

GCE

Geology

H014/01: Geology

AS Level

Mark Scheme for June 2022

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

© OCR 2022

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal <http://www.rm.com/support/ca>
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **number of required** standardisation responses.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the RM Assessor messaging system, or by email.
5. **Crossed Out Responses**
Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple Choice Question Responses

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth **two or more marks**)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add a tick to confirm that the work has been seen.
7. There is a NR (No Response) option. Award NR (No Response)
 - if there is nothing written at all in the answer space
 - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')

- OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
If you have any questions or comments for your team leader, use the phone, the RM Assessor messaging system, or e-mail.
9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.
10. For answers marked by levels of response:
Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.

Once the level is located, award the higher or lower mark:

The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.

The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

In summary:

The skills and science content determines the level.

















The communication statement determines the mark within a level.

Level of response questions on this paper are **22(a)** and **24(a)**.

11. Annotations

Annotation	Meaning
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
()	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

Marking Annotations

Annotation	Use
	Benefit of Doubt
	Contradiction
	Cross
	Error Carried Forward
	Given Mark
	Extendable horizontal wavy line (to indicate errors / incorrect science terminology)
	Ignore
	Large dot (various uses as defined in mark scheme)
	Highlight (various uses as defined in mark scheme)
	Benefit of the doubt not given
	Tick
	Omission Mark
	Blank Page
	Level 1 answer in Level of Response question
	Level 2 answer in Level of Response question
	Level 3 answer in Level of Response question

Subject-specific Marking Instructions

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

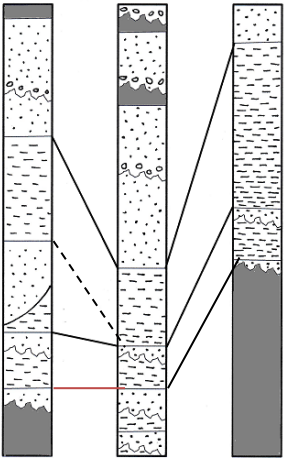
Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

Question		Answer	Mark	Guidance	AO
1		B ✓	1	3	1.1a
2		C ✓	1	quartz, topaz, corundum	2.1b
3		B ✓	1	feldspar and quartz	1.1a
4		A ✓	1	it must be an inorganic compound	1.1c
5		A ✓	1	crust and upper mantle	1.1a
6		A ✓	1	gcm^{-3}	1.1b
7		C ✓	1	Granite	2.1a
8		B ✓	1	Equicrystalline	1.1a
9		A ✓	1	Colour	2.1b
10		B ✓	1	Lead	1.1c
11		D ✓	1	67	2.1a
12		C ✓	1	Moho and Gutenberg	1.1c
13		C ✓	1	2.0Ga	2.1a
14		C ✓	1	X and Y are joined between 400 and 100 Ma ago	2.1a
15		A ✓	1	Desert environments	2.1a
16		D ✓	1	Sieves not in the correct order	2.1b
17		B ✓	1	Extrusion	2.1a
18		A ✓	1	Ice	2.1a
19		A ✓	1	Deposition of microfossils below the carbonate compensation depth (CCD)	1.1a
20		A ✓	1	Collapse of nebula, increased rate of rotation, formation of a star, formation of planetesimals	2.1a

Question			Answer	Mark	Guidance	AO
21	(a)	(i)	<p>4 bed thicknesses plotted correctly (0.5, 0.7, 4.3, 6.1, 6.7 m) ✓</p> <p>4 grain sizes marked in correctly</p> <p>ALLOW sands and silts as vertical lines on the coarse limits ✓</p> <p>Fining-upwards beds drawn in as curves or straight lines between the coarse and fine limits as shown ✓</p> <p>Top of mudstone bed OR base of pebbly bed drawn as a wavy line ✓</p>	4		1.1a 2.1a 3.1a 1.1b
		(ii)	<p>beds decorated and structures identified alongside key boxes ✓</p> <p>rootlets drawn recognisably and labelled in key ✓</p>	2	ALLOW one error	2.1a 1.1a
(b)	(i)	<p>Environment fluvial/river/meandering river ✓</p> <p>Explanation ANY two from: fining upwards sequence ✓ presence of rootlets means plants grew ✓ only grow in air thus continental/fluvial ✓ presence of thin bed of coarser clasts/pebbles/cobbles/granules ✓ found in channel lag deposits of rivers ✓</p>	Max 3	<p>ALLOW continental ALLOW delta</p> <p>ALLOW presence of imbricate structures</p> <p>Max one mark ecf if desert or alluvial fan environment given with explanation</p>	3.1a 3.1b	

		(ii)	formed by a <u>meandering</u> river ✓ erosion on the outer edge of the bend ✓ deposition on the inner edge of the bend ✓ causes meander to migrate (downriver and laterally) ✓ sorting sediment into coarse and fine based on energy ✓ channel lag clasts at the deepest/fastest flowing part of the channel ✓ the moving point bar creates cross bedding ✓ overlain by finer sands and silts as channel infills ✓ cross bedding created by ripples/dunes on the river bed ✓ mud is laid down as flood plain deposits ✓	Max 4	ALLOW a very large river system ALLOW prograding and retrograding delta ecf Max one mark for description of dune sand or waddi conglomerate formation	1.1a 1.1c 2.1a
	(c)	(i)	conglomerate;	1		1.1a
		(ii)	paleo-current direction OR unidirectional current;	1	ALLOW current direction ALLOW high energy ALLOW river channel	1.1c
		(iii)	rootlets are in the <u>top</u> of the bed OR fining upwards beds OR graded bedding correct way up;	1	ALLOW explanation based on attitude of cross bedding	2.1a
	(d)	(i)	quartz;	1	DO NOT ALLOW answers with more than one mineral	2.1a
		(ii)	clays;	1	DO NOT ALLOW answers with more than one mineral	2.1a
			Total	18		

Question		Answer	Mark	Guidance	AO
22	(a)	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 5 – 6 marks Has a logical order of depositional and structural events with relevant detail explaining conclusions.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated</i></p> <p>Level 2 3 – 4 marks The order of events is presented correctly but with little explanatory detail.</p> <p><i>There is a line of reasoning with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 1 – 2 marks The order of events is not always logical (e.g. fails to see evidence of overturning) and lacks evidence showing understanding of conditions.</p> <p><i>There is an attempt at a logical structure with a line of reasoning. The information is, in the most part, relevant.</i></p> <p><i>No response or no response worthy of credit 0 marks.</i></p>	6	<p>Indicative content may include from oldest to youngest:</p> <p>Shale, limestone, (shale), limestone deposited – evidence by the law of superposition; Uplift and erosion; Unconformity Deposition of sandstone – evidence of included limestone fragments; Deposition of graded beds; Intrusion of sill – evidence that it contains clasts from beds above and below and is dolerite; Intrusion of sill could be anytime after the limestone but before the second unconformity; Severe folding leading to inversion of the succession – evidence inverted graded bedding, included fragments and tilt of beds; Uplift and erosion forming unconformity – evidence difference in dip and uneven surface; Deposition of wind-blown sands – evidence of large-scale cross bedding (also right way up); Formation of present day surface by erosion and possible soil horizon;</p> <p>An order of deposition should ALLOW for the ecf resulting from failing to understand the inversion of the succession. Results in: graded beds, sandstone with fragments, limestone, sandstone, limestone, shale. Sill must come after the deposition of the beds above and below it.</p>	<p>2.1a</p> <p>3.1a</p> <p>3.1b</p> <p>3.1 d</p> <p>3.1e</p>

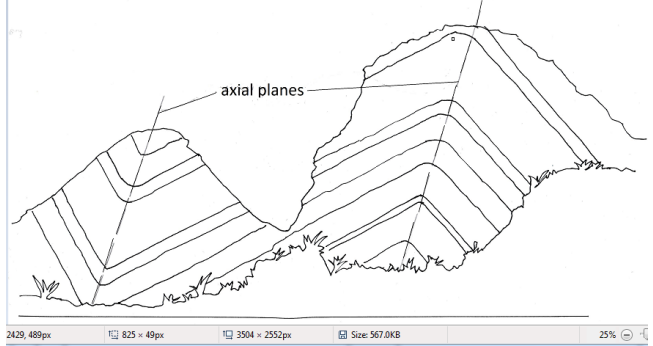
	(b)	(i)	two lines joining similar beds of the three logs ✓✓	2	<p>DO NOT ALLOW any crossing correlation Must be a line at the top and bottom of the bed for a mark.</p> 	2.1b 3.1b 3.1c
		(ii)	there is often lateral variation OR bed thickness changes with distance from the source OR different rates of deposition/erosion/subsidence/transgression/regression ✓	1		1.1c
		(iii)	<p>Example: changing sea-level/transgression/regression acting on coastal deposits OR lateral migration in fluvial environments OR prograding and retrograding delta ✓</p> <p>Explanation: diachronous beds change in age with distance/lateral extent OR diachronous beds linked to Walther's law ✓ as a result of deposition or erosion shifting ✓</p>	3	<p>ALLOW delta as explanation</p>	1.1a 1.1c
	(c)	(i)	<p>Species: F ✓</p> <p>Explanation: it has the shortest stratigraphic range ✓</p>	2	ALLOW AW	1.1c 2.1a

		(ii)	199.834 ✓ (to) 199.750Ma ✓	2	ALLOW 1 mark for 834-750 OR 750-834 ka ALLOW 'from' and 'to' reversed Max one if both correct but only to 2 d.p.	2.1a 2.1b
		(iii)	unconformity / unconformable / disconformity ✓	1	ACCEPT erosion/non-deposition surface	3.1b
		(iv)	they evolved rapidly so have short stratigraphic ranges ✓ they were numerous so are more easily found ✓ they were nektonic/free-swimming so are found widely distributed ✓ they have strong, hard shells enabling common preservation ✓ easily identifiable with obvious differences ✓ found in different rock types OR independent of facies ✓	Max 3	Max one mark for 2 correct statements with no explanation	1.1a 1.1c
			Total	20		

Question			Answer	Mark	Guidance	AO
23	(a)	(i)	axes correctly assigned and labelled ✓ smooth curve joining points ✓ 20 or more points plotted correctly ✓	3	DO NOT ALLOW distance on y axis 	2.1b
		(ii)	0 metres sample is close to the (western) margin/edge of the granite ✓ 525 m sample is approaching/ close to the (eastern) margin/edge ✓ 50 to 225m not close to margin/edge ✓ roof/upper surface of the intrusion is asymmetrical/uneven ✓ roof/upper surface is lower at 325m ✓ country rock is weaker at 325m/ releases more xenoliths ✓	Max 3		3.1b 3.1d 3.1e
	(b)		8 samples have nothing to measure OR could pay more attention to the rapidly changing areas ✓ stratified sampling ✓	2		3.1c 3.1f

	(c)	<p>weaknesses/jointing/faulting in the country rock could provide more xenoliths/move the margin ✓</p> <p>structures in the country rock could result in larger xenoliths which would affect the results ✓</p> <p>larger xenoliths will survive longer and could be found further from the margins ✓</p> <p>composition of the country rock could result in slower or more rapid assimilation of xenoliths ✓</p> <p>composition/temperature of the granite magma affects the melting of the xenoliths ✓</p> <p>density/viscosity of the magma may vary ✓</p>	Max 2		2.1a 1.1c
	(d)	all readings are rounded to the nearest 5% ✓	1		3.1c
		Total	11		

Question		Answer	Mark	Guidance	AO
24	(a)	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 5 – 6 marks Has a logical order of steps to measure and record dip and strike of bedding. The purpose or aim of each step is given.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated</i></p> <p>Level 2 3 – 4 marks The steps described would produce a dip and strike of bedding but with little explanation.</p> <p><i>There is a line of reasoning with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 1 – 2 marks The steps described would only give dip or strike and there is little evidence that the process is understood.</p> <p><i>There is an attempt at a logical structure with a line of reasoning. The information is, in the most part, relevant.</i></p> <p><i>No response or no response worthy of credit 0 marks.</i></p>	6	<p>Indicative scientific points could include the following steps and explanation:</p> <p>Select a bedding plane exposed in 3D. Explain that only apparent dip is measurable on some quarried faces. Ensure safe working. Set the compass into clinometer mode so that a horizontal strike line can be found on the plane. Mark the line and use the compass in a horizontal position to measure the direction of the strike. Right-hand-rule with thumb down the dip is usual but ALLOW left-hand-rule. Record strike direction as 3 figures so that it cannot be confused with dip readings. Put compass into clinometer mode to measure the dip. Must be at right angles to the strike line as this is the true/maximum dip. Record dip (degrees) as 2 figures so that it cannot be confused with strike readings. Repeat for accuracy.</p> <p>ALLOW diagrams as text</p>	1.1b 1.1d

	(b)	(i)	two parallel labelled lines through the hinges of the folds ✓	1		2.1a
		(ii)	28 +/- 4° AND 48 +/- 4° ✓✓	2		2.1b
		(iii)	the diagram is two-dimensional ✓ there is no 3D surface to find the true dip ✓ the quarried outcrop is a 2D section through the rocks ✓ the (apparent) dip may not be 90° to the strike ✓ the bedding plane cannot be seen ✓	Max 1		1.1c
		(iv)	antiformal / anticlinal ✓ asymmetric OR inclined (axial plane) ✓ open ✓	Max 2		1.1a 1.1c
		(v)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 20 (%) award 2 marks (length of bed – length of folded bed) / length of bed ✓ = 22 +/- 3 % ✓	2		2.1b
	(c)	(i)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 72° award 2 marks 72° ✓✓	2	Max one mark if answer not whole number If incorrect answer then Max one mark for correct totals in x x f column	3.1a

	<p>(ii) ANY two from: mean cleavage dip and axial plane folding have similar dips ✓ they could have been the result of the same stresses ✓ competent beds fold under compression ✓ incompetent beds may form cleavage under compression ✓ slates are older so would have been affected by the same stress field as folded beds ✓</p>	<p>Max 2</p>		<p>2.1a 3.1a</p>																																																																																										
	<p>(iii) FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 2.1 award 3 marks</p> <table border="1" data-bbox="376 534 952 970"> <thead> <tr> <th>Dip (x degrees)</th> <th>Frequency (f)</th> <th>(x . f)</th> <th>x - mean</th> <th>(x - mean)²</th> <th>f. (x-mean)²</th> </tr> </thead> <tbody> <tr><td>67</td><td>0</td><td>0</td><td>-5</td><td>25</td><td>0</td></tr> <tr><td>68</td><td>1</td><td>68</td><td>-4</td><td>16</td><td>16</td></tr> <tr><td>69</td><td>2</td><td>138</td><td>-3</td><td>9</td><td>18</td></tr> <tr><td>70</td><td>4</td><td>280</td><td>-2</td><td>4</td><td>16</td></tr> <tr><td>71</td><td>5</td><td>355</td><td>-1</td><td>1</td><td>5</td></tr> <tr><td>72</td><td>7</td><td>504</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>73</td><td>4</td><td>292</td><td>1</td><td>1</td><td>4</td></tr> <tr><td>74</td><td>3</td><td>222</td><td>2</td><td>4</td><td>12</td></tr> <tr><td>75</td><td>1</td><td>75</td><td>3</td><td>9</td><td>9</td></tr> <tr><td>76</td><td>0</td><td>0</td><td>4</td><td>16</td><td>0</td></tr> <tr><td>77</td><td>2</td><td>154</td><td>5</td><td>25</td><td>50</td></tr> <tr><td>(Σ) totals =</td><td>29</td><td>2088</td><td>0</td><td>110</td><td>130</td></tr> <tr><td>mean =</td><td></td><td>72</td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td>std devn =</td><td></td><td>2.12</td></tr> </tbody> </table> <p>1.982 / 1.98 / 2.0 ✓✓✓</p>	Dip (x degrees)	Frequency (f)	(x . f)	x - mean	(x - mean) ²	f. (x-mean) ²	67	0	0	-5	25	0	68	1	68	-4	16	16	69	2	138	-3	9	18	70	4	280	-2	4	16	71	5	355	-1	1	5	72	7	504	0	0	0	73	4	292	1	1	4	74	3	222	2	4	12	75	1	75	3	9	9	76	0	0	4	16	0	77	2	154	5	25	50	(Σ) totals =	29	2088	0	110	130	mean =		72							std devn =		2.12	<p>3</p>	<p>ALLOW 2.155 / 2.15 / 2.2 ALLOW ecf from mean calculation ALLOW 2 marks for correct answer to incorrect significant figures ALLOW max 1 mark for any of the two right hand columns being correct ALLOW answer written in table</p>	<p>3.1a</p>
Dip (x degrees)	Frequency (f)	(x . f)	x - mean	(x - mean) ²	f. (x-mean) ²																																																																																									
67	0	0	-5	25	0																																																																																									
68	1	68	-4	16	16																																																																																									
69	2	138	-3	9	18																																																																																									
70	4	280	-2	4	16																																																																																									
71	5	355	-1	1	5																																																																																									
72	7	504	0	0	0																																																																																									
73	4	292	1	1	4																																																																																									
74	3	222	2	4	12																																																																																									
75	1	75	3	9	9																																																																																									
76	0	0	4	16	0																																																																																									
77	2	154	5	25	50																																																																																									
(Σ) totals =	29	2088	0	110	130																																																																																									
mean =		72																																																																																												
			std devn =		2.12																																																																																									
	<p>(iv) The standard deviation suggests there is a 1.98° degree of uncertainty ✓ standard deviation suggests that 68(.3) % of readings will be within 2° of the mean OR 95(.4) % of readings will be within 4° of the mean OR 99(.7) % of readings will be within 6° of the mean ✓ clinometer can only be read to one degree at best ✓ there will be additional practical / geological errors ✓ 2° is reasonably accurate ✓</p>	<p>Max 2</p>	<p>ecf from (iii)</p>	<p>3.1b 3.1c</p>																																																																																										
<p>Total</p>		<p>23</p>																																																																																												

Question			Answer	Mark	Guidance	AO
25	(a)	(i)	erosion (at rates of mm/a OR km/Ma) ✓ there will be uplift ✓ subsidence as thicker crust sinks into the mantle ✓ formation of a 'root' beneath mountains ✓ mantle moves away to allow crust to sink ✓ lower density crust in root floats / compensates for extra mass in mountain ✓ isostasy OR isostatic equilibrium ✓	Max 3		1.1a 1.1c
		(ii)	gravity anomalies ✓ low density 'root' means lower gravitational attraction than expected ✓ large anomalies where crust is <i>out</i> of equilibrium ✓ e.g. after load caused by ice sheet has been removed OR after erosion large negative anomaly ✓ isostatic rebound associated with negative anomaly ✓	Max 2		2.1a
		(iii)	lithosphere is rigid / brittle ✓ asthenosphere is able to flow / is a rheid (solid) / 5% partially molten / slowly deforms to move away when the crust is loaded OR to move back when the load is removed ✓	2	DO NOT ALLOW semi molten ALLOW plastic	2.1a
	(b)		magnetic field acts as if created by a geodynamo / self-exciting-dynamo ✓ core must be composed of iron OR nickel ✓ needs convection in a rotating fluid ✓ this needs a solid inner core OR the outer core is a liquid ✓	Max 2		
			Total	9		

Question			Answer	Mark	Guidance	AO
26	(a)	(i)	<p>oceanic lithosphere moves apart at the ridge OR sea floor spreads at the MOR OR new crust created at the MOR ✓</p> <p>this allows magma to escape to the seabed ✓</p> <p>it forms pillow lavas (and sheeted dykes) ✓</p> <p>as these cool (through the Curie temperature) they acquire a permanent magnetization in the direction of the geomagnetic field at that time ✓</p> <p>magnetic minerals / magnetite is magnetised ✓</p> <p>the geomagnetic field undergoes reversals ✓</p> <p>the result is that strips of ocean floor spread apart magnetised in opposite directions ✓</p> <p>those magnetised in the same direction as today give positive magnetic anomalies OR those magnetised in the opposite direction to today's field show as negative anomalies ✓</p>	Max 4	AW flips / switches	1.1a 1.1c
		(ii)	<p>can be dated by radiometric dating of the rock ✓</p> <p>distance of the known anomalies gives the spreading rate ✓</p> <p>spreading rate can be used to give an age ✓</p> <p>spreading in several oceans is used to check the results ✓</p>	Max 2		2.1a
		(iii)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 2520 (km) award 2 marks</p> <p>distance between SJ and L - distance between 60 Ma isochrons OR use distances on sketch and convert using scale after subtraction</p> <p>3870 – 1350 ✓</p> <p>= 2520 +/- 60 km ✓</p>	2	ALLOW 1 mark for correct method used if answer incorrect	2.1a 2.1b

	(iv)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 1.1 (cm a⁻¹) award 2 marks</p> <p>distance between 20 and 80 Ma isochrons = 650 +/- 50 km Divide by 60 Ma = 10.8 km Ma⁻¹</p> <p>650 / 60 = 10.8 km Ma⁻¹ ✓</p> <p>Convert to cm a⁻¹ = 1.1 ✓</p> <p>1.1 (+/- 0.1) (cm a⁻¹)</p>	2	<p>ALLOW 1 mark for correct method used if answer incorrect</p> <p>ALLOW 1.11 (cm a⁻¹)</p>	2.1a 2.1b
	(v)	they are the same ✓	1	ALLOW two distances measured differing by a mm so east or west can be 0.05 cm a ⁻¹ faster	3.1a
	(vi)	<p>the plates rotate about a pole to the north ✓</p> <p>the MOR/spreading ends/starts further north ✓</p> <p>separation is zero at the pole and maximum 90° from it: due to rigid plates moving on a sphere ✓</p>	Max 1		1.1c
(b)	(i)	<p>a pair of the animals must have swum the ocean ✓</p> <p>a pair of the animals must have drifted across on floating debris ✓</p> <p>the fertilised eggs of the animals may have been carried by ocean currents ✓</p> <p>the animals may have island-hopped on islands ✓</p> <p>the animals may have crossed on a land bridge - ✓</p> <p>these animals evolved to the same species on two different continents at the same time by chance ✓</p> <p>the animals migrated over ice sheets ✓</p>	Max 1		1.1a
	(ii)	<p>freshwater reptiles cannot swim that distance in salt water ✓</p> <p>eggs were laid on land so could not travel by sea ✓</p> <p>these reptiles are unlikely to survive a long sea voyage ✓</p> <p>they are not land animals so crossing a land bridge is unlikely ✓</p> <p>they could have used coastal waters of islands or the land bridge if only they existed ✓</p> <p>the same species cannot evolve twice / separately ✓</p>	Max 2		1.1c 2.1a

	(c)	<p>ANY four from: uniformitarianism / past processes can be interpreted by present-day processes; assumes that the distribution of climate by latitude has held over geological time ✓ e.g. that coal is deposited in equatorial conditions and latitudes ✓ e.g. that desert sandstones are produced in the tropical latitude dry zones ✓ e.g. evaporites can indicate tropical latitude dry zones ✓ if coal found in present-day UK latitude, the plate must have moved north ✓ if glacial evidence / tillites found on widely dispersed (same age) rocks of the southern continents ✓ then they must originally have been in contact to make a realistically sized ice cap ✓ regions showing similar climate evidence in rocks of the same age may once have been adjacent ✓ fossils (<i>Glossopteris</i>) can indicate the environment ✓</p>	Max 4		2.1a 3.1b
		Total	19		

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on

01223 553998

Alternatively, you can email us on

support@ocr.org.uk

For more information visit



ocr.org.uk/qualifications/resource-finder



ocr.org.uk



Twitter/ocrexams



/ocrexams



/company/ocr



/ocrexams



CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT

OCR is part of Cambridge University Press & Assessment, a department of the University of Cambridge.

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored. © OCR 2022 Oxford Cambridge and RSA Examinations is a Company Limited by Guarantee. Registered in England. Registered office The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA.

Registered company number 3484466. OCR is an exempt charity.

OCR operates academic and vocational qualifications regulated by Ofqual, Qualifications Wales and CCEA as listed in their qualifications registers including A Levels, GCSEs, Cambridge Technicals and Cambridge Nationals.

OCR provides resources to help you deliver our qualifications. These resources do not represent any particular teaching method we expect you to use. We update our resources regularly and aim to make sure content is accurate but please check the OCR website so that you have the most up-to-date version. OCR cannot be held responsible for any errors or omissions in these resources.

Though we make every effort to check our resources, there may be contradictions between published support and the specification, so it is important that you always use information in the latest specification. We indicate any specification changes within the document itself, change the version number and provide a summary of the changes. If you do notice a discrepancy between the specification and a resource, please [contact us](#).

Whether you already offer OCR qualifications, are new to OCR or are thinking about switching, you can request more information using our [Expression of Interest form](#).

Please [get in touch](#) if you want to discuss the accessibility of resources we offer to support you in delivering our qualifications.