GCE AS MARKING SCHEME

AUTUMN 2020

AS
GEOLOGY - COMPONENT 2
B480U20-1

INTRODUCTION

This marking scheme was used by WJEC for the 2020 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

AUTUMN 2020 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.

<table>
<tr><th colspan="3" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks Available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>
<table>
<tr><th></th><th>Mass (g)</th><th>Volume (cm^3)</th><th>Density</th></tr>
<tr><td>Earth</td><td>• 5.94x10^{27}</td><td>1.08 x 10^{27}</td><td>5.5</td></tr>
<tr><td>Basalt sample (oceanic crust)</td><td>58</td><td>• 20</td><td>2.9</td></tr>
<tr><td>Granite sample (continental crust)</td><td>135</td><td>50</td><td>• 2.7</td></tr>
</table>
</td><td></td><td>3</td><td></td><td>3</td><td>3</td><td>3</td></tr>
<tr><td></td><td>(b)</td><td></td><td>Layers below the Earth’s crust must be denser than crust (1)
Use of numbers in explanation (1)</td><td>2</td><td></td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>
<table>
<tr><th>Meteorite</th><th>Density</th><th>Type (stony, iron)</th></tr>
<tr><td>X</td><td>10.5</td><td>• Iron</td></tr>
<tr><td>Y</td><td>4.1</td><td>• Stony</td></tr>
</table>
</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Meteorite X labelled correctly (1)
Meteorite Y labelled correctly (1)</td><td></td><td>2</td><td></td><td>2</td><td>2</td><td>2</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>Any three x (1) from:
• meteorites formed at the same time as the Earth/ from the same material
• meteorites have similar composition to Earth
• meteorite X analogous with Earth’s core
• meteorite Y analogous with Earth’s mantle
• appropriate use of density and depth data</td><td>3</td><td></td><td></td><td>3</td><td></td><td></td></tr>
</table>

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(d)		**Seismic waves** **Any three x (1) from:** • wave speed depends on rock properties (1) • dependant on density, rigidity (+ incompressibility) (1) • slow down if rigidity decreases (1) • slow down if density increases (1) • slow down if incompressibility decreases (1) **Xenoliths** Description of formation (1) Evidence of mantle composition (1) Cannot be used to provide information about core (1) **Geomagnetism** Core generates magnetic field (1) Core composed of iron/ nickel (1) Outer core mobile (1) *Credit reference to magma/ lava composition*	3			3		
			Question 1 Total	**9**	**5**	**0**	**14**	**5**	**5**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)	475 (1) (accept 470-480)	1			1	1	1
		(ii)	20 – 5 = 15 (1) $\frac{15}{20}$ x 100 = 75% (1)		2		2	2	2
		(iii)	No evidence of mass extinctions (1) Decline is gradual (1) Mass extinctions are sudden (1)			3	3		
	(b)		*Didymograptus* – 6 (1) *Monograptus* – 7 (1) *Tetragraptus* – 2 (1)		3		3		3
	(c)		**Indicative content** Reference to law of superposition Use of graptolites to date beds Recognition that load cast is inverted Whole sequence inverted **5-6 marks** There is a clear response which refers to the law of superposition and fully describes the use of graptolites and the load cast to provide evidence against the statement *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 refers to the law of superposition and references either the graptolite evidence or load cast to provide evidence against the statement. *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 makes use of at least one of the law of superposition, the graptolite evidence or the load cast to provide evidence against or related to the statement *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 2 Total	**1**	**5**	**9**	**15**	**3**	**6**

<table>
<tr><th colspan="3" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks Available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td>3</td><td>(a)</td><td>(i)</td><td>Any three x (1) from:
• clastic/granular
• 0.5 – 1mm
• rounded/ subrounded
• well sorted</td><td>3</td><td></td><td></td><td>3</td><td></td><td>3</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Orthoquartzite (1)</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td>Plagioclase/ orthoclase/ feldspar (1)</td><td>1</td><td></td><td></td><td>1</td><td></td><td>1</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td><table><tr><th></th><th colspan="2">Sediment A</th><th colspan="2">Sediment B</th></tr><tr><th>Size (mm)</th><th>Percentage</th><th>Cumulative Percentage</th><th>Percentage</th><th>Cumulative Percentage</th></tr><tr><td>0.125 – 0.25</td><td>15</td><td>15</td><td>5</td><td>• 5</td></tr><tr><td>0.25 – 0.5</td><td>25</td><td>40</td><td>15</td><td>• 20</td></tr><tr><td>0.5 – 1</td><td>60</td><td>100</td><td>30</td><td>• 50</td></tr><tr><td>1 - 2</td><td>0</td><td>100</td><td>50</td><td>• 100</td></tr></table>All correct (1)</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>4 correct points (2)
3 correct points (1)
2 or 1 correct points (0)</td><td></td><td>2</td><td></td><td>2</td><td>2</td><td>2</td></tr>
</table>

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(c)		**Indicative content** Sediment A is finer grained Sediment A has a lower interquartile range and is therefore more well sorted Sediment A is more rounded Sediment A has been transported further/ longer Sediment A has undergone more attrition Sediment A has a higher percentage of quartz Sediment A has undergone more chemical decomposition Sediment A is more texturally mature Sediment A is more mineralogically mature **5-6 marks** The response fully describes and explains all textural aspects of maturity making full use of data provided linking processes of attrition into explanation. The response discusses that sediment A is more mineralogically mature discussing processes involved. *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 describes and explains two aspects of textural maturity with some description of the processes involved. The response may also discuss mineralogical maturity but lacks full explanation. *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.*			6	6		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
			1-2 marks The response discusses one aspect of textural maturity with a limited discussion of the processes involved. There may be no discussion of mineralogical maturity. *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	**6**	**2**	**6**	**14**	**2**	**6**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)	**Any 3 x (1) from:** • crystalline/interlocking crystals • 1.0 - 5.0mm • random orientation/non-foliated • anhedral/subhedral	**3**			**3**		
		(ii)	Gabbro (1)	1			1		
	(b)	(i)	Crystalline (1) Coarser than Fig 4c (1) Scale (1)	3			3	1	3
		(ii)	Metaquartzite (1)	1			1		
	(c)		**Any three x (1) from:** • high temperature • from intrusion • recrystallises sandstone • contact/thermal metamorphism		3		3		
	(d)		Rock **J** is crystalline/interlocking crystals therefore least permeable (1) Sandstone most permeable as less compact than mudstone/ Sandstone contains larger grains therefore has larger pores and higher permeability (1) Mudstone less permeable than sandstone as pores not interconnected and small/ mudstone made of platy minerals therefore less permeable (1) Low at point S due to new crystalline texture (1)		4		4		
			Question 4 Total	**8**	**7**	**0**	**15**	**1**	**6**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)		2 points plotted correctly (2) 1 point plotted correctly (1)	2			2	2	2
	(b)	(i)	Depth increases with increasing distance from plate boundary/ positive correlation (1) Correct use of numbers (1)	2			2	2	2
		(ii)	Subduction to the east (1) **Any two x (1) from:** • away from trench/ point of contact between plates • building and release of pressure due to friction • Brittle failure of subducting plate		3		3		
	(c)		**Any two x (1) from:** • plate deforms in a ductile manner • due to increase in temperature • slate unable to fracture	2			2		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)	Named hazard (1) (lava flow, pyroclastic flow, lahar, ash, gas) **Any two x (1) for the named hazard only** *Lava Flow* • slow-moving viscous lava • high temperature *Pyroclastic Flow* • very fast (use of sensible numbers) • density current of hot ash and gas • can flow on water *Lahar* • ash mud flow • confined to valleys • mixture of ash and water • highly erosive *Ash* • very fine crystalline texture • can travel large distances • cause respiratory problems • if mixed with water can cause structural damage and lahars *Gas* • cause suffocation • named gas (CO_2/ SO_2) • denser than air *Credit other sensible examples*		3		3		

		(ii)	Named monitoring technique (1) (EDM, tiltmeter, gas emissions, seismic activity, gravity anomalies, thermal anomalies) **Any two x (1) from:** *Electronic distance measurement* • laser fired from known location • reflector in known location • distance calculated using time for reflection and speed of light • monitoring difference in distance (larger/ smaller) *Tiltmeter* • similar to a spirit level • electrodes sense position of bubble • recorded on data logger • monitoring difference in tilt (larger/ smaller) *Gas Emissions* • correlation spectrometry/COSPEC • named gas (CO_2/SO_2) • measures differences in concentration of gas in plume/ fumaroles *Seismic Activity* • fractures caused by magma movement • used to track progress of magma underground • can be used to estimate size of magma reservoirs *Gravity Anomalies* • magma adds mass to the crust • rising magma locally increases force of gravity • can be used to estimate size of magma reservoirs *Thermal Anomalies* • infra-red imagery for temperature changes • can image magma rising beneath the surface • can detect hot gases being released from vents/fumaroles *Credit other sensible examples*	3			3		
			Question 5 Total	**9**	**6**	**0**	**15**	**4**	**4**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	Any 2 bedding planes drawn correctly (1)		1		1		
		(ii)	Graded bedding (1) **Any two x (1) from:** • deposition from a waning/slowing current • reduction in energy • correct link between energy and grain size	3			3		
		(iii)	Graded beds the correct way up (1) Oldest beds in the centre/ core of anticline (1)		2		2		
		(iv)	**Any four x (1) from:** • axes trend North-South • asymmetrical • angular hinges • limbs of equal dip • dip angles of approx. 50° • vertical fold axes • wavelength 1.2km (accept 1.1-1.3km) • amplitude 500m (accept 475-525m)	4			4		
	(b)		Establish true dip direction (1) Measure dip angle with clinometer (1) Measure strike orientation with compass (1) ***Max 2 with no diagram***			3	3		3

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(c)		Folding formed by east-west compression (1) Footwall of fault downthrown/ hanging wall upthrown (1) Fault is normal (1) Fault formed by tension/ extension (1)		4		4		
			Question 6 Total	**7**	**7**	**3**	**17**	**0**	**3**
			Paper Totals	**40**	**32**	**18**	**90**	**15**	**30**