



# **GCE A LEVEL MARKING SCHEME**

**SUMMER 2022** 

A LEVEL GEOLOGY – COMPONENT 1 A480U10-1

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#### INTRODUCTION

This marking scheme was used by WJEC for the 2022 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 1 - GEOLOGICAL INVESTIGATIONS**

#### SUMMER 2022 MARK SCHEME

#### **Specimens**

Specimen T = Pyrite Specimen E = Granite Specimen X = Marble

## 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 A	vailable		
G	uesu	on		AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)	Reference to outcrop width 11-17 km/ overall length 60km / thicker to the SE (1) Synformal / curved / cut by faults / credit other sensible answers (1)	2			2	1	1
		(ii)	<ul> <li>Any one x (1) from:</li> <li>fractional crystallisation</li> <li>magma segregation</li> <li>ore minerals have a higher density than basaltic minerals</li> <li>Any one x (1) from:</li> <li>gravity settling</li> <li>reference to sinking</li> </ul>		2		2		
	(b)		Gravity (1) Due to ore minerals having a higher density than the surrounding rocks (1) Greater gravitational attraction (1) OR Seismic reflection (1) Seismic waves will reflect off geological boundaries (1) Density changes seismic wave velocity (1) OR Magnetic survey (1) Magnetic field strength will vary with concentration of Fe or Ni (1) Above ore body the magnetic field will change (1) OR Electrical Resistivity (1) Resistivity of the ground will vary with metal content of the rocks (1) Metallic ore body lowers resistivity (1)		3		3		

	Question		Marking details	Marks Available						
G				AO1	AO2	AO3	Total	Maths	Prac	
	(c)	(i)	Systematic sampling (1)	1			1	1	1	
		(ii)	50ppm and 100ppm lines on western side correctly continued (1) 50ppm and 100ppm lines on eastern side drawn (1)	2			2	2	2	
		(iii)	<ul> <li>Any three x (1) from:</li> <li>higher concentrations closer to the ore body</li> <li>NE/SW trend due to the orebody striking NE/SW</li> <li>lower concentrations away from the ore body due to dispersion of Cu ions</li> <li>dispersion by groundwater</li> <li>dispersion may be related to topography</li> </ul>			3	3			
		(iv)	<ul> <li>Any three x (1) from:</li> <li>gives quantitative data</li> <li>non-invasive</li> <li>cheaper than borehole drilling</li> <li>could give inaccurate results due to pollution</li> <li>geochemical not appropriate for Fe or other ores that do not have a good chemical signature</li> <li>does not enable a large area to be explored</li> <li>time consuming</li> <li>does not prove presence of economic ore body</li> <li>enables target zones to be identified</li> <li>cannot detect insoluble chemicals in river water/groundwater/vegetation surveys</li> <li>Credit other sensible points e.g. only for bodies close to surface, not useful in arid area, anomaly may not be at the ore body because of dispersion</li> </ul>			3	3			
			Question 1 total	5	5	6	16	4	4	

Question			Marking details	Marks Available						
6			Marking details	AO1	AO2	AO3	Total	Maths	Prac	
2	(a)	(i)	Cross-bedding (1) Flute casts/ sole structures (1)	2			2			
		(ii)	Arrow pointing left (1) Arrow pointing diagonally up to the left (1)		2		2			
		(iii)	All boundaries at the correct location (1) Bed 2 fining upwards, with base < or = 2mm and top between1/16 <sup>th</sup> and 2mm (1) Both shales drawn entirely finer than 1/16 <sup>th</sup> mm (1) Medium sands coarser than fine sand and both within the 1/16 <sup>th</sup> mm to 2mm (1)		4		4	4	4	
	(b)		Indicative content Bed 1 – Low energy marine deposition of mud Bed 2 – Turbidite, High density fluid (mixture of sediment and water) flows beneath less dense fluid (clear seawater). Flows down slope under gravity at high speed (~100 kmhr <sup>-1</sup> ). Sole structures produced by erosion/deposition during the initial high energy flow. Graded bedding produced as the flow loses energy. Bed 3 – Unidirectional current formed cross-bedding. Energy levels lower than that of Bed 2. Bed 4 – Energy levels lower than that of Bed 3 Bed 5 – Low energy marine deposition of mud		6		6		6	

Question	Marking dataila			Marks A	vailable		
Question		AO1	AO2	AO3	Total	Maths	Prac
	<b>5–6 marks</b> There are references to <b>both</b> the turbidity current with energy change <b>and</b> low energy marine environments which are described coherently. A clear explanation as to how <b>either</b> flute casts <b>or</b> cross-bedding are formed is offered. There is a clear explanation as to how the energy levels within the sequence have changed. All judgements are consistent with the information as analysed. <i>There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant.</i>						
	<b>3–4 marks</b> There is reference to <b>two of</b> the turbidity current, low energy marine environments, flute casts or cross bedding which are described / explained coherently. Most judgements are drawn that are consistent with the information as analysed. 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.						
	<b>1–2 marks</b> Turbidity currents or low energy marine environments or one of the sedimentary structures are described only with rather superficial comment. There may be a lack of relevance in places and judgements drawn concerning the links between processes and structures are superficial, with simple comments on the nature of the structures. 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.						

Question	Marking details	Marks Available						
Question		AO1	AO2	AO3	Total	Maths	Prac	
	<b>0 marks</b> No attempt made or no response worthy of credit.							
	Question 2 total	2	12	0	14	4	10	

0	Question		Marking datails			Marks A	vailable		
<u> </u>	uesii	511		AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)	Rub the specimen on the back of a streak plate/an unglazed porcelain tile or equivalent (1)			1	1		1
		(ii)	Greenish Black (1) (accept green/black/grey)		1		1		1
	(b)	(i)	5 (1)		1		1	1	1
		(ii)	Mass $0.1/12.5 \times 100 = 0.8\%$ or Volume $0.25/2.5 \times 100 = 10\%$ (1) 0.8% + 10% = 10.8% (1)		2		2	2	2
	(c)		Pyrite		1		1		1
			Question 3 total	0	5	1	6	3	6

	unction	Marking details	Marks Available						
Q	uestion		AO1	AO2	AO3	Total	Maths	Prac	
4	(a)	Interlocking crystals (1) Coarser euhedral phenocrysts (1) Finer subhedral/ anhedral groundmass (1) Scale such that phenocrysts are typically 1-3 cm and groundmass 1-7mm (1)		4		4	1	4	
	(b)	Granite (1) Coarse crystal size/ >3mm (1) Light in colour/contains quartz/silicic (1)		3		3			
		Question 4 total	0	7	0	7	1	4	

0	unsting	Marking details			Marks A	vailable		
Q	uestioi		AO1	AO2	AO3	Total	Maths	Prac
5	(a)	No Yes (1)						
		Accept between 0.5 – 1 mm (1) Must be a single value						
		Acid Test: Reacts with acid (Also accept scratch with steel pin/copper coin, will scratch) (1)	4	1	1	6	2	4
		Calcite / CaCO <sub>3</sub> (1)						
		Oolitic limestone / limestone (1) Marble (1)						
	(b)	0° and 20° (1) NE/045° (1)	2			2		2
	(c)	Locality II is next to a pluton/igneous body (1) As the pluton forced its way up it folded/deformed rock unit F (1)		2		2		
		Question 5 total	6	3	1	10	2	6

Question		20	Marking details			Marks A	vailable		
Q	uesiit	Л		AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	Initial temperature of the water (1)	1			1		1
		(ii)	<ul> <li>Any two x (1) from:</li> <li>depth / volume of sand</li> <li>water content of sand</li> <li>distances of thermometers in the sand</li> <li>air temperature</li> <li>size of inner / outer tin</li> <li>initial temperature of the sand</li> <li>volume of water poured into inner tin</li> <li>material of the inner tin / container</li> <li>type of sand</li> </ul>			2	2		2
	(b)		<ul> <li>Any two x (1) from:</li> <li>placed an insulating tile underneath the inner tin</li> <li>put a lid on the inner tin</li> <li>ensured that the sand is up to the top of the inner tin</li> <li>filled up the inner tin to the top with hot water</li> <li>inner tin made of metal</li> </ul>	2			2		2
			Question 6 total	3	0	2	5	0	5

Question	Marking details			Marks A	vailable		
Question	Marking details	AO1	AO2	AO3	Total	Maths	Prac
7	Indicative content see table below						
	<ul> <li>7–9 marks Reference is made to the geological features shown in both photographs 2 and 3. The response is well-structured and justifies at least 4 relevant observations, most of which are well justified, and at least 2 relevant techniques to investigate past geological processes including the environmental conditions at the time of deposition. Most or all the observations/techniques are well justified showing that the candidate has a clear rationale for most of the observations that have been proposed. There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant. </li> <li>4–6 marks The response is quite well-structured and includes at least 2 relevant observations and at least 1 relevant technique to investigate past geological processes. At least one of the observations is justified appropriately, showing that the candidate has a reasonable rationale for many of the observations/ techniques that have been proposed. Some of the observations (although correctly described and justified) may not be relevant to the geological features shown in photographs 2 and 3. There is a line of reasoning which is partially coherent, supported by some evidence and with some structure. Mainly relevant information or minor errors.</li></ul>			9	9		9

Question	Marking details			Marks A	vailable		
Question		AO1	AO2	AO3	Total	Maths	Prac
	<ul> <li>1–3 marks The response makes use of relevant observations without appropriate justification, and techniques with only superficial comments. Justification for the observations is very limited revealing that the candidate has a limited rationale for the observations / techniques proposed. Some of observations may not be relevant to the geological features shown in photographs 2 and 3, or rather than plan a field investigation the response contains interpretations of the geological features shown in photographs 2 and 3. 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> <li>0 marks No attempt made or no response worthy of credit.</li></ul>						
	Question 7 total	0	0	9	9	0	9

Observation	Justification given	Technique used
Fossil morphology	To use uniformitarianism to deduce the environmental conditions	Study with hand lens; cleaning of fossils
Fossil preservation	To establish the energy levels at the time of deposition	Study with hand lens;
Identify the type of fossil	To enable the age of the rocks to be determined To discover its palaeoenvironmental conditions	Study with hand lens; use of reference material
Record the variety of fossils	To enable biodiversity to be established	Systematic sampling; study with hand lens; field sketch/photo
Grid reference/ GPS	To enable location to be established	Map reference techniques
Grain size and variation	To establish the energy levels at the time of deposition	Sediment size comparator; hand lens
Mineralogy	To enable the depositional environment to be determined	Study with hand lens; acid test
Grain shape	To deduce the distance travelled by the sediment and the medium of transport	Study with hand lens; sediment shape comparator
Toughness of rock	To determine type of lithification	Scratch the rock
Sedimentary structures	To determine palaeocurrent directions and palaeoenvironment	Careful observation, measurement of palaeocurrent directions with compass
Bed thickness	To establish the rate of environmental change	Measurement; field sketch/photo
Fossil orientation	To establish current directions if any	Systematic sampling; compass directions
Dip angle, dip direction, strike direction of beds	To determine the nature of post depositional stresses	Compass/clinometer

Question		Marking dataila			Marks Available				
			AO1	AO2	AO3	Total	Maths	Prac	
8	(a)	<ul> <li>Any two x (1) from:</li> <li>strikes North-South</li> <li>transgressive / discordant in places</li> <li>mostly concordant</li> <li>four outcrops</li> <li>linear</li> <li>approximately 60m width</li> <li>displaced by a fault</li> </ul>	2			2			
	(b)	Dolerite (1)		1		1			
(c)		Statement is incorrect (1) Crystal size on photograph too coarse to be a lava flow. (1) On map 1 Rock Unit B is found in different beds / transgressive (1)			3	3			
	Question 8 total		2	1	3	6	0	0	

Question		Marking dataila		Marks Available				
			AO1	AO2	AO3	Total	Maths	Prac
9	(a)	Correct position of 2 APTs (1) Correct label for 2 APTs (1) Award 1 mark for 1 correctly positioned and labelled APT	2			2		
	(b)	<ul> <li>Reverse (1)</li> <li>Any three x (1) from: <ul> <li>F2 is dipping N so northern side is the hanging wall</li> <li>Hanging wall / N side has moved up</li> <li>Rock Unit G (core of antiform) has become wider on northern side</li> <li>younger beds on the south side / older beds on the north side</li> <li>fold APT not offset so F2 is a dip-slip fault / not strike-slip</li> <li>angle of dip of fault plane too steep for a thrust fault</li> </ul> </li> </ul>		4		4		4
		Question 9 total	2	4	0	6	0	4

Question		2	Marking details	Marks Available						
		'n		AO1	AO2	AO3	Total	Maths	Prac	
10	(a)		Pluton (1) Base of F horizontal (1) H/C boundary dipping less than 30°(1) F1 Vertical (1) Correct surface plots and dip directions of A/G next to F1 (1) Correct surface plots and dip directions of A/G for synform (1) A/B/G boundaries dipping at 50° (1) Correct surface plots and dip of D/B next to Z (1) F dipping at 20° next to Pluton (1) Hidden synform in H (1) Cross-cut of C against F (1) Correct location and drawn near vertical of 2 antiform and 1 synform APT (1) Correct symbols for APTs (1) Transgressive nature of B drawn above ground, transgressing other drawn beds (1)		1 1 1 1 1 1	1 1 1 1	14	14	14	
	(b)		Are open as interlimb angle is 80° (1) Are non-plunging as the limbs have parallel strike (1) Not isoclinal as limbs have different dip directions (1) Yes E-W crustal shortening because APTs strike N-S / limbs dip to E and W (1)			4	4		4	
			Question 10 total	0	9	9	18	14	18	



Question		Marking datails	Marking dataila	Marks Available					
			, 	AO1	AO2	AO3	Total	Maths	Prac
11	(a)	Chi-squared (1) Only credit one from below if chi squared	box is ticked						
		<ul> <li>Any one x (1) from:</li> <li>data not in the form of at least 10 sets of paired data</li> <li>data set contains categorical data</li> <li>total observations &gt;20</li> <li>observations are independent of each other</li> <li>expected frequency &gt;5</li> <li>data in the form of frequencies in groups</li> <li>data not all quantitative</li> </ul>				2	2	2	2
	(b)	<ul> <li>(b) IV shows great range suggesting poorer sorting / V shows smaller range suggesting better sorting (1)</li> <li>However</li> <li>V has greater interquartile range suggesting poorer sorting / IV has smaller interquartile range suggesting better sorting (1)</li> </ul>			2		2	2	2

Question	Marking dataila	A01 A02		Marks Available					
Question			AO3	Total	Maths	Prac			
(C)	<ul> <li>Different energy levels/transport distance at locations IV and V (1)</li> <li>Any one x (1) from: <ul> <li>Locality IV closer to shore, higher wave energy / less transport distance or vice versa for locality V (1)</li> <li>Locality IV higher energy / less transport distance therefore coarser clasts or vice versa for locality V</li> </ul> </li> <li>Any two x (1) from: <ul> <li>IV contains more granitic clasts as it is located nearer to the outcrop of Rock Unit E / V contains fewer granitic clasts as it is located nearer to the outcrops of Rock Unit E / V contains fewer basaltic clasts as it is located nearer to the outcrops of Rock Unit B / IV contains fewer basaltic clasts as located further away from the outcrops of Rock Unit B</li> <li>IV contains more carbonate rocks as it is located closer to the outcrops of Rock Units F and H / V contains fewer carbonate rocks as it is located further away form the outcrops of Rock Units F and H / V contains fewer carbonate rocks as it is located further from the outcrops of Rock Units F and H</li> </ul> </li> </ul>			4	4		4		
	Question 11 total		2	6	8	4	8		
	Paper Totals		48	37	105	32	74		

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