GCE

Geology

H014/01: Geology

AS Level

Mark Scheme for June 2023

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.

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 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.

3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **required number** of 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 50% 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, email or via the RM Assessor messaging system.

5. Work crossed out:

   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. Award No Response (NR) if:

- there is nothing written in the answer space

Award Zero '0' if:

- anything is written in the answer space and is not worthy of credit (this includes text and symbols).

Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

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 email.

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 **24(a)** and **25(e)(ii).**

11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore
	Blank page

12. Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

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

13. **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	Marks	AO element	Guidance
1			**A** - Augite	1	2.1a	
2			**C** - frameworks	1	2.1a	
3			**B** – Baked margins	1	1.1c	Although crystal size can be helpful – it is not specific
4			**D**- sill	1	2.1a	
5			**B** - Q R S U T P V W	1	2.1b	
6			**B** - dyke	1	2.1a	
7			**D -** 70% Plagioclase, Pyroxene + Hornblende + Biotite 30%, coarse crystals	1	1.1a	
8			**B** - the composition of chondrites	1	2.1a	
9			B - the Moon has no plate tectonism	1	2.1a	
10			**B** - 28 s	1	2.1b	
11			**C** – Magnetism can be preserved in mafic rocks	1	2.1a	
12			**A** - Cephalopods	1	1.1c	
13			**A** - deep water carbonate seas	1	2.1a	
14			B - fold mountains	1	1.1a	
15			**D** - the 'roots' are deeper than needed for isostatic compensation	1	2.1a	
16			C - rheid	1	1.1c	
17			**B**	1	1.1a	
18			C - 25 $^{o}C\ km^{-1}$	1	2.1b	
19			**A** – there is only partial melting in the mantle	1	1.1c	
20			B – Mid-ocean ridges are always mid-ocean due to the spreading process	1	1.1c	

Question			Answer	Marks	AO element	Guidance
21	(a)	(i)	**Any two from:** Buried in (fine) sediment✓ (Unstable) aragonite will break down / recrystalised✓ To be replaced by (more stable) calcite✓ Replaced / substituted atom by atom✓ Preserved as casts and moulds✓	2	1.1c	**ALLOW** replacement by any other mineral including silica / Si **OR** (iron) pyrite / FeS_2
21	(a)	(ii)	Ribs / crenulations on valve margin / thick shell labelled✓	1	3.1a	**ALLOW** labelling of dentition / teeth and sockets **OR** (adductor) muscle scars as evidence that the organism needed a strong shell to survive in energetic conditions Labels do **NOT** have to use specific feature names – **ALLOW** descriptive labels
21	(a)	(iii)	There is an abundance of sediment / rapid burial / rapid deposition✓	1	3.1b	
21	(a)	(iv)	(Preservation potential is) high / good✓ The fossil is robust / strong / hard / made of stable calcite / has few delicate features✓	2	2.1a 3.1b	
21	(a)	(v)	**Any three from:** Energy levels – high energy will fragment / disarticulate / break up organism before fossilisation **ORA**✓ Rapidity of burial – increases the chance that whole body fossils will be preserved. Protects from environment and scavengers **ORA**✓	3	1.1a	**DO NOT ALLOW** presence of hard parts is excluded as not an 'external' factor Each factor must have an indication of how it affects preservation potential for mark **ALLOW** alternative wording for these factors

Question			Answer	Marks	AO element	Guidance
			Oxygen levels – high levels will encourage bacterial decay / decomposition and destruction by scavengers **ORA**✓ Sediment grain size – Fine sediment will preserve detail / means lower energy / excludes oxygen more effectively **ORA**✓ Distance of transport – greater transport likely to destroy / damage the shell✓ pH of the environment / water – determines the rate of dissolution✓ Temperature of the environment – low temperature slows down biological activity / decomposition / scavenging ORA✓ Carbonate Compensation Depth – only preserved above the CCD / dissolved below CCD✓ Early diagenesis – making the organism into a resistant rock-like material before it can be affected by destructive processes **ORA**✓ Compaction / metamorphism / diagenesis / erosion – processes will distort or destroy the fossil **ORA**✓			**ALLOW** MAX 1 if 3 correct statements but no valid explanation
	(a)	**(vi)**	**Any two from:** Organisms with high preservation potential will dominate the fossil record **ORA**✓ Organisms living in environments with good preservation conditions will dominate the fossil record **ORA**✓ Organisms with hard parts will dominate the fossils record **ORA**✓	**2**	**2.1b**	**ALLOW** use of appropriate examples to illustrate e.g. robust shells or low-energy conditions

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td></td><td></td><td></td><td>Biased / not a true reflection of the whole ecosystem✓</td><td></td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td><table><tr><th></th><th>Class or phylum</th></tr><tr><td>A</td><td>Bivalve OR Mollusc</td></tr><tr><td>B</td><td>Coral OR Cnidaria</td></tr><tr><td>C</td><td>(Articulate) Brachiopod</td></tr><tr><td>D</td><td>Trilobite OR Arthropod</td></tr><tr><td>E</td><td>Cephalopod OR Mollusc</td></tr></table></td><td>2</td><td>1.1a</td><td>4 or 5 correct for 2 marks
2 to 3 correct for 1 mark

ALLOW Anthozoa / rugose for B

DO NOT ALLOW generic or specific names

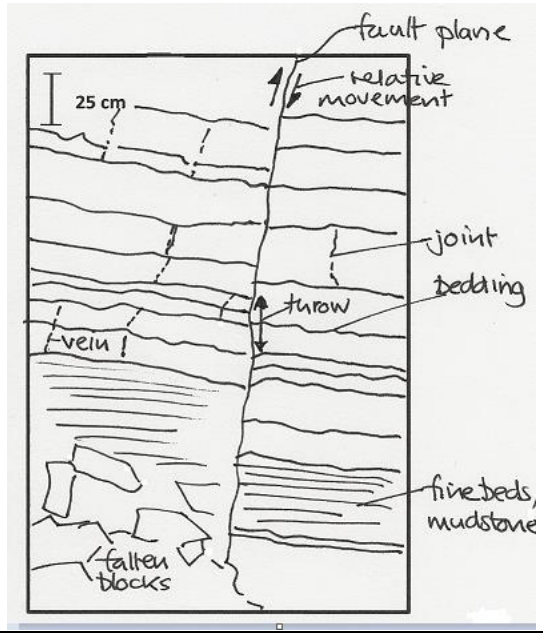
ALLOW ammonite / ammonoid for E</td></tr>
<tr><td></td><td>(b)</td><td>(ii)</td><td>D ✓

Palaeozoic✓</td><td>2</td><td>1.1a</td><td>ALLOW Trilobite</td></tr>
<tr><td></td><td>(b)</td><td>(iii)</td><td>Any two from:
Biostratigraphy OR use of zone fossils ✓

There were major extinction events at the era boundaries✓

Permo-Triassic (P-T / Permian) boundary extinction✓

Cretaceous – Palaeogene (K-T) boundary extinction✓</td><td>2</td><td>1.1c</td><td></td></tr>
</table>

Question			Answer	Mark	AO element	Guidance
22	(a)		Clear sketch illustrating fault movement✓ **Any two from:** Bedding ✓ joint✓ fault (plane)✓ hanging wall / footwall✓ thickness of beds✓ relative movement on fault plane✓ upthrown / downthrown block✓ (mineral) vein✓	**3**	**1x 2.1b** **2x 3.1b**	
22	(b)		Throw correctly indicated on sketch or photo✓ 25 +/- 3cm✓	**2**	**2.1b**	Must be vertical indication for mark No units – no mark
22	(c)		75 – 85^{o}✓ Towards the south / 180 ^{o}✓	**2**	**2.1b** **3.1b**	
22	(d)		**Any** two **from:** True dip would require a surface / plane to measure✓ Not possible to locate / measure the strike✓ True dip would have to be measured with a compass-clinometer✓	**2**	**3.1b**	

Question			Answer	Mark	AO element	Guidance
			This is only a 2D representation **OR** requires 3D to measure✓ True dip is at least 75 – 85^{o} **OR** apparent dip is always < or = true dip **OR** true dip is always > or = apparent dip✓			
22	**(e)**		Compressive✓	**1**	**3.1b**	**ALLOW** convergent / collision (zone)

Question			Answer	Mark	AO element	Guidance
23	(a)	(i)	**Any three from:** Layout a transect (at right angles to the palaeocurrent direction)✓ Lay out a measuring tape✓ Sample by laying down a quadrat and measuring clasts within✓ Sampling could be systematic / random across the outcrop **OR** measure all clasts touching the tape and record distance✓ Mean clast size calculated for each location✓ Measure clasts using a mm ruler **OR** callipers✓	3	1.1b	
	(a)	(ii)	**Any two from**: Can only measure one or two of the axes of a clast in outcrop; **ORA**✓ Visible axes in outcrop may not be typical✓ Clasts with unequal axes may be aligned and skew results✓ Clasts in outcrop may be deformed / eroded / weathered ORA✓	2	2.1a 2.1b	
	(b)	(i)	**FIRST CHECK ANSWER ON ANSWER LINE. IF ANSWER = 80 AWARD 1 MARK** Sum of measurements / 15 = 80 (mm) ✓	1	2.1b	**ALLOW** 79 (mm)

Question			Answer	Mark	AO element	Guidance
	(b)	**(ii)**	Read off velocity > = 90 +/- 5 (cm s^{-1})✓ State to one or no decimal places✓	**2**	**2.1b** **3.1a**	
	(b)	**(iii)**	Mean of clast C is 139 mm = flow rate of 115 ✓ cm s^{-1} ✓	**2**	**3.1a**	**ALLOW** 110 to 140 cm s^{-1} for estimates based on log axes
	(c)	**(i)**	**Any two from:** Blades✓ Short axis<<intermediate and long axes / long axes much greater than short axes / the 3 axes are very different✓ Low sphericity✓	**2**	**2.1a**	**ALLOW** alternative wording for description of lengths of axes
	(c)	**(ii)**	**ANY** rock with bedding or foliation✓	**1**	**2.1a**	**DO NOT ALLOW** conglomerate or breccia
	(c)	**(iii)**	Imbrication **OR** imbricate structure✓	**1**	**1.1c**	
	(c)	**(iv)**	**Any one from:** Clasts are inclined / leaning in the direction of the palaeocurrent / top of clasts point in direction of current / clasts dip downstream✓ Clasts are aligned parallel to the palaeocurrent direction✓	**1**	**1.1c**	**ALLOW** all flat clasts inclined in one direction of the current

Question			Answer	Marks	AO element	Guidance
24	(a)		Please refer to the marking instructions on page 5 of this mark scheme for guidance on how to mark this question. **Level 3 (5 – 6 marks)** Gives relevant background on the factors which control seismic velocity and correctly states how a colder slab or a hotter plume would affect velocity **AND c**learly explains how anomalously faster or slower arrivals from different foci at a spread of seismic stations define the location and volume of the slab and plume in 3D. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3 – 4 marks)** The principles affecting seismic velocity are presented logically with correct recognition of slab being colder and plume hotter than surrounding mantle **AND** an explanation of locating the anomalously fast or slow mantle is attempted but not clear. *There is a line of reasoning with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1 – 2 marks)** Outlines that cold slabs are faster and hot plumes slower **AND** attempts an explanation of how anomalies are located. *There is an attempt at a logical structure with a line of reasoning. The information is, in the most part, relevant.*	**6**	**1.1a** **1.1c** **2.1a** **3.1a**	**Indicative scientific points may include:** • P-waves commonly used, travel more slowly in hotter mantle material which has lower bulk modulus (incompressibility) • P-waves are slowed by the presence of fluids and mantle plumes may contain a small percentage of melt • P-wave velocity controlled by bulk modulus (incompressibility), shear strength and density • S-waves are drastically affected by the presence of melt as they rely on shear strength. They allow detection of mantle plumes down to the core-mantle boundary • S-wave velocity controlled by shear strength and density • Subducted slab is colder, denser and with a greater shear strength and bulk modulus than the mantle • The mantle plume has a hotter, less dense and lower shear strength and bulk modulus than the mantle • Reverse arguments for colder slab in hotter mantle • density arguments: only credit statement that it acts in the opposite sense to bulk modulus changes but is less important. • Velocities change with depth but in a predictable manner, it is unexpectedly **early** arrivals that are used to detect the downgoing slab • The faster material is in the volume where the seismic wave paths intersect, so only detectable using a variety of sources (earthquakes) and receivers (seismic stations). • Low wave velocity / hotter regions indicating mantle plumes can extend deep into the mantle.

Question			Answer	Marks	AO element	Guidance
			0 marks *No response or no response worthy of credit*.			• Low wave velocity / hotter regions can indicate mantle plumes extend to the core-mantle boundary.
24	**(b)**	**(i)**	**Any two from:** Interiors of plates are aseismic / have no seismicity / no earthquakes✓ Boundaries / margins of plates are zones of active seismicity / earthquakes ✓ Earthquake activity shows the extent of the plates✓ Seismicity shows the thickness of the lithospheric plate / locates the boundary between lithospheric plate and the asthenosphere✓	**2**	**1.1a**	
24	**(b)**	**(ii)**	**Any four from:** Lithospheric slab / plate descends into the mantle✓ Friction with the lithosphere above causes earthquakes along the upper surface of the downgoing slab✓ Straightening of the slab after the trench causes earthquakes within the slab✓ Tension caused by the pull of the dense cold slab causes earthquakes within the slab✓ The Benioff zone indicated that a plate was subducting✓ *Idea of* subduction helped prove concept that plates were moving✓	**4**	**2x 1.1c** **2x 2.1a**	

Question			Answer	Marks	AO element	Guidance
			Idea of subduction helped develop the idea of recycling of the crust✓ Helped explain how lithosphere could be generated at ocean ridges without increasing the size of the Earth✓ Explained why there were wide belts of seismicity at some convergent boundaries✓			
24	**(c)**	**(i)**	Divergent margins / ocean ridges / MOR **OR** hot spots / mantle plumes✓	**1**	**1.1a**	
24	**(c)**	**(ii)**	**Any one from:** heat is transferred as hot mantle convects between core and the upper mantle✓ high heat flows associated with generation of magma✓ rising magma efficiently moves heat energy to the surface / advection✓ heat loss at surface by convection of sea water / black smokers✓	**1**	**2.1a**	

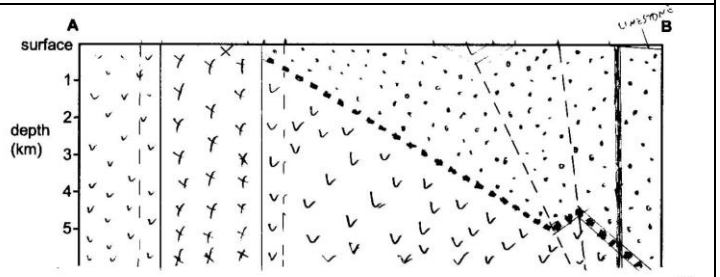
<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>25</td><td>(a)</td><td>(i)</td><td>Any four from:
Section drawn to scale with dips approximately correct and rock units showing key decoration✓

Lavas, lime mudstone, gritstone, slate and limestone in right order✓

Dyke shown in cross-section✓

Unconformable boundary shown between limestone and older folded rock units✓

Upright axis shown for anticline✓

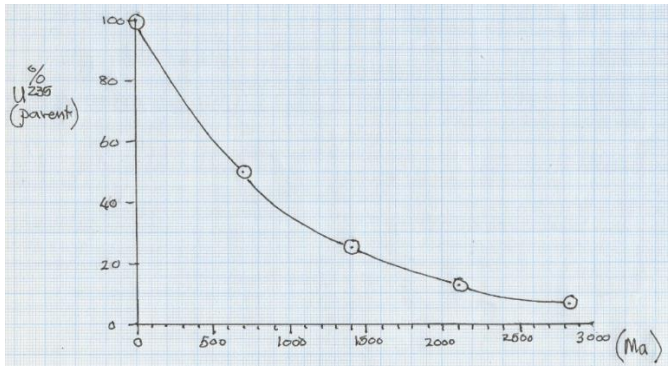
Metamorphic aureole follows major intrusion margins✓</td><td>4</td><td>2.1a
2.1b
3.1a
3.1b</td><td> 

[4]</td></tr>
<tr><td>25</td><td>(a)</td><td>(ii)</td><td><table><tr><th></th><th>Order</th></tr><tr><td>Erosion and change of sea-level</td><td>6</td></tr><tr><td>Intrusion and metamorphism</td><td>5/4</td></tr><tr><td>Deposition of lime mudstones</td><td>2</td></tr><tr><td>Eruption of lavas</td><td>1</td></tr><tr><td>Folding on NE-SW axes</td><td>4/5</td></tr><tr><td>Deposition of gritstones</td><td>3</td></tr><tr><td>Deposition of limestone</td><td>7</td></tr></table></td><td>4</td><td>2.1b
3.1b
3.1e</td><td>ALLOW events in correct order as ecf

6 to 7 events in correct order for 4 marks
4 to 5 events in correct order for 3 marks
2 to 3 events in correct order for 2 marks
1 event in correct order for 1 mark

ALLOW MAX 1 mark if 6 or more correct but in reverse order

ALLOW MAX 1 for lava, fold OR intrusion and limestone in correct relative order</td></tr>
</table>

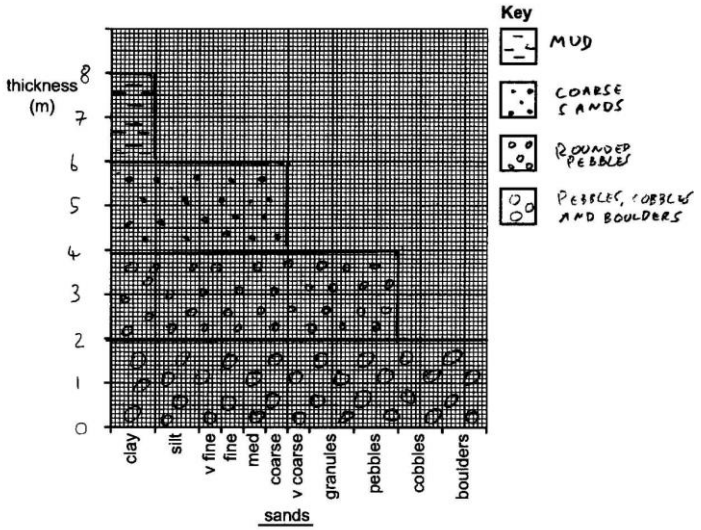
Question			Answer	Marks	AO element	Guidance
25	(b)	(i)	Axis correctly positioned **AND** labelled ✓ Appropriate scale✓ 4 half-lives plotted **AND** 100% included✓ Smooth curve through points **AND** not crossing x-axis✓	4	1.1d 2.1a 3.1b	3 points plotted correctly for 1 mark 
25	(b)	(ii)	400 Ma +/- 25 (Ma)✓	1	3.1b	**ALLOW** one mark for ecf on incorrect curve
25	(c)	(i)	Granite✓ Abundant quartz / abundant K-feldspar / felsic minerals predominate **AND** crystals average more than 5mm diameter **OR** coarse grained✓	2	1.1a 2.1a	**ALLOW** Adamellite
	(c)	(ii)	Porphyritic✓ Cooled at depth **AND** cooled slowly✓ **OR** Shows a two-level cooling history **AND** cooled very slowly then cooled faster✓	2	1.1a 2.1a	**ALLOW** coarse

Question			Answer	Marks	AO element	Guidance
	(c)	(iii)	The outcrop is merely the exposed top of a much larger intrusion **/** larger intrusion below the surface **OR** the contacts of the intrusion are shallow dipping and found close to the surface✓ a larger volume of magma than outcrops is needed to allow such slow cooling / formation of such coarse crystals **OR** Country rock is more permeable / more easily metamorphosed / more reactive / water carries heat into the country rock✓	**2**	**2.1b** **3.1b**	**ALLOW** intrusion is a magma with higher temperature or similar argument
	(d)		**Any two from:** Antiform / anticline✓ Upright fold axis / axial plane✓ Symmetrical✓ Open✓ Axis NE – SW✓ Non-plunging / horizontal fold✓	**2**	**2.1a**	
	(e)	(i)	**Any three from:** Original clay-rich sediments / mudstone / clay / shale✓ Imposition of a stress field / compression✓ Low grade regional metamorphism✓	**3**	**1.1a** **1.1c**	

Question			Answer	Marks	AO element	Guidance
			Clay mineral ls broken down and their components used to make micas / chlorite / muscovite ✓ Micas are aligned perpendicular to the principal stress✓ Rock will cleave along the aligned micas / slaty cleavage forms✓			
	(e)	**(ii)**	Please refer to the marking instructions on page 5 of this mark scheme for guidance on how to mark this question. **Level 3 (5 – 6 marks)** Detailed description of how to use a compass-clinometer, specifically linked to the Lake District rocks. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated* **Level 2 (3 – 4 marks)** Detailed description of how to use a compass-clinometer, but no link made to the Lake District rocks. **OR** Outline description of how to use a compass-clinometer, specifically linked to the Lake District rocks. *There is a line of reasoning with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1 – 2 marks)** Outline description of how to use a compass-clinometer. *There is an attempt at a logical structure with a line of reasoning. The information is, in the most part, relevant.*	**6**	**1.1b** **1.1d** **2.1b**	**Indicative scientific points may include:** • Find an exposed cleavage surface in the slates • Find an exposed bedding plane in the limestone, gritstone or lime mudstone • Find a boundary between two lava flows • Hold compass-clinometer vertically and use as a clinometer to locate the horizontal on the plane • Use the clinometer to draw on a horizontal line • Turn the compass to horizontal so the needle can swing without constraint • Turn the outer bezel until the north (red) arrow is bracketed by the lines drawn on the moving scale • Read off the direction of the strike using the right-hand rule • Thumb down the dip index finger of right-hand points to azimuth of strike **OR** record the smaller number • Record strike using 3 figures to prevent mistakes • Align compass so that clinometer scale is parallel with the long edge of the instrument • Align clinometer at right angles to strike to measure maximum / true dip • Read off and record dip of cleavage using two figures • Record approximate direction of dip for clarity • Repeat process on several surfaces to obtain mean and some idea of precision

Question			Answer	Marks	AO element	Guidance
			0 marks *No response or no response worthy of credit*.			**ALLOW** left-hand rule if clearly stated as used Diagrams may be used to clarify the descriptions.
	(e)	**(iii)**	Strike NE- SW / 225^{o} +/- 20^{o} (right-hand rule) ✓ Dip 75^{o} +/- 15^{o} towards 145^{o} / SE✓	**2**	**3.1a** **3.1d**	**ALLOW** left-hand rule 045^{o} and +/- 20^{o}

Question			Answer	Marks	AO element	Guidance
26	(a)	(i)	**1.** Muds / fine, clay-rich deposits are only deposited where energy is low / below the low water mark and any wave action✓ Bioturbation preserved as organisms burrow in soft mud✓ **2. Any one from:** coarse, rounded, well-sorted sands deposited by wave action / moderate to high energy✓ sand sheets re-worked by tidal currents down to low water mark✓ symmetrical ripples formed by wave action✓ **3.** well rounded pebbles / cobbles deposited and sorted by high energy / wave action✓ **4. EITHER** Boulders at top of beach are fallen blocks / talus from cliffs being poorly sorted and angular **OR** These are storm deposits above the high tide mark being rounded / poorly sorted cobbles / boulders✓	**4**	**2.1a**	There must be an explanation of the energy available to transport, sort and shape the sediment at each of the four locations. **ALLOW** MAX 1 for general idea of grain size linked to energy / depth of water
	(a)	(ii)	**Any one from:** Energy levels are too high in the other units which disarticulates the fossils✓ Fossils would be destroyed in the other units✓ Energy levels are low enough to allow preservation✓ It has the highest preservation potential **ORA**✓ Fine sediment allows burrowing protects the fossils✓	**1**	**2.1a**	

Question			Answer	Marks	AO element	Guidance
26	(b)		Sediments drawn in the right order✓ Decorated log and key completed✓ All 4 show appropriate grain size✓	3	3.1a	Any thickness allowed – only x-axis is marked, transitions can be gradational 
26	(c)		Lithostratigraphic correlation relies upon the recognition of beds or sequences of beds in different areas✓ Lateral variation as seen in beach deposits means that beds will not be recognised in separate outcrops✓ All four different sediments in the coastal example were deposited at the same time✓ Different sediments forming at the same time✓ Transgression creates ‘beds’ with similar lithology often assumed to be the same age✓	4	1x 2.1a 3x 3.1a	**ALLOW** alternative wording for these principles

Question			Answer	Marks	AO element	Guidance
			Diachronous beds changed age laterally / different ages at different locations / diachronous beds cut across time✓ These diachronous beds will be older towards the sea **ORA**✓ Prograding / retrograding deltas create diachronous beds / lateral variation✓			

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.

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.