



GCE AS MARKING SCHEME

SUMMER 2023

**AS
GEOLOGY - COMPONENT 2
B480U20-1**

INTRODUCTION

This marking scheme was used by WJEC for the 2023 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCE AS GEOLOGY
COMPONENT 2 - FOUNDATION GEOLOGY
SUMMER 2023 MARK SCHEME

Instructions for examiners of A Level Geology when applying the mark scheme

1 Positive marking

It should be remembered that candidates are writing under examination conditions and credit should be given for what the candidate writes, rather than adopting the approach of penalising him/her for any omissions. It should be possible for a very good response to achieve full marks and a very poor one to achieve zero marks. Worthwhile answers that meet the requirements of the question, but do not appear on the mark scheme are to be given credit.

2 Tick marking

Low tariff questions should be marked using a points-based system. Each credit worthy response should be ticked in red pen. The number of ticks must equal the mark awarded for the sub-question. The mark scheme should be applied precisely using the marking details box as a guide to the responses that are acceptable. Do not use crosses to indicate answers that are incorrect.

3 Annotated diagrams

Where a candidate has answered a question wholly or partly by use of an annotated diagram, credit must be awarded to the annotations which form credit-worthy responses as outlined in the marking details box. Candidates must be credited only once for valid responses which appear both as annotations to diagrams and within a section of prose in the answer to the same question.

4. Banded mark schemes

Banded mark schemes are divided so that each band has a relevant descriptor. The descriptor for the band provides a description of the performance level for that band. Each band contains marks. Examiners should first read and annotate a learner's answer to pick out the evidence that is being assessed in that question. **Do not use ticks** on the candidate's response. Once the annotation is complete, the mark scheme can be applied. This is done as a two-stage process.

Stage 1 – Deciding on the band

When deciding on a band, the answer should be viewed holistically. Beginning at the lowest band, examiners should look at the learner's answer and check whether it matches the descriptor for that band. Examiners should look at the descriptor for that band and see if it matches the qualities shown in the learner's answer. If the descriptor at the lowest band is satisfied, examiners should move up to the next band and repeat this process for each band until the descriptor matches the answer.

If an answer covers different aspects of different bands within the mark scheme, a 'best fit' approach should be adopted to decide on the band and then the learner's response should be used to decide on the mark within the band. For instance, if a response is mainly in band 2 but with a limited amount of band 3 content, the answer would be placed in band 2, but the mark awarded would be close to the top of band 2 as a result of the band 3 content.

Examiners should not seek to mark candidates down as a result of small omissions in minor areas of an answer.

Stage 2 – Deciding on the mark

Once the band has been decided, examiners can then assign a mark. During standardising (marking conference), detailed advice from the Principal Examiner on the qualities of each mark band will be given. Examiners will then receive examples of answers in each mark band that have been awarded a mark by the Principal Examiner. Examiners should mark the examples and compare their marks with those of the Principal Examiner.

When marking, examiners can use these examples to decide whether a learner's response is of a superior, inferior or comparable standard to the example. Examiners are reminded of the need to revisit the answer as they apply the mark scheme in order to confirm that the band and the mark allocated is appropriate to the response provided.

Indicative content is also provided for banded mark schemes. Indicative content is not exhaustive, and any other valid points must be credited. In order to reach the highest bands of the mark scheme a learner need not cover all of the points mentioned in the indicative content but must meet the requirements of the highest mark band. Where a response is not creditworthy, that is contains nothing of any significance to the mark scheme, or where no response has been provided, no marks should be awarded.

Question		Marking details		Marks Available											
				AO1	AO2	AO3	Total	Maths	Prac						
1	(a)		<table border="1"> <tr> <td>Lithophile</td> <td>• Crust or Mantle</td> </tr> <tr> <td>Siderophile</td> <td>• Core</td> </tr> <tr> <td>Atmophile</td> <td>• Atmosphere or Hydrosphere</td> </tr> </table>	Lithophile	• Crust or Mantle	Siderophile	• Core	Atmophile	• Atmosphere or Hydrosphere	2			2		
		Lithophile	• Crust or Mantle												
Siderophile	• Core														
Atmophile	• Atmosphere or Hydrosphere														
	All correct 2 marks Two correct 1 mark														
	(b)	(i)	Correct use of formula (1) km^3 (1) 1.08×10^{12} (1)		3		3	3	3						
		(ii)	5.53 (1) g cm^{-3} (1) or 5.53×10^{12} (1) kg km^{-3} (1) ecf for use of incorrect volume in Q1b(i)		2		2	2	2						
	(c)		Whole Earth density greater than values given in the table for the crust and mantle (1) Material in core must therefore be greater density than crust and mantle (1) Iron and nickel are dense metals (1)			3	3								
			Question 1 total	2	5	3	10	5	5						

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)		Sedimentary (1)		1		1		
	(b)		Crystalline (1) Equicrystalline, crystals with straight edges (1) Approximately 120° contact between crystals (1)		3		3		3
	(c)		Location I (1) Regional metamorphism/ High pressure-high temperature (1) Any two x (1) from: <ul style="list-style-type: none"> • foliation/alignment • schist • garnet correctly interpreted • insufficient energy/too low grade of metamorphism at L 	4			4		4
	(d)	(i)	'The present is the key to the past' or equivalent (1)	1			1		
		(ii)	The Earth's core/radioactive decay of naturally occurring minerals/primordial heat (1) The Sun (1)	2			2		

Question			Marking details	Marks Available						
				AO1	AO2	AO3	Total	Maths	Prac	
		(iii)	<p>Indicative content</p> <p>Rock A is shale Rock A forms in a low energy sedimentary environment, such as deep marine basin Rock B is spotted rock Rock B forms from the contact metamorphism of rock A Rock B forms from high temperatures and low pressures close to an igneous body Rock C is gneiss Rock C forms from the regional metamorphism of either rock A or rock B Rock C forms under high temperatures and high directed pressures associated with convergent plate boundaries Rocks A, B and C could undergo weathering, erosion and transport to form rock A</p> <p>5–6 marks The response describes the formation of all three rocks, linking them to their geological setting as well as describing the rock forming conditions. The link between the three rocks is clear and explicit. <i>There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant.</i></p> <p>3–4 marks The response describes the formation and rock forming conditions of at least two of the rocks. There is some link between the three rocks, however, it may not be explicit. <i>There is a line of reasoning which is partially coherent, supported by some evidence and with some structure. Mainly relevant information is included but there may be some irrelevant information or minor errors.</i></p>							
						6	6			

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
			<p>1–2 marks The response describes the formation and rock forming conditions of at least one of the rocks. There is no, or a vague link made between the rocks. <i>There is a basic line of reasoning which is not coherent, supported by limited evidence and with very little structure. There may be significant errors or the inclusion of much irrelevant information.</i></p> <p>0 marks <i>No attempt made or no response worthy of credit.</i></p>						
			Question 2 Total	7	4	6	17	0	7

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)		Volcano A – Divergent (1) Volcano B – Convergent (1)	2			2		
	(b)		Solid (1)		1		1		
	(c)	(i)	Any three x (1) from: <ul style="list-style-type: none"> • thinner lithosphere • hot mantle rock rises • reduction in pressure/decompression melting • partial melting 	3			3		
		(ii)	Volcano A – mafic/basaltic (1) Volcano B – intermediate/andesitic (1)	2			2		
	(d)	(i)	Any three x (1) from: <ul style="list-style-type: none"> • clastic/granular/fragmented • matrix supported • poorly sorted • angular/subangular • size – 1.5cm – 0.1cm 	3			3		3
		(ii)	Volcano B (1) Intermediate magma viscous/high gas content/high Si content (1) Intermediate magma produces explosive eruptions (1) Explosive eruptions will produce fragmented material (1)	4			4		
			Question 3 Total	14	1	0	15	0	3

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)	Suture line (1)	1			1		
		(ii)	Goniatite (1) Simple suture line (1)	2			2		
		(iii)	Suture line drawn with multiple high saddles and deep lobes (1) Suture line drawn with continuous frilliness (1)	2			2		
		(iv)	Mineral replacement (1) Molecule by molecule (1) Preserved in pyrite/pyritization (1) OR Dissolving of original shell (1) Leaves cavity/mould (1) Infilled by pyrite (1)	3			3		1
	(b)	(i)	A fossil that can be used to relatively date rocks (1)	1			1		
		(ii)	Location 1 (1) Fossil L older than Fossil M or vice versa (1) Location 1 above unconformity (1) Location 1 younger than location 2 (1) Also credit reference to Beds at location 3 dip beneath beds at location 2/ location 3 is older than location 2 (fossil L)		4		4		
			Question 4 Total	9	4	0	13	0	1

Question		Marking details		Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)		All four arrows drawn correctly (3) Three arrows drawn correctly (2) Two arrows drawn correctly (1)	3			3		
	(b)	(i)	12/12 (1) Mean = 1 (1)		2		2	2	2
		(ii)	Iron bearing minerals (1) Minerals' magnetic fields align with Earth's magnetic field (1) Cool below Curie temperature and locked/frozen in place (1)	3			3		
		(iii)	Tan 1 = 0.017 (1) Working to equal 8.7×10^{-3} (1) 0.50 (1) ecf for use of incorrect mean in Q5b(i)		3		3	3	3

Question		Marking details				Marks Available					
						AO1	AO2	AO3	Total	Maths	Prac
(c)	(i)	Sample Number	Magnetic inclination (°)	$x - \bar{x}$	$(x - \bar{x})^2$						
		1	-20	-21.3	453.7						
		2	-30	-31.3	• 979.7						
		3	10	• 8.7	75.7						
		4	20	18.7	349.7						
		5	15	13.7	187.7						
		6	12	10.7	114.5						
		7	1.5	0.2	• 0.04						
		8	2	0.7	0.49						
		9	1	-0.3	0.09						
		10	-15	• -16.3	265.7						
		11	19	17.7	• 313.3						
		12	0.5	-0.8	0.64						
		Mean Inclination		$\sum (x - \bar{x})^2$							
		1.3		2741.26							
		All correct (3) Four correct (2) Two or three correct (1)									
	(ii)	Correct use of formula ($2741.26/12 = 228.4$) (1) 15.1 (1)					2		2	2	2

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
		(iii)	Any three x (1) from: <ul style="list-style-type: none"> • Cotopaxi has a smaller range/India has a greater range • one eruption at Cotopaxi vs a series of eruptions in India • plate movement over time for India/Cotopaxi stationary • one location vs many locations/large area of India 			3	3		
			Question 5 total	6	10	3	19	10	10

Question		Marking details		Marks Available																							
				AO1	AO2	AO3	Total	Maths	Prac																		
6	(a)		Antiformal axial plane trace drawn in correct location (1)		1		1																				
	(b)		Discordant (1) Linear/sheet like (1)		2		2																				
	(c)		Dip-Slip (1) Any three x (1) from: <ul style="list-style-type: none"> axial plane of antiform not displaced so not strike slip movement statement of evidence of vertical movement vertical movement so no hanging/footwall 	4			4																				
	(d)		Any three x (1) from: <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>Field evidence</td> <td>Sill</td> <td>Lava flow</td> </tr> <tr> <td>Baked margin</td> <td>2 – one above one below</td> <td>1 – only below</td> </tr> <tr> <td>Weathered upper surface</td> <td>No weathering - intrusive</td> <td>Weathered upper surface</td> </tr> <tr> <td>Crystal size</td> <td>Medium</td> <td>Fine</td> </tr> <tr> <td>Included fragments</td> <td>Included fragments of rocks from above and below body</td> <td>Included fragments of rocks from below body only</td> </tr> <tr> <td>Pillow lavas</td> <td>Not present</td> <td>Could be present</td> </tr> </tbody> </table> <p>Credit other sensible e.g. vesicles more typically in lava flows</p>	Field evidence	Sill	Lava flow	Baked margin	2 – one above one below	1 – only below	Weathered upper surface	No weathering - intrusive	Weathered upper surface	Crystal size	Medium	Fine	Included fragments	Included fragments of rocks from above and below body	Included fragments of rocks from below body only	Pillow lavas	Not present	Could be present				3	3	3
Field evidence	Sill	Lava flow																									
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Question		Marking details	Marks Available					
			AO1	AO2	AO3	Total	Maths	Prac
	(e)	<p>Indicative content</p> <p>Rock Unit D is the oldest rock Rock Unit D is at the core of the anticline Rock Unit C was deposited after D Rock Unit E deposited after C Rock Units D, C and E were folded into an anticline Faulting (F) occurred after the folding Rock Unit A intruded after faulting Rock unit B intruded after faulting You cannot tell which came first Rock Unit B or Rock Unit A as there is no cross-cutting relationship Period of uplift/erosion and then deposition created the unconformity Above unconformity Rock Unit is F is older than Rock Unit G Relative age of rock unit H is not known, could be older or younger than G depending whether H is a lava flow or sill</p> <p>5-6 marks The response accurately states the varying known relative age of all Rock Units/structures included within the map. The evidence for the conclusions is fully explained. There is a recognition of at least one unidentifiable relative age from:</p> <ul style="list-style-type: none"> • the unconformity and Rock Unit B • Rock Unit H and Rock Unit G • Rock Unit A and Rock Unit B. <p><i>There is a sustained line of reasoning which is coherent, substantiated and logically structured.</i> <i>The information included in the response is relevant.</i></p>		6		6		6

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
			<p>3-4 marks The response correctly states the known relative ages of most Rock Units/structures within the map with only a few omissions. The evidence for some conclusions is partially explained. The response fails to recognise that there are features of unidentifiable relative age. <i>There is a line of reasoning which is partially coherent, supported by some evidence and with some structure. Mainly relevant information is included but there may be some irrelevant information or minor errors.</i></p> <p>1-2 marks The response correctly states the known relative ages of some Rock Units/structures within the map with notable omissions. The answer lacks explanation of the evidence for the conclusions. The response fails to recognise that there are features of unidentifiable relative age. <i>There is a basic line of reasoning which is not coherent, supported by limited evidence and with very little structure. There may be significant errors or the inclusion of much irrelevant information.</i></p> <p>0 marks <i>No attempt made or no response worthy of credit.</i></p>						
			Question 6 Total	4	9	3	16	0	9
			Paper Totals	42	33	15	90	15	35