

GCE

Geology

H414/03: Practical skills in geology

A Level

Mark Scheme for June 2025

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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.

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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. These are available in RM Assessor
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 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 is not 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.

Levels of response questions on this paper are **1(c)** and **4(a)**.

11. Annotations

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. Subject Specific Marking Instructions

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

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
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.

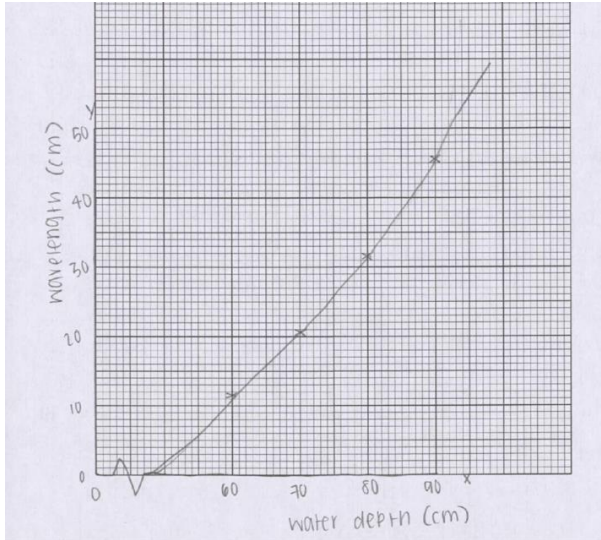
You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New 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)	(i)	Grainstone ✓	1	AO3.1b	
1	(a)	(ii)	FIRST CHECK ANSWER ON THE ANSWER LINE. If answer is 8.5 award 2 marks. M1 = 17mm / 2mm ✓ M2 = 8.5 ✓	1 1	AO1.1b x1 AO2.1b X1	M2 ALLOW tolerance +/- 0.25 magnification (8.25-8.75)
1	(a)	(iii)	<u>Any two:</u> M1; Tropical / subtropical seas ✓ M2; Shallow marine / <2m deep / intertidal / littoral zone / ✓ M3; Water agitated by waves / high OR medium energy water ✓	2	AO1.1a x1 AO1.1c x1	IGNORE; references to how it formed M1 ALLOW; High temperatures / high rates of evaporation / Warm water / water saturated in CaCO₃ M2 ALLOW reference to (shallow) lagoon M3 ALLOW; bi- directional current
1	(a)	(iv)	<u>Any two:</u> M1; Ooids / Ooliths are chemically formed ✓ M2; Sand / shell fragments / nucleus / moved by tides / waves / currents ✓ M3; <u>Precipitation</u> of CaCO₃ / Calcite from seawater / as concentric layers / around the nucleus ✓ M4; Later cementation ✓	2	AO2.1a	

Question			Answer	Marks	AO Element	Guidance
1	(b)	(i)	dark minerals: light minerals = 1: 3 ✓	1	AO2.1a	ALLOW 2-4 for the light-coloured minerals
1	(b)	(ii)	M1; Foliated / layered / banding (requires directed pressure) suggests <u>regional</u> metamorphism ✓ M2; Gneissose Banding / mineral segregation suggests <u>high grade</u> OR Coarse-grained rocks / crystals > 5mm suggests <u>high grade</u> metamorphism ✓	1 1	AO2.1a	

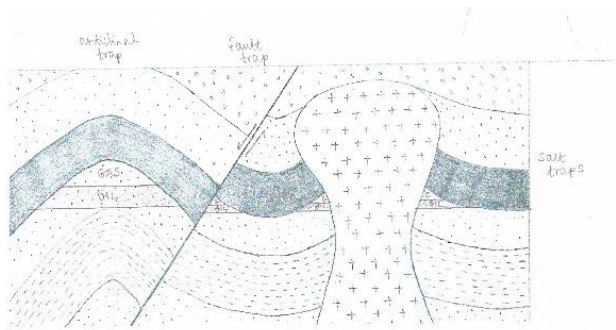
1	(c)	* Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. Level 3 (5–6 marks) <u>Detailed</u> description of observable features (composition, crystal size AND texture) of Rock A AND Rock B using comparative language. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. Uses comparative language</i> Level 2 (3–4 marks) Description of observable features (at least two of composition, crystal size or texture) of Rock A AND Rock B using comparative language OR a <u>detailed</u> description of observable features (of composition, crystal size and texture) of Rock A OR Rock B. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i> Level 1 (1–2 marks) Description of Rock A AND Rock B with limited attempt at comparison (maybe only 1 of composition, crystal size or texture) may include some erroneous statements OR description of EITHER Rock A OR Rock B (with 2 of composition, crystal size or texture) <i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i> 0 marks - No response or no response worthy of credit.	6	AO1.1d x3 AO3.1a x3	Indicative content: <u>(Rock A appears to be Amygdaloidal Basalt):</u> <u>Composition:</u> Mafic Dominated by Dark coloured / mafic minerals / augite / Olivine Non-visible paler minerals; Plagioclase / Feldspar / Ca rich Plagioclase <u>Crystal Size:</u> Fine crystal size / crystals too fine to see / <1mm diameter <u>Texture:</u> Equicrystalline Vesicles/ amygdales partly filled with white crystals / minerals Amygdales vary in size / shape <u>(Rock B appears to be Granite (Shap Granite):</u> <u>Composition:</u> Silicic Dominated by silicic minerals; Plagioclases / Feldspar / Na rich Plagioclase / Orthoclase / Quartz / Muscovite Less dark coloured / mafic minerals / biotite / hornblende <u>Crystal Size:</u> Coarse crystal size / crystals >5mm diameter <u>Texture:</u> Porphyritic / large phenocrysts of Orthoclase / groundmass of quartz, plagioclase and biotite / Euhedral Feldspar
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Question			Answer	Mark	AO Element	Guidance
2	(a)	(i)	M1 Mean to 3 sf = 45.1 ✓ M2 Median = 45 ✓	1 1	AO1.1d	ALLOW any correct decimal places for median (e.g. 45.0, 45.00)
2	(a)	(ii)	M1; Axes correctly labelled (x axis = water depth and y axis = wavelength) to include units ✓ M2; Points are accurately plotted ✓ M3; Points are joined (but line does not extend beyond points) ✓	1 1 1	AO2.1b	M1 ALLOW axes drawn the wrong way round M1 DO NOT ALLOW non linear scale M1 ALLOW broken scale symbol M2 ALLOW 1 plotting error M2 ALLOW ½ square plotting tolerance  Nb This is an example which gets M1 and M2 but not M3 as the line extends beyond the points plotted but effectively shows a broken scale

2	(a)	(iii)	<u>Any one:</u> M1; Ripple wavelength increases with increasing water depth ✓ M2; Positive correlation ✓	1	AO3.1a	ORA
2	(a)	(iv)	M1; Frequency or speed of waves / paddle M2; same depth / mass / volume of sand	1	AO3.1f	IGNORE parameters already given such as sand size and sorting
2	(b)		<u>Any three:</u> M1; Shape: symmetric OR asymmetric ✓ M2; Ripples suggest medium / high energy water ✓ M3; Indicates direction of wave / current motion / bidirectional / unidirectional / paleocurrent direction ✓ M4; Indicates <u>shallow</u> marine / beach / littoral zone OR river / turbidite environment ✓ M5; Wavelength could indicate water depth / energy / velocity ✓	3	AO3.1b	DO NOT ALLOW symmetrical ripples as being formed by a unidirectional current OR in a river DO NOT ALLOW asymmetrical ripples as being formed by a bidirectional current OR in the sea M4 ALLOW reference to the edges of a lake
2	(c)		M1; Measuring cylinder / jar / clear container / flume tank containing water (with lid) ✓ M2; Mixed grainsize sediment ✓ M3; mix sediment and water then shake / generate a current / movement (leave to settle) ✓	1 1 1	AO3.1f	ALLOW suitable other explanations of lab procedure which would give the same result MAX 2 if experiment relates to lateral change along a gradient

			M4; observe / measure grainsize arrangement of coarsest at the base ✓	1		M4 ALLOW ORA
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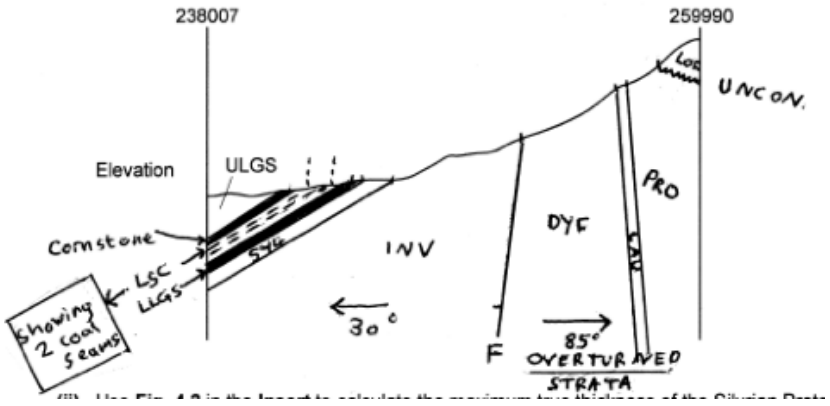
Question			Answer	Marks	AO Element	Guidance
3	(a)	(i)	<u>Any three:</u> M1; Sandstone reservoir rock is permeable ✓ M2; Shale cap rock is impermeable ✓ M3; Anticlinal trap ✓ M4; Organic rich Shale is the source rock ✓ M5; oil / gas rises /migrates upwards from the Shale due to higher buoyancy / lower density / hydraulic gradient ✓	3	AO2.1a	
3	(a)	(ii)	M1; Fault trap in correct location with gas shown above oil ✓ M2; Salt dome trap on either side of salt dome with gas shown above oil ✓	1 1	AO2.1a	Labelled arrows must touch the feature

Question			Answer	Marks	AO Element	Guidance
						MAX 1 if both correct trap positions are labelled but no oil or gas is shown MAX 1 if base of oil is not drawn horizontal
3	(b)	(i)	M1; Rock C has high porosity due to EITHER rounded grains OR well sorted grains OR lack of cement / matrix ✓ M2; Rock D has low porosity due to EITHER sub angular grains OR poorly sorted grains OR finer sediment OR less pore spaces due to matrix infilling them ✓ M3; Rock E has low porosity due to pore spaces being filled with cement ✓	1 1 1	AO3.1a	ALLOW 1 MAX for stating that C has high porosity and D / E low porosity with no correct explanation ALLOW 1 MAX for general comment about cement / matrix / grain shape determining porosity without specific reference to the 3 rocks shown
3	(b)	(ii)	Rock C AND has the greatest porosity / most permeable / least cement / least matrix ✓	1	AO3.1d	Needs rock name AND explanation
3	(b)	(iii)	M1; Rock D AND has more varied grain sizes / poorly sorted / sub angular / angular / texturally immature indicating less erosion / attrition / abrasion ✓ M2; Rock D AND contains lithic clasts / compositionally immature indicating less erosion / attrition / abrasion ✓	1 1	AO3.1b	Needs rock name AND explanation ALLOW maturity without qualification only once MAX 1 mark if M1 and M2 are correct BUT no reference to erosion

Question			Answer	Marks	AO Element	Guidance
						M2 ALLOW reference to less weathering
3	(c)	(i)	FIRST CHECK ANSWER ON THE ANSWER LINE. If answer is <u>0.04 °C m⁻¹</u> OR <u>40 °C km⁻¹</u> award 2 marks M1 = 200/5000 OR 200/5 ✓ M2 = 0.04 °C m⁻¹ OR 40 °C km⁻¹ ✓	2	AO2.1b	ALLOW units given as °C/m OR °C/km M1 ALLOW other correct substituted values e.g. 100/2500 Needs value AND unit.
3	(c)	(ii)	Decrease ✓	1	AO2.1a	
3	(d)		<u>Any one:</u> M1; reference to issues concerned with the extraction process e.g. danger of blow outs / leakage of chemicals from the site / named pollution issues e.g. leakage of oil or gas or fracking chemicals ✓ M2; Relocation / displacement of people ✓ M3 reference to corruption qualified / exploitation of workforce ✓ M4; Unsustainable / Non-renewable / Finite fuels being extracted ✓ M5; loss of biodiversity / habitat loss in area of extraction / named harm to species e.g. fish poisoned due to toxic leakage ✓	1	AO1.1c	DO NOT ALLOW general comments regarding pollution or environment without qualification

Question			Answer	Marks	AO Element	Guidance
4	(a)	*	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. Level 3 (5–6 marks) A detailed explanation of how to measure dip, including direction AND strike, in a logical order with clear instructions. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i> Level 2 (3–4 marks) A brief explanation of how to measure dip, possibly no direction AND strike OR detailed explanation of Dip and direction OR Strike <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i> Level 1 (1–2 marks)	6	AO1.1b x3 AO2.1b x3	Indicative content: Strike Set compass to clinometer mode / E_W position (or description of how) Place long edge vertically on bedding surface and rotate to find 0° dip / horizontal plane Draw a line along the edge Hold long edge along line with compass laid horizontally Turn compass dial until north arrows line up Read off strike direction and record bearing as a three-figure number Draw a line at 90 degrees to this strike line; this is the dip / use right hand rule to locate which side of the line is the direction of dip Dip Set compass to clinometer mode / E-W position

Question			Answer	Marks	AO Element	Guidance
			A basic explanation of how to measure dip OR strike which may be unclear. <i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i> 0 marks - No response or no response worthy of credit.			Place long edge vertically on bedding surface parallel to direction of dip Read dip angle and record as a two-figure number Record dip direction as a compass direction Final measurement recorded in the format of strike / dip angle and dip direction, e.g.; 180° / 45°W.
4	(b)	(i)	<u>Any five:</u> M1; ≥5 Beds correctly labelled in correct position ✓ M2; Beds to north of fault dip 30° northwest ✓ M3: Beds to south of fault dip 85° southeast ✓ M4; Labelled sub vertical fault in correct location with downthrow to the north ✓ M5; Plotting of Coal seams parallel and within LSC / labelling of position of coal seams OR labelling PRO, LAU and DYF as overturned strata M6; Base of LOR (unconformity) in correct location with a low dip to the southeast ✓	5	AO2.1b x3 AO3.1b x2	ALLOW for M1; labelling using abbreviations from the map OR rock names from the Stratigraphic column key OR candidates own key ALLOW for M2 and M3; +/- 5 degree tolerance on dips M4 ALLOW downthrow as a tick or as movement arrows M5 ALLOW mineral veins M6 ALLOW wavy line for the base of the Devonian. M6 ALLOW Flat base for the base for the Devonian M6 DO NOT ALLOW unconformable series to have a curved base.

Question	Answer	Marks	AO Element	Guidance
				
4	(b) (ii) FIRST CHECK ANSWER ON THE ANSWER LINE. If answer is <u>between 194 and 222</u> (m) award 2 marks M1: Outcrop width = 8 mm ✓ M2: True thickness = 222 m ✓	1 1	AO3.1b	ALLOW outcrop width of 7-8 mm ALLOW true thickness of 194-222 m
4	(b) (iii) M1: U-shaped burrows OR named trace fossil e.g. <i>Diplocraterion</i> / burrows / trails e.g. <i>Cruziana</i> / fossils in life position e.g Brachiopods / concentrated shell layer(s) which fines upwards / geopetal structures ✓ M2: Correct explanation of how the named structure can be used as a way-up indicator ✓	1 1	AO2.1b	Credit any valid marine fossil way up criteria found in sandstones M1 DO NOT credit footprints as land animals had not evolved yet or Plant roots Credit an <u>annotated</u> diagram or text

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