



# **GCE A LEVEL MARKING SCHEME**

**SUMMER 2019** 

A LEVEL (NEW) GEOLOGY - COMPONENT 1 A480U10-1

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#### INTRODUCTION

This marking scheme was used by WJEC for the 2019 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

# SUMMER 2019 MARK SCHEME

# **COMPONENT 1 - GEOLOGICAL INVESTIGATIONS**

Specimen A = Schist Specimen E = Colonial Coral Specimen F = Dolerite

### 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.

		<b>.</b>	Marking dotails		Marks Available						
Q			Marking details	AO1	AO2	AO3	Total	Maths	Prac		
1	(a)		A = Glabella/Cephalon/Head shield (1) B = Pygidium	2			2				
	(b)	(i)	Ordovician (1)		1		1				
		(ii)	Palaeozoic (1)		1		1				
	(c)	(i)	X (1)		1		1		1		
		(ii)	Similarity; For both the number of thoracic segments increases with time (1) Difference; <i>Nobillasaphus</i> shows a linear relationship, <i>Ogygiocarella</i> shows a non-linear relationship, or credit use of numbers - <i>Nobillasaphus</i> changes from 5-13 segments, <i>Ogygiocarella</i> from 10-14. (1)	2			2		2		
	<ul> <li>(iii) Any three x (1) from:         <ul> <li>Possible linear nature of Nobillasaphus supports gradual</li> <li>Gaps between species mean that both could be punctuated</li> <li>Non-linear nature of Ogygiocarella may suggest punctuated.</li> <li>Can't tell from this data because some data may be missing</li> </ul> </li> </ul>				3	3					

0	weeti	<b>.</b>	Marking dataila	Marks Available							
<u>u</u>				AO1	AO2	AO3	Total	Maths	Prac		
	(d)	(i)	Benthonic (1)		3		3				
			<ul> <li>Any two x (1) from:</li> <li>No eyes suggest low light levels (deep/muddy)</li> <li>Genal spines suggest soft sea bed</li> <li>Pitted area on the front of the cephalon could be used to sense prey/predators</li> <li>Large fringe could be used as a shovel for feeding</li> </ul>								
		(ii)	<ul> <li>Any three x (1) from:</li> <li>Only hard parts are preserved</li> <li>Trilobites now extinct</li> <li>So can't apply uniformitarianism</li> <li>Morphological features may have a variety of possible functions</li> <li>Alteration during diagenesis</li> </ul>	3			3				
			Question 1 total	7	6	3	16	0	3		

Question			Marking datails		Marks Available							
L Q	uestio	on	Marking details	AO1	AO2	AO3	Total	Maths	Prac			
2	(a)		<ul> <li>Any three x (1) from:</li> <li>Shafton Coal was deposited in a swamp</li> <li>Suggesting a freshwater environment</li> <li>Goniatite is marine</li> <li>Suggesting a transgression/sea level rise</li> <li>Increase in energy level up the sequence P-Q</li> </ul>		3		3					
	(b)	(i)	<ul> <li>Any two x (1) from:</li> <li>Black</li> <li>Lustrous/Shiny</li> <li>Not banded</li> </ul>	2			2					
		(ii)	% Carbon = 83% (1) Rank = Bituminous		2		2	1	1			
	(c)		Evidence of correct area calculated Area of Pillar = $2m \times 3m = 6m^2$ Area of 4 Pillars = $6m^2 \times 4 = 24m^2$ (1) Evidence of correct thickness used Volume of 4 Pillars = $24m^2 \times 2m$ (1) Correct volume and units = $48m^3$ (1) Allow a value for thickness of between 1.5m and 2.5m Award ECF marks for incorrect measurement of area 36 to $60m^3$		3		3	3	3			

Question	Marking details			Marks A	vailable		
Question		AO1	AO2	AO3	Total	Maths	Prac
(d)	<ul> <li>A minimum of one x (1) from: <ul> <li>May miss coal seams if borehole sunk above a stall.</li> <li>Systematic nature means that may drill through the pillars and over-estimate the coal reserve if stalls are undetected</li> </ul> </li> <li>Up to three x (1) from: <ul> <li>Drilling has a high level of accuracy</li> <li>Enables actual thickness of coal to be measured</li> <li>Enables depth of coal to be determined</li> <li>Enables chemical analysis of the coal</li> <li>Invasive technique so will cause disruption at the surface</li> <li>Time consuming/expensive</li> </ul> </li> </ul>			4	4		
	Question 2 total	2	8	4	14	4	4

Question			Marking details			Marks A	vailable		
Q	uestic	n	Marking details	AO1	AO2	AO3	Total	Maths	Prac
3	(a)		Crystalline texture (1) Phenocrysts show random orientation (1) Phenocrysts are euhedral and groundmass not euhedral (1) Phenocrysts and groundmass drawn to correct scale (1) Description:		4		4	1	4
	(b)		<ul> <li>Description:</li> <li>Any one x (1) from: <ul> <li>Test the hardness by scratching with a steel pin/steel nail</li> <li>Observe the cleavage by looking for parallel planes of weakness using a hand lens</li> <li>Observe the colour</li> <li>Look for evidence of twinning</li> </ul> </li> <li>Result: <ul> <li>Credit the correct result of the test described (1)</li> <li>Mineral would not scratch with steel pin</li> <li>2 directions of cleavage at 90 degrees</li> <li>Pink/creamy white/white/grey/colourless</li> <li>Simple twins or multiple twins visible</li> </ul> </li> </ul>		2		2		2
	(c)		Aureole drawn to the correct scale (1) Aureole stops at the unconformity (1)		2		2	1	2

Question	Marking details			Marks A	vailable		
Question		AO1	AO2	AO3	Total	Maths	Prac
(d)	<ul> <li>Any two x (2) from:</li> <li>Temperature of the magma / explanation of hotter = wider</li> <li>Size of intrusion / explanation of larger = wider</li> <li>Temperature of the country rock / explanation of hotter = narrower</li> <li>Water content of country rock / explanation of wetter = narrower</li> <li>Angle of the contact / explanation of steeper = narrower</li> <li>Composition of the country rock/ explanation of greater thermal conductivity = wider</li> <li>Composition of the magma/ explanation of mafic = wider</li> </ul>	4			4		
	Question 3 total	4	8	0	12	2	8

	Question		Marking dataila			Marks A	vailable		
	uesti	on		AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)	<ul> <li>Any two x (1) from:</li> <li>Straight line/ Linear</li> <li>North/South strike</li> <li>Discordant</li> <li>Width 60-90m</li> </ul>		2		2		2
		(ii)	Crystalline or equicrystalline (1) Medium sized crystals or a value between 1-3 mm (1) Mafic/dark in colour/ credit reference to named minerals (1)	3			3		3
		(iii)	Dolerite (1) Allow basalt/gabbro if fine/coarse crystal size stated in 4(a) (ii)		1		1		
	(b)		Dyke (1) Discordant/linear (1) Medium crystal size/ Allow ref to fine crystal size if stated in Q4 (a) (ii) (1)		3		3		3
			Question 4 total	3	6	0	9	0	8

Question	Marking dotails			Marks A	vailable		
Question	marking details	AO1	AO2	AO3	Total	Maths	Prac
5	Indicative Content see table below			9	9		9
	<ul> <li>7–9 marks The response is well-structured and justifies a range of observations to investigate processes from igneous plus one of sedimentary, metamorphic and structural. Reference is also made to the sequence of events. Most or all of the observations 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 a range of observations to investigate processes from igneous plus one of sedimentary, metamorphic and structural. Many but not all of the observations are justified appropriately, showing that the candidate has a reasonable rationale for many of the observations that have been proposed. 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></ul>						

Question	Marking datails			Marks A	vailable		
Question		AO1	AO2	AO3	Total	Maths	Prac
	<ul> <li>1–3 marks The response makes use of a few observations only with superficial comments. A minimum of one of the processes (igneous, sedimentary, metamorphic, structural) is considered. Justification for the observations is limited revealing that the candidate has a limited rationale for the observations proposed. 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 5 total	0	0	9	9	0	9

	Observations Suggested	Justification Given				
Igneous	Texture: crystalline or granular	crystalline more likely to be igneous (granular sedimentary)				
Processes	Crystal size	Cooling rate				
	Crystal shape	Cooling history 1 or 2 stage				
	Equicrystalline, porphyritic, vesicular	Cooling history, vesicular more common in extrusive				
	Random or orientated crystals	Random = lack of flow/ orientated = flow				
	Colour or seek to identify minerals	To determine the composition dark = mafic pale = silicic olivine pyroxene plagioclase = mafic quartz plag orthoclase = silicic				
	Heft of a fragment	To determine if mafic or silica-rich				
	Concordant or discordant	Discordant = dyke or Pluton Concordant = sill or lava flow				
	Chilled margins	2 chilled margins = dyke or sill 1 = lava flow				
	Columnar joints	indicate that it is igneous indicates the "cooling surfaces", joints at 90 degrees to cooling surfaces dyke = at right angle to walls				
	Lateral continuity	Sill may be transgressive				
	Pillow lavas	Indicates lava has been erupted underwater				
	Aa or pahoehoe	Indicates a lava flow				
	Variation in composition	To determine if a composite intrusion or if fractionation has taken place				
Metamorphic	Baked margins (crystalline or granular)	indicates contact metamorphism, marble 2 = dyke or sill 1 = lava flow				
Processes	Size of margins	Indicates temperature of intrusion				

Sedimentary	Weathered surface on the igneous body	Indicates a lava flow			
Processes	Grain size	Energy levels in the depositional environment			
	Graphic log	Changes in energy levels/ environment			
	Sedimentary/ way up structures	Palaeocurrent directions			
	Fossils	Use uniformitarianism to reconstruct the palaeoenvironment			
	Porosity	Cementation during diagenesis			
Structural	Dip and strike of the sedimentary rocks	To determine post depositional stresses			
Processes	Joint orientation	To determine post depositional stresses			
History	Xenoliths/ included fragments	To enable relative dating to be done			
	Cross-cutting relationships	To enable relative dating to be done			
	Metamorphism	To enable relative dating to be done			

0	weeti	~ ~	Marking dataila			Marks A	vailable		
	uesti	on		A01	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	Scale (1) <b>R</b>		3		3	1	3
			<ul> <li>Any two x (1) from:</li> <li>Shape (hexagonal)</li> <li>Septum</li> <li>More than one corallite</li> </ul>						
		(ii)	Coral	1			1		
	(b)		Brachiopod	1			1		
	(c)		Photograph 2 shows graded bedding (1) Coarse material should be at the base therefore the rock unit has been overturned (1) Figure 6b shows laminated sediment which would originally have been at the bottom of the valve (1) These laminations are now on top of the empty space so the rock unit has been overturned. (1)		4		4		
			Question 6 total	2	7	0	9	1	3

Question	Marking details	Marks Available						
Question		AO1	AO2	AO3	Total	Maths	Prac	
7	Indicative Content Answers should make use of analysis of a balance of evidence using information from the three sources (Specimen A, Photograph 3 and Photograph 4) <b>Analysis and judgements using Photograph 3</b> Shale is the parent rock for Specimen A and Photograph 4 Shale contains a variety of minerals/ clay minerals The shale has been buried and subjected to regional metamorphism <b>Analysis and judgements using Specimen A</b> Specimen A is Schist. Crystalline and medium crystal size indicates heat Schistosity (credit foliation) indicates pressure Contains biotite mica, muscovite mica, quartz Has undergone medium grade regional metamorphism <b>Analysis and judgements using Photograph 4</b> Photograph 4 shows Gneiss Crystalline and coarse crystal size indicates heat Gneissose banding (credit light/dark layers) indicates pressure Contains quartz, feldspar, biotite mica and muscovite mica Has undergone high grade regional metamorphism. Gneiss has undergone more intense metamorphism than Schist			6	6			

Question	Marking details	Marks Available						
Question		AO1	AO2	AO3	Total	Maths	Prac	
	<ul> <li>5–6 marks There is a clear response which draws upon analysis of all of the sources of information (specimen A, photograph 3 and photograph 4). The answer must refer to both texture and mineralogy.Most or all of the sources of evidence are analysed coherently. Judgements regarding the processes involved in regional metamorphism are drawn that include reference to heat, pressure. All judgements are consistent with the information as analysed. There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant. </li> <li>3–4 marks The response draws upon analysis of a minimum of two of the three sources of information (specimen A, photograph 3 and photograph 4) and comments with relevance to the processes involved in regional metamorphism. Judgements regarding the intensity of metamorphism are made. 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 or minor errors. </li> </ul>							

Question	Marking details	Marks Available						
Question		AO1	AO2	AO3	Total	Maths	Prac	
	<ul> <li>1–2 marks The response makes use of one or two of the three sources of information (specimen A, photograph 3 and photograph 4) only with rather superficial comment. There may be a lack of relevance in places and judgements drawn concerning regional metamorphism are superficial, with simple comments on heat and pressure. 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	6	6	0	0	

Question			Marking details	Marks Available						
		חכ		AO1	AO2	AO3	Total	Maths	Prac	
8	(a)		SE (1)           NE (1)           NE (1)           NE (1)           Normal (1)           Thrust (1)		6		6		6	
	(b)		U/C correctly labelled (1) Correctly labelled antiform in bed D (1) Correctly labelled synform in bed B to NE of overturned dip symbol (1) (Credit one mark for both APTs correctly located but incorrectly labelled)	3			3		3	
			Question 8 total	3	6	0	9	0	9	

Question		Marking dataila	Marks Available						
Q	uestion		AO1	AO2	AO3	Total	Maths	Prac	
9	(a)	<ul> <li>The following points should appear on the cross-section</li> <li>Pluton discordant</li> <li>B/E Boundary at 30° towards Y next to Pluton</li> <li>F1 dipping at 80° towards Z</li> <li>Base of bed E drawn to show correct thickness of bed E between F1 and Pluton.</li> <li>Arrows on F1 downthrow towards Z</li> <li>B/E/D boundaries at 30° towards Y NE of F1</li> <li>Bed E dipping at 60° towards Y SW of the dyke</li> <li>Antiformal fold axis drawn bisecting the fold and correctly labelled.</li> <li>Dyke, correct location and discordant</li> <li>Base of G drawn horizontal</li> <li>Hidden beds B/E/D below U/C dipping towards Y at 30°</li> <li>Synformal fold axis drawn bisecting the fold and correctly labelled</li> <li>Any cross-cutting relationship shown above the ground surface.</li> </ul>		1 1 1 1 1 1	1 1 1 1	13	13	13	
	(b)	F youngest (1) G older than K (1) J older than G (1) B E D in correct order (1) D oldest (1) F2 younger than F1 (1) F2 older than G and younger than BED (1) Folding younger than BED and older than F1			8	8		8	
		Question 9 total	0	7	14	21	13	21	
		Paper Totals	21	48	36	105	20	65	

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