



# **GCE A LEVEL MARKING SCHEME**

**AUTUMN 2021** 

A LEVEL GEOLOGY – COMPONENT 2 A480U20-1

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#### INTRODUCTION

This marking scheme was used by WJEC for the 2021 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 A LEVEL GEOLOGY

## **COMPONENT 2 - GEOLOGICAL PRINCIPLES AND PROCESSES**

# AUTUMN 2021 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.

	Juanti	o.n	Marking dataila			Marks	Available		
	Juesu	on		AO1	Marks Available         AO1       AO2       AO3       Total       Maths         1       1       1       1       1         3       3       3       3       1       1         4       4       4       4       4       4				Prac
1	(a)	(i)	Pyrite (1)	1			1		1
		(ii)	<ul> <li>Any three x (1) from:</li> <li>Shell originally CaCO<sub>3</sub></li> <li>Replacement</li> <li>Pyritisation/ by pyrite</li> <li>Anoxic environment</li> </ul>	3			3		
	(b)	(i)	<ul> <li>Site 2 (1)</li> <li>Any two x (1) from: <ul> <li>Fossil A is a ceratite</li> <li>Ceratites are intermediately aged cephalopod</li> <li>Law of superposition shows site 1 is older than site 2</li> <li>Law of superposition shows site 2 is older than site 3</li> </ul> </li> </ul>			3	3		3
		(ii)	<ul> <li>Any four x (1) from:</li> <li>Discordance/cross-cutting relationship</li> <li>Different dip angles</li> <li>Different dip directions</li> <li>Contrasting age of fossils</li> <li>Development on age of fossils</li> <li>Process of unconformity formation</li> </ul>		4		4		

Questi	• •	Marking dataila		Marks	Available		
auesti	on	marking details	Marks Available         AO1       AO2       AO3       Total       Maths         I time       1       1       1       1         ation       Image: Second seco	Prac			
(c)	(i)	A fossil used to define/identify a period of geological time	1		1		
	(ii)	Indicative content					
		<ul> <li>wide and plentiful distribution- pelagic nekton ready preservation- hard parts (rapid) evolutionary change easy identification use of suture lines high degree of facies independence in marine rocks but absent in (high energy) conglomerate but not useful in non- marine rocks but only useful in Late Palaeozoic and Mesozoic but ease of identification may be lost during preservation</li> <li><b>5-6 marks</b> There is a clear response which describes and explains why cephalopods are good zone fossils. This includes reference to data from <b>Figure 1a</b> and <b>Figure 1b</b>. A clear evaluation is made i.e. students clearly recognise some of the problems in using cephalopods as zone fossils. There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant.</li> </ul>					

Question	Marking dataila			Marks	Available		
Question	Marking details	AO1	AO2	AO3	Total	Maths	Prac
	<ul> <li>3-4 marks The response describes and explains why cephalopods are good zone fossils. This includes reference to data from at least one of Figure 1a and Figure 1b. A partial evaluation is made i.e. students recognise there may be problems in using cephalopods as zone fossils. A logical sequence of the processes is developed in places but not throughout. There is a line of reasoning which is partially coherent, supported by some evidence and with some structure. Mainly relevant information or minor errors. 1-2 marks The response describes why cephalopods are good zone fossils. However, there is a lack of detail in the response and comment is rather superficial. There may be a significant lack of relevance in places. No evaluation is made. 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. </li> </ul>			6	6		
	No attempt made or no response worthy of credit						
	Question 1 total	5	4	9	18	0	4

	Questi	<b>.</b>	Marking dataila			Marks	Available		
	auesti	511		Marks Available         AO1       AO2       AO3       Total       Maths       F         1       1       1       1       1       1       1         3       3       3       3       3       3       1         1       1       1       1       1       1       1         1       3       3       3       3       3       1         1       1       1       1       1       1       1				Prac	
2	(a)	(i)	Two arrows pointing away from the ocean ridge (1)		1		1		
		(ii)	$100/4.0 = 25 \text{ kmMa}^{-1} (1)$ 2.5 cmyr <sup>-1</sup> (1) 2 x 2.5 cmyr <sup>-1</sup> = 5.0 cmyr <sup>-1</sup> (1)		3		3	3	3
	(b)	(i)	Magnetic field (preserved in the rocks) is in the opposite direction to today (1)	1			1		
		(ii)	<ul> <li>Any three x (1) from:</li> <li>Iron minerals/magnetite</li> <li>Present in basalts/mafic magma-lava</li> <li>Align in direction of magnetic field</li> <li>Alignment 'locked' in the rock when falls past the Curie temperature</li> </ul>	3			3		
		(iii)	Rate of seafloor spreading (1) Faster rate = narrower stripe (1) Periodicity of magnetic reversal (1) Longer duration = wider stripe (1)		4		4		

Vuontia		Marking dataila			Marks	Available		
luesu	ווכ		A01	AO2	AO3	Total	Maths	Prac
(c)	(i)	<ul> <li>Any three x (1) from:</li> <li>Mantle/asthenosphere rises</li> <li>Partially melts</li> <li>Reduction in pressure</li> <li>Forms a mafic melt</li> <li>Crystallises to form new oceanic crust</li> <li>Fast cooling = basalt or moderate cooling = dolerite or slow cooling = gabbro</li> </ul>	3			3		
	(ii)	<ul> <li>Any two x (1) from:</li> <li>Ridge push</li> <li>Newly formed ridge at higher elevation than abyssal plain</li> <li>Gravity causes rigid lithosphere to slide down elevated asthenosphere</li> </ul>		2		2		
		Question 2 total	7	10	0	17	3	3

	)		Mouling dataile	Marks Available					
	Juestic	n	Marking details	AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)	Flank lava flow because only these threaten to engulf major population centres (1)		1		1		
		(ii)	Pyroclastic flows (1) Heat (1) mass/speed/momentum (1) <b>also credit reference to:</b> Lateral blast/explosion (1) Volcanic bombs (1) mass/momentum/speed (1) <b>or</b> Ash fall (1) Accept two of: collapsing roofs (1) contamination of water supplies (1) breathing problems (1) death of crops/livestock (1) <b>or</b> Gases (1) CO/CO <sub>2</sub> (1) asphyxiation/suffocation (1) <b>or</b> Lahars (1) Speed/momentum (1) drowning (1) <b>or</b> Volcanic landslide (1) Steep slope (1) mass/momentum/speed (1) <b>or</b> Volcanic tsunami (1) Landslide into water/displacement of water (1) impact of water & debris (1)	3			3		

0.	uostio	<b>N</b> D	Marking datails			Marks	Available		
S.	uestio	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		A01	AO2	AO3	Total	Maths	Prac
	(b)	(i)	<ul> <li>Any three x (1) from:</li> <li>Increase in early January</li> <li>Decrease from January to mid-March</li> <li>Increase in mid-March</li> <li>Decrease in late-March to mid-April</li> <li>Increase from mid-April to mid-May</li> <li>Decrease from mid-May</li> <li>Exemplar values</li> </ul>	3			3	3	3
		(ii)	<ul> <li>Any four x (1) from:</li> <li>CO<sub>2</sub>:SO<sub>2</sub> ratio appears to increase before eruption (1)</li> <li>But changes in ratio unreliable (1)</li> <li>Prior to July eruption rapid decrease in CO<sub>2</sub>:SO<sub>2</sub> ratio but not before August eruption (1)</li> <li>No eruption related to increase in CO<sub>2</sub>:SO<sub>2</sub> ratio in May (1)</li> <li>No absolute value in CO<sub>2</sub>:SO<sub>2</sub> ratio seems to herald an eruption (1)</li> <li>Although a CO<sub>2</sub>:SO<sub>2</sub> ratio above 15 may be a precursor</li> </ul>			4	4		4
			Question 3 total	6	1	4	11	3	7

	Questi	0.7		Marking details			Marks	Available	9	
,	QUESU	on			AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)	<ul><li>A Olivine (1)</li><li>B Plagioclase feldspar</li></ul>	· (1)	2			2		2
		(ii)	Stony (chondrite)	Iron	3			3		3
			granular/chondrules	crystalline (1)						
			finer (<0.5cm)	coarser (>1cm) (1)						
			spherical/rounded	angular/euhedral (1)						
			Credit other sensible de	escriptions						
	(b)	(i)	Aluminium (1) Calcium (1)		2			2		
		(ii)	Most (88%) in iron met crust (1) Approximately the sam (30%) meteorites (1)	eorites and least (6.3%) in Earth's e in whole Earth (32%) and chondrite	2			2		

Question	Marking details			Marks	Available		
Question		AO1	AO2	Marks Available         AO2       AO3       Total       Maths       Pi         4	Prac		
(iii)	<ul> <li>Any four x (1) from:</li> <li>Earth was once molten</li> <li>Iron being most dense sunk to Earth's core</li> <li>Iron meteorites represent the core of planetesimals/Earth's core</li> <li>Other elements concentrated into Earth's crust by virtue of being less dense &amp;/or fractional crystallisation</li> <li>Stony (chondrite) meteorites never underwent planetary differentiation</li> <li>Stony (chondrite) meteorites thus very similar in composition to bulk Earth</li> <li>Iron is a siderophile element</li> <li>Other seven elements are lithophile</li> </ul>		4		4		
	Question 4 total	9	4	0	13	0	5

	Questi		Marking dataila			Marks	Available		
	Juesu	n	marking details	AO1	AO2	AO3	Total	Maths	Prac
5	(a)		<ul> <li>Any two x (1) from:</li> <li>Reduction in sea depth</li> <li>From 100m to above sea level</li> <li>Some higher frequency changes in sea level</li> </ul>	2			2	2	2
	(b)		<ul> <li>Max three x (1) backing conclusion:</li> <li>Fine grain size/shale</li> <li>Lamination</li> <li>Cephalopod</li> <li>Brachiopod</li> </ul> Max three x (1) against conclusion: <ul> <li>Symmetrical wave ripples</li> <li>Plant fossils</li> <li>Broken fossils</li> <li>Bivalves may be non-marine</li> <li>Coarser grains of thin sandstones</li> </ul>			4	4		4
	(c)	(i)	Marine regression (1) Facies 2 is moving seaward (1)		2		2		
		(ii)	Student is incorrect because volcanic tuffs deposited at a distinct time- not diachronous/isochronous (1) Student is correct because facies boundaries cut across time lines- diachronous (1)			2	2		

Question Marking details		Marks Available							
auesu	511		AO1	AO2	AO3	Available Total Maths 1 3	Prac		
(d)	(i)	Anywhere where all 3 facies types are penetrated (1)		1		1			
	(ii)	Clear understanding of what Walther's Law means (1) Vertical succession of facies 1,2,3 in the borehole in Figure 5a (1) Reflects the lateral succession of facies 1,2,3 at one time in Figure 5b (1)			3	3		3	
		Question 5 total	2	3	9	14	2	9	

	Questi		Marking dataila		AO2         AO3         Total         Maths         F           1         1         1         1         1         1           3         3         3         3         1         1         1           1         1         1         1         1         1         1         1           3         3         3         3         3         3         1         <				
	Juesu	on	Marking details	AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	Stress arrows vertical (1)		1		1		1
		(ii)	<ul> <li>Any three x (1) from:</li> <li>Compressed</li> <li>Competent</li> <li>Brittle</li> <li>Fractured</li> <li>Beyond fracture point</li> <li>Cold</li> <li>Unconfined</li> <li>Lacks pore fluids</li> </ul>		3		3		
	(b)	(i)	Fracture point drawn correctly at (0.0095, 118) (1)		1		1		1
		(ii)	Any three x (1) from: 90-30 or 0.0048-0.0020 seen (90 - 30)/(0.0048 - 0.0020) 21000 (range 20000-22000) 2 significant figures		3		3	3	3
		(iii)	Gradient less (1) Transition from linear portion of graph at lower stress value (1) Curved portion of line stretches to higher strain values (1)		3		3	3	3

Question			Marking details	Marks Available						
		on		A01	AO2	AO3	Total	Maths	Prac	
	(C)		Indicative content		6		6			
			At 1 brittle deformation occurs As rocks are competent Forming a fault Due to low depths/confining pressures and temperatures At 2 both brittle and ductile deformation occurs As rocks are less competent Forming a fold and fault Due to intermediate depths/confining pressures and temperatures At 3 ductile deformation only occurs As rocks are incompetent Forming a fold/shear zone Due to high depths/confining pressures and temperatures <b>5-6 marks</b> There is a clear response which describes and explains in detail most of the processes involved in the transition from brittle faulting (layer 1), both brittle faulting and ductile folding/shearing (layer 2) to ductile folding/shearing (layer 3). This includes processes related to most of the following: competency, increasing depth, temperature and confining pressure. A logical link between the descriptions and explanations is made. There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant.							

Question	Marking details	Marks Available						
Question		A01	AO2	AO3	Total	Maths	Prac	
	<ul> <li>3-4 marks The response describes and explains many of the processes involved in the transition from brittle faulting (layer 1) to ductile folding/shearing (layer 3). This includes processes related to some of the following: competency, increasing depth, temperature and confining pressure. A logical link between the descriptions and explanations is made in places but not throughout. 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. </li> <li>1-2 marks The response describes and explains only a few of the processes involved in the transition from brittle faulting to ductile folding/shearing. There is a lack of detail in the response and comment is rather superficial. There may be a significant lack of relevance in places. 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. 0 marks No attempt made or no response worthy of credit</li></ul>							
	Question 6 total	0	17	0	17	6	8	
	Paper Totals	29	39	22	90	14	36	

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