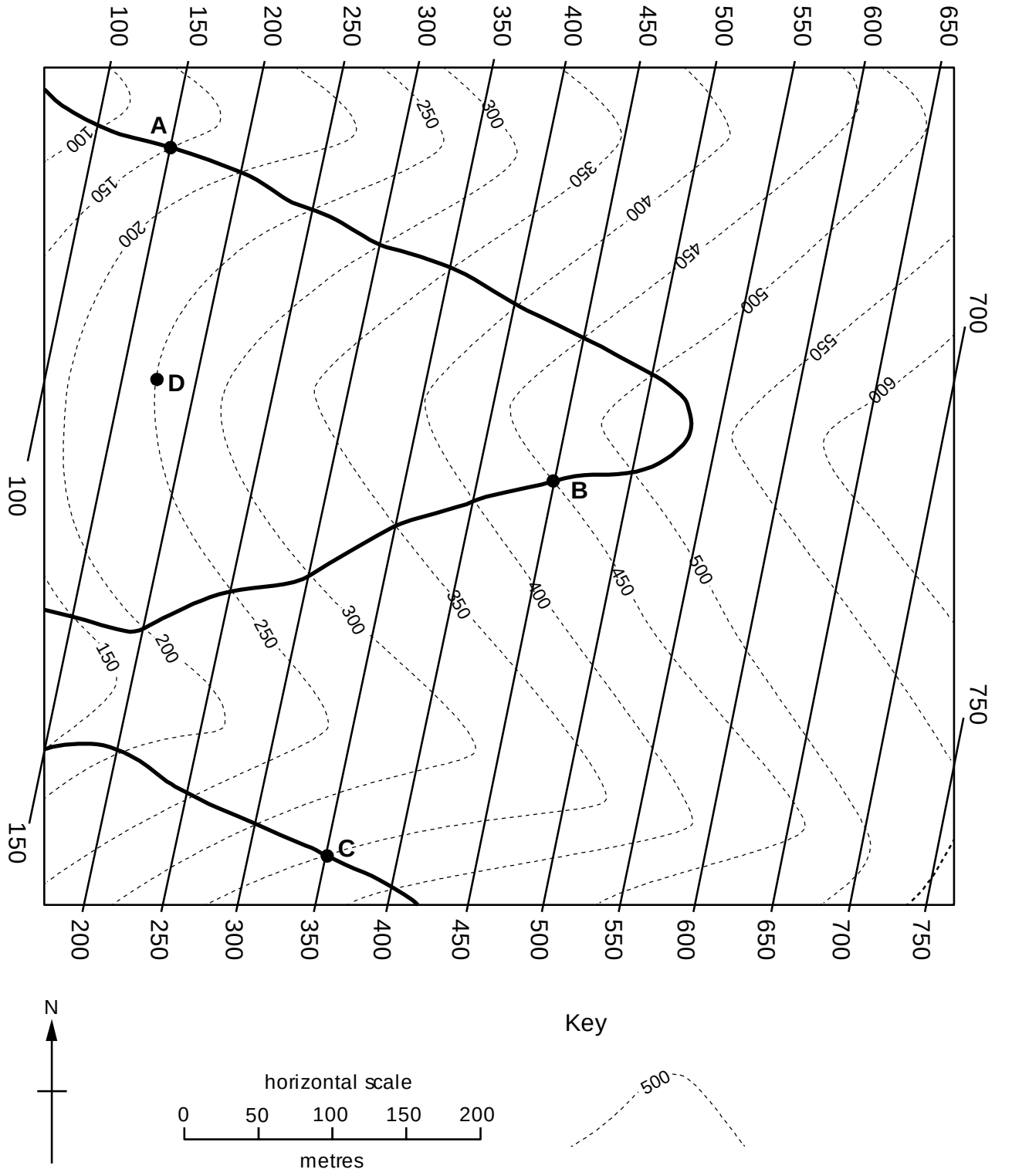
30 surface contours with height in metres

structure contours

P outcrop of coal seam

Question			Expected Answer/s	Max Mark	Additional Guidance
12	c		South	1	

Question			Expected Answer/s	Max Mark	Additional Guidance
13	**a**	**i** **ii**	See below	**4**	



Question			Expected Answer/s	Max Mark	Additional Guidance
13	**a**	**iii**	45° West $\frac{\text{Vertical}}{\text{Horizontal}} \quad \frac{50}{50} = 1$	**2**	
13	**a**	**iv**	75 metres	**1**	

[END OF MARKING INSTRUCTIONS]