GCE A LEVEL MARKING SCHEME

SUMMER 2022

A LEVEL
GEOLOGY – COMPONENT 2
A480U20-1

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 2 - GEOLOGICAL PRINCIPLES AND PROCESSES

SUMMER 2022 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)		External energy source = solar (1) Internal energy source = radiogenic or primordial (1)	**2**			**2**		
	(b)	(i)	Correct positioning of: uplift in highest box (1) lithification in box leading into sedimentary rock (1) partial melting in one of the two boxes leading into magma (1)		**3**		**3**		**3**
		(ii)	**Maximum of three x (1) from:** • B more mature than A • B more rounded than A • B finer than A • B better sorted than A • B more quartz-rich than A **Any three x (1) from:** • B transported further than A • B undergone more erosion than A • B undergone more abrasion/attrition than A or vice versa on any point **To a maximum of 4 marks**		**4**		**4**		**4**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)	**Any two x (1) from:** • Porphyroblastic / crystalline • foliated • contains garnet		**2**		**2**		
		(ii)	**No mark for stating student is correct.** **Any two x (1) from:** • contains a mafic mineral • which is found in oceanic crust/ not found in continental crust • rocks formed at both Loc 1 and Loc 2 would have foliation			**2**	**2**		**2**
	(d)	(i)	0-200 km (1) Temperature increases most in the shortest depth (or equivalent) (1)	**2**			**2**	**2**	**2**
		(ii)	←**T** at 2900 km and ←**B** at 5250 km (1) Outer core is molten (1) Temperature exceeds the melting point (1)		**3**		**3**	**1**	**1**
			Question 1 total	**4**	**12**	**2**	**18**	**3**	**12**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)	10 cm s^{-1} (1) 1 cm s^{-1} (1)	**2**			**2**	**2**	**2**
		(ii)	**Any two x (1) from:** • need more energy to pick grain up / entrain • than to keep it in transport • need to overcome inertia to erode / pick up the grain • moving grain already has energy/momentum	**2**			**2**		
		(iii)	Erosion velocity curve above dashed curve throughout (1) Settling velocity curve above solid curve throughout (1)		**2**		**2**		**2**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)	**Any two x (1) from:** • as salinity increases settling velocity increases • non-linear • s-shaped curve • exemplar values	**2**			**2**		
		(ii)	**Any four x (1) from:** • flocculation • higher salinity water has dissolved positive ions • cancel/reduce the repulsive (negative) charge on the surface of clay particles • allows clay particles to group together • behave as larger particles/increase mass • clays settle out at higher velocities		**4**		**4**		
			Question 2 total	**6**	**6**	**0**	**12**	**2**	**4**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)	Cephalon (1) Genal spine (1)	**2**			**2**		
		(ii)	**No mark for stating student is most likely incorrect.** **Any three x (1) from:** • unlikely because eyes on top of body • unlikely because poorly developed glabella • unlikely because presence of genal spines • reference to role of few thoracic segments • reference to role of large pygidium • unlikely because flattened • credit reference to role of streamlined shape • possible because of small size • not sure as trilobites are extinct • correct explanation of one morphological adaption			**3**	**3**		
	(b)		**Any three x (1) from:** • bilateral symmetry • segmented body / thorax / thoracic segments • clear 'head / tail' • presence of 'cephalon' • axial region • flattened appearance • streamlined	**3**			**3**		
	(c)		**Any two x (1) from:** • sudden appearance • of 'hard parts' • and organisms such as trilobites, brachiopods etc. • increase in diversity/ number of species/ number of fossils		**2**		**2**		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(d)		**Indicative content** **Oxygen** Description: Increase in atmospheric oxygen content Explanation: Facilitated rise of carnivores – higher metabolic rates/ elaborate food webs/ defence strategies including hard parts/ increased rates of evolution/ evolution of new animal groups **Chemical weathering** Description: Increase in rate of chemical weathering Explanation: Released ions by oxidation etc/ used to develop first mineralised skeletons/ of calcite etc. Chemical weathering adds more nutrients to oceans allowing more metabolic processes/building bigger bodies **Glaciations - meteorite impacts** Description: Glaciations/ meteorite impacts led to mass extinctions Explanation: Rapid and dramatic environmental catastrophes allow for subsequent rapid diversification of life/ new recovery fauna/ innovation and development of new animal groups/ competition and selective processes following obliteration of previous ecosystems **5–6 marks** There is a clear response which describes all **three** of the prescribed aspects. Most or all of the evidence is interpreted competently. Salient explanations are provided for the effects of **at least two** of the prescribed aspects. *There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant.*			**6**	**6**		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
			3–4 marks There is a clear response which describes **at least two** of the prescribed aspects. Some of the evidence is interpreted coherently. Partial explanations are provided for the effects of **at least one** of the prescribed aspects. *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.* **1–2 marks** The response describes **at least one** of the prescribed aspects. The evidence is discussed with only rather superficial comment and there is a lack of relevance in places. Very limited/no explanations are provided. *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						
			Question 3 total	**5**	**2**	**9**	**16**	**0**	**0**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)		Pluton (1) **Any two x (1) from:** • large • circular outcrop pattern • discordant • metamorphic aureole	**3**			**3**		
	(b)		**Indicative content** **Phase 1** Deposition of fine-grained parent rock Low grade regional metamorphism Folding and NE-SW compression **Phase 2** Deposition of greywacke, shale, chalk, orthoquartzite Folding and N-S compression **Phase 3** Intrusion of pluton and contact metamorphism Thrust faulting and NE-SW compression **Phase 4** Uplift, erosion and unconformity Deposition of conglomerate Intrusion of dyke Present day weathering and erosion			**6**	**6**		**6**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
			5–6 marks There is a clear response which comprehensively describes **all four** phases of the geological history of the area in chronological order. Most or all the aspects on the map are interpreted competently. Igneous, sedimentary, metamorphic and structural processes are all included. *There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant.* **3–4 marks** The response which describes **at least three** phases of the geological history of the area in a reasonable chronological order. Some of the aspects on the map are interpreted coherently. Most of the igneous, sedimentary, metamorphic and structural processes are included. *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.* **1–2 marks** The response describes **just one or two** phases of the geological history of the area in a reasonable chronological order. Aspects on the map are discussed with only rather superficial comment and there is a lack of relevance in places. A few of the igneous, sedimentary, metamorphic and structural processes are included. *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						

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)	Values seen inserted into equation (1) Correct answer to any sig. fig. e.g. 543.5640536 (1) Correct answer to 3 sig. fig 543 Ma (1) (i.e. if correct answer to more than 3 sig figs = 2 marks max)		**3**		**3**	**3**	**3**
		(ii)	**Any three x (1) from:** • location 1 found at the edge of the pluton / closest to country rock / chilled margin • igneous body cooled/ solidified quicker at location 1 • blocking temperature achieved earlier at location 1 • radiometric 'clock' set earlier at location 1 • multiple injections of magma – younger intrusive episode at location 2		**3**		**3**		
			Question 4 total	**3**	**6**	**6**	**15**	**3**	**9**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)		**Any two x (1) from:** • ocean trench • island arc • earthquakes greater than 70km depth / deeper focus • reference to Benioff Zone / increasing depth from trench • Pacific Plate is moving towards the N. American Plate	**2**			**2**		
	(b)	(i)	**Any two x (1) from:** • increases towards the west • increases with age • use of exemplar values	**2**			**2**		
		(ii)	As ocean plate gets older towards the west it gets denser (1) Slab pull forces increase (1) **or** Where relative movement of plates is at 90 degrees to the plate margin = slow / faster where movement parallel to plate boundary / faster where no subduction (1) Because of possible increase in 'friction'. (1)		**2**		**2**		**2**
	(c)	(i)	Depth increasing towards Y (1) Line curving towards Y passing close to the bulk of foci (1)		**2**		**2**		
		(ii)	M→ at 70km depth just above the top of subducting plate (1) V→ at surface above M ±50 km (1)		**2**		**2**		**2**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
		(iii)	**Any three x (1) from:** • more silicic in east / less silicic in west • andesite/rhyolite in east or basalt/andesite in west • continental crust in east / oceanic crust in west • mafic primary magma • less likely to be contaminated during rise through oceanic crust / more likely to be contaminated during rise through continental crust • more assimilation through silicic continental crust • relevant discussion of fractional crystallisation / magmatic differentiation • (credit ref to older crust-thicker sediment-more silicic)		**3**		**3**		
	(d)		**Any two x (1) from:** • no/less subduction • oceanic crust moves parallel to trench • strike-slip fault (accept transform fault / conservative plate boundary / lateral movement)		**2**		**2**		**2**
			Question 5 total	**4**	**11**	**0**	**15**	**0**	**6**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	**Any three x (1) from:** • majority between the tropics • most between 30^{o}N and 30^{o}S of equator • shallow/coastal seas • majority temperatures > 20^{o}C • around mid-ocean islands • credit ref to geographical locations e.g. more on E of map	**3**			**3**		
		(ii)	Valid if principle of uniformitarianism holds (1) **Any one x (1) from:** • indicates that UK was in a tropical/southerly /lower latitude during the Silurian • limestones form in tropical conditions • corals form in tropical conditions • corals in Silurian may have tolerated different conditions • different climatic zones in Silurian compared to today • coral groups present in the Silurian may be extinct now			**2**	**2**		
	(b)	(i)	**Any two x (1) from:** • corals use dissolved carbonate ions (containing oxygen) in seawater • to secrete their skeleton of calcite/aragonite • $^{18}O/^{16}O$ in coral skeleton same as ancient seawater	**2**			**2**		
		(ii)	-3.63 to -3.67 (1) -4.05 to -4.12 (1)	**2**			**2**	**2**	**2**
		(iii)	Range of candidate values to (c) (ii), or the subtraction of the range (1) Range ÷ 0.18 (1) expect answer typically between 2^{o}C and 3^{o}C		**2**		**2**	**2**	**2**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(c)		**Any three x (1) from:** • ^{18}O heavier than ^{16}O • during evaporation of seawater ^{16}O evaporated more easily • in cooler climates (precipitation reduced) ^{16}O not returned to seawater / removed from area / less ^{16}O in seawater • hence $^{18}O/^{16}O$ in seawater increased • in warmer climates (precipitation increased) ^{16}O returned to seawater / more ^{16}O in seawater • hence $^{18}O/^{16}O$ in seawater decreased • $^{18}O/^{16}O$ decreased in coral skeletons from 1800-1990 thus seawater temperature increased			**3**	**3**		
			Question 6 total	**7**	**2**	**5**	**14**	**4**	**4**
			Paper Totals	**29**	**39**	**22**	**90**	**12**	**35**