

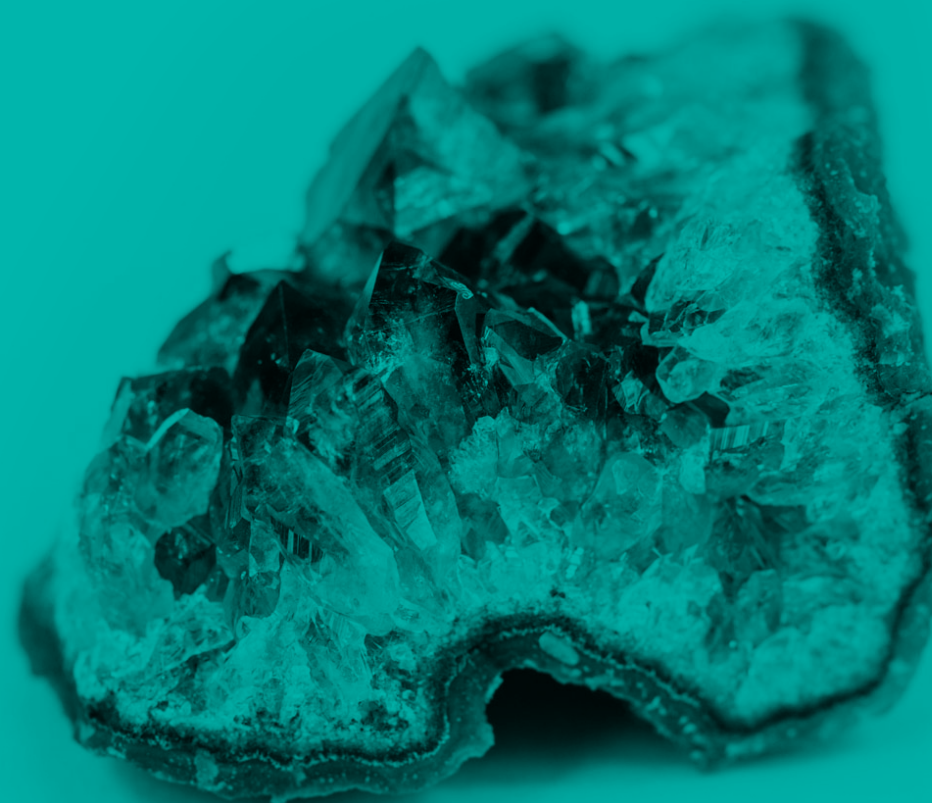
GCE AS

WJEC Eduqas GCE AS in
GEOLOGY

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**SAMPLE ASSESSMENT
MATERIALS**

Teaching from 2017
For award from 2018





For teaching from 2017
For awards from 2018

GCE AS GEOLOGY

SAMPLE ASSESSMENT
MATERIALS

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Candidate Name	Centre Number				Candidate Number			
					0			



AS
GEOLOGY
COMPONENT 1



Geological Enquiries

SAMPLE ASSESSMENT MATERIALS

1 hours 30 minutes

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- the Resource Sheet
- Specimens **A**, **C** and **H**
- geological equipment for testing specimens
- the Mineral Data Sheet
- a calculator

INSTRUCTIONS TO CANDIDATES

Answer **all** questions.

Use black ink or black ball-point pen.

Do not use gel pen. Do not use correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The geology is **not** designed to represent any particular area.

The Mineral Data Sheet and **Map 1** and **Photographs 1** and **2** are provided on separate resource sheets.

Strips of plain paper may be obtained from the supervisor on request.

Three specimens, **A**, **C** and **H**, are provided for use.

The number of marks is given in brackets at the end of each part-question.

The assessment of the quality of extended response (QER) will take place in question **3**.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	12	
2.	5	
3.	14	
4.	12	
5.	13	
6.	4	
Total	60	

Answer **all** questions.

Study **Map 1** on the Resource Sheet carefully before answering **Questions 1-6**.

1. **Specimen A** is representative of **Rock Unit A** in the western part of **Map 1**.

- (a) Complete **Figure 1** by drawing to scale the texture of **specimen A**. Add a scale to your drawing. [4]

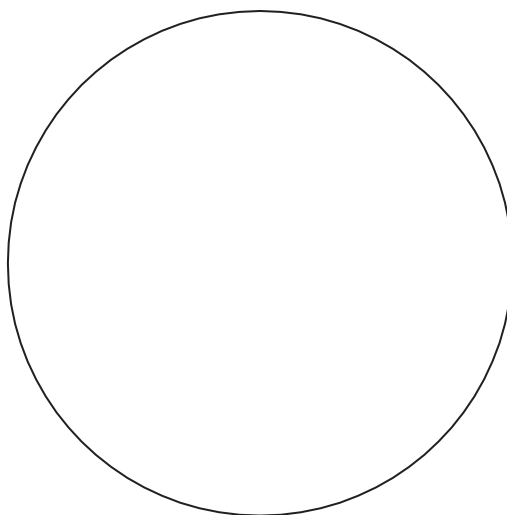


Figure 1

- (b) It has been suggested that **Rock Unit A** is a pluton.

Complete **Table 1a** by describing **one** piece of evidence from **Map 1** and **one** piece of evidence from the texture of the groundmass of **Specimen A** which could support the statement that **Rock Unit A** is a pluton. [2]

	Evidence
Map 1	•
Texture of the groundmass of Specimen A	•

Table 1a

- (c) Identify **one** of the minerals contained within **Specimen A**, stating the result of **two** tests/observations you used for your identification. You may wish to refer to the **mineral data sheet**. [3]

Name of **one** mineral within **Specimen A**.....

Result of test/observation 1

.....

Result of test/observation 2

.....

- (d) (i) A sample of **Rock Unit A** has a mass of 63.2 g. It was immersed in water and displaced 23.4 cm³ of water. Calculate the density of the sample. *Show your working*. [2]

Answer	Units
•	•

- (ii) Explain with reference to the mineral content of **Specimen A** why the sample of **Rock Unit A** might be expected to have the density you calculated. [1]

.....

2. **Photograph 1** on page 4 of the **resource sheet** is a fossil collected from **Rock Unit C**.

(a) (i) Complete **Figure 2** below by drawing the fossil shown in **Photograph 1** using the scale provided. [3]

(ii) Label the *foramen* on your drawing. [1]

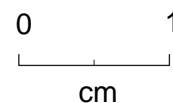


Figure 2

(b) Identify the fossil group to which the fossil in **Photograph 1** belongs. [1]

.....

5

3. Two specimens were collected from different localities in **Rock Unit C**. **Specimen C** was collected from **Locality I** on **Map 1** and is representative of **Rock Unit C**. **Figure 3** is a drawing of the texture of a specimen of marble collected from **Rock Unit C** at **Locality II** on **Map 1**.

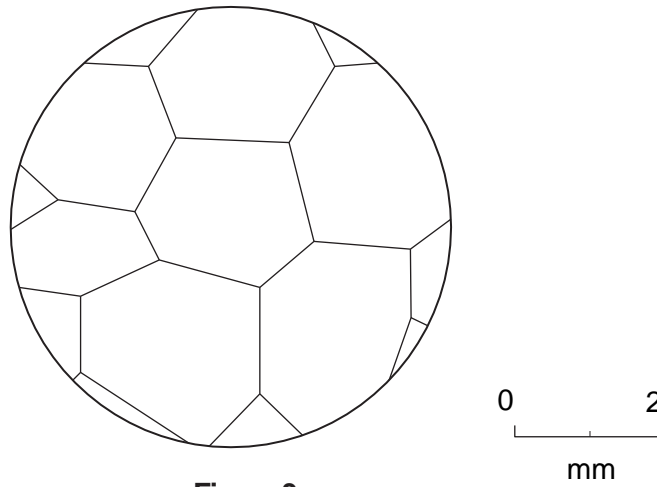


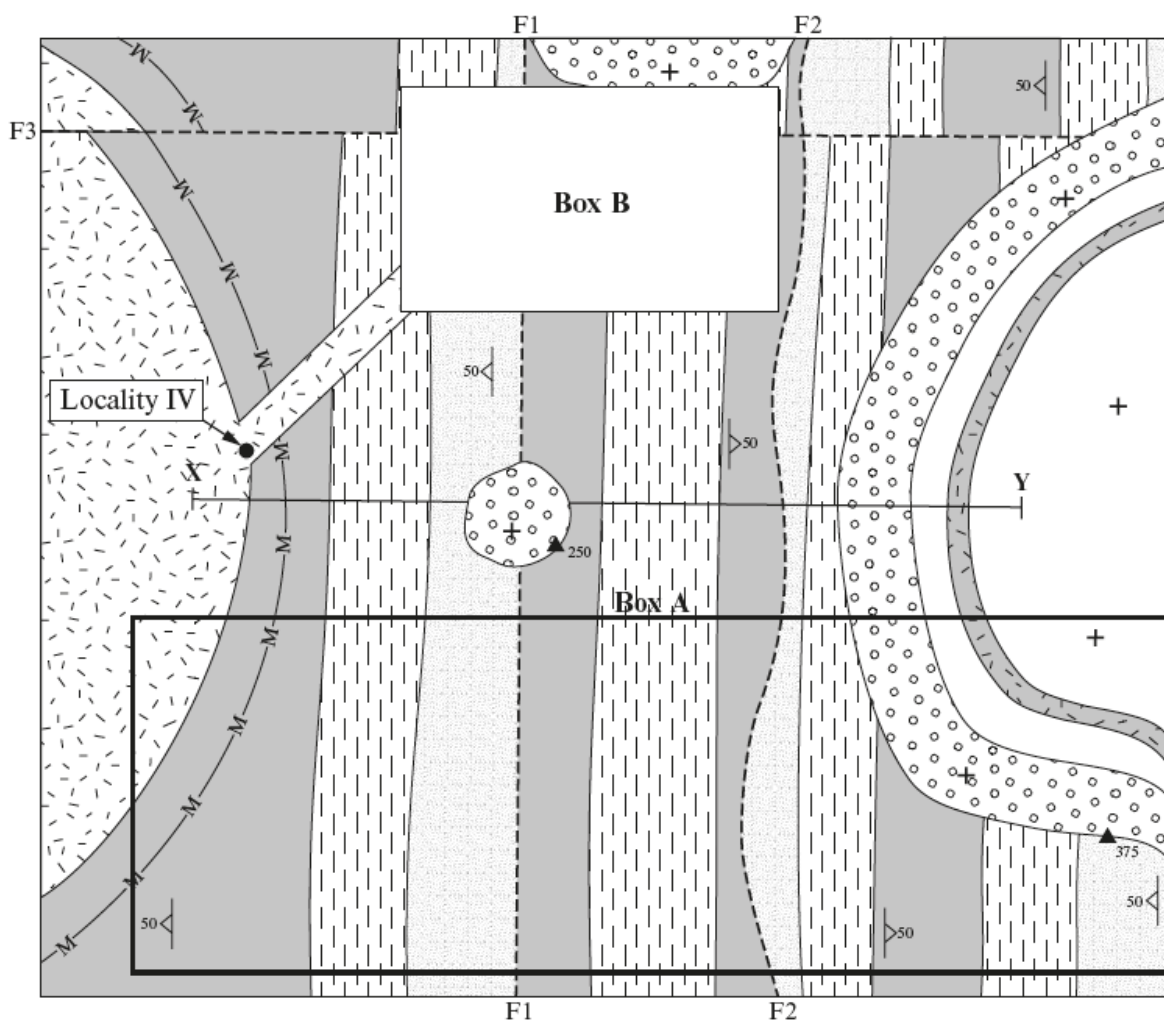
Figure 3

- (a) Complete **Table 3a** using evidence from **Specimen C** and **Figure 3**. For **Specimen C** you must refer to a diagnostic test using the equipment provided by the supervisor. [6]

	Evidence from Specimen C Locality I	Evidence from Figure 3 Locality II
Crystalline texture (yes / no)	No	•
Mean size of grains / crystals (mm)	•	•
Composition	Test • Result and Composition •	Composed of calcium carbonate
Name of rock	•	Marble

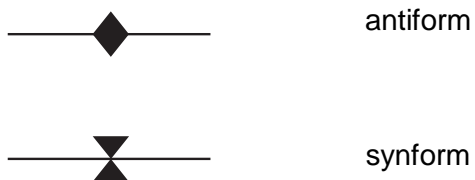
Table 3a

4. **Map 2** below is a reduction of **Map 1**. The key for the Rock Units is the same as for **Map 1**.



Map 2

- (a) Clearly draw and label within **Box A** on **Map 2** the axial plane traces (APT) of an **antiform** and a **synform**.
Label them as appropriate with the following symbols. [2]



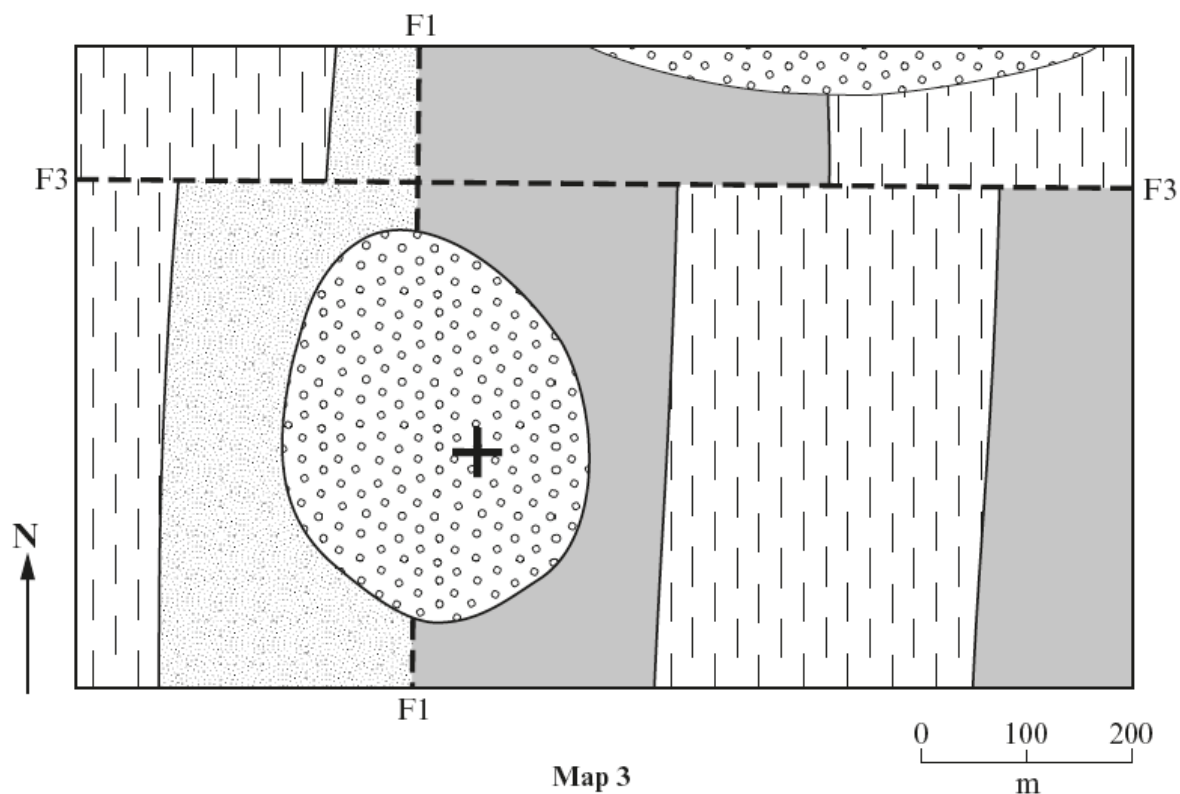
(b) With reference to evidence on **Map 1** only, state the criterion of relative age that is most useful in determining the relative ages of each of the following pairs of geological features: [2]

- Rock Unit A and Rock Unit F

.....

- Rock Unit G and Rock Unit C

.....



(c) **Map 3** shows the geology in the blank area (**Box B**) on **Map 2**. **Map 2** shows part of a dyke emerging from the pluton at **Locality IV**. Clearly draw and label on **Map 3** the continuation of this dyke which:

- has a NE–SW strike
- is 100 m wide
- is older than **Rock Unit G**
- is older than **Fault F3**.

[4]

(d) Mineral **Specimen H** was found in a mineral vein associated with **Fault F1**.

(i) Complete **Table 4** by;

- stating the result of the test/observation described
- describing **one** other test/observation which is a **useful** property for diagnosis and stating the result. [3]

Description of test/observation	Result of the test/observation described
Scratch the mineral with a steel pin	•
•	•

Table 4

(ii) Identify mineral **Specimen H**. [1]

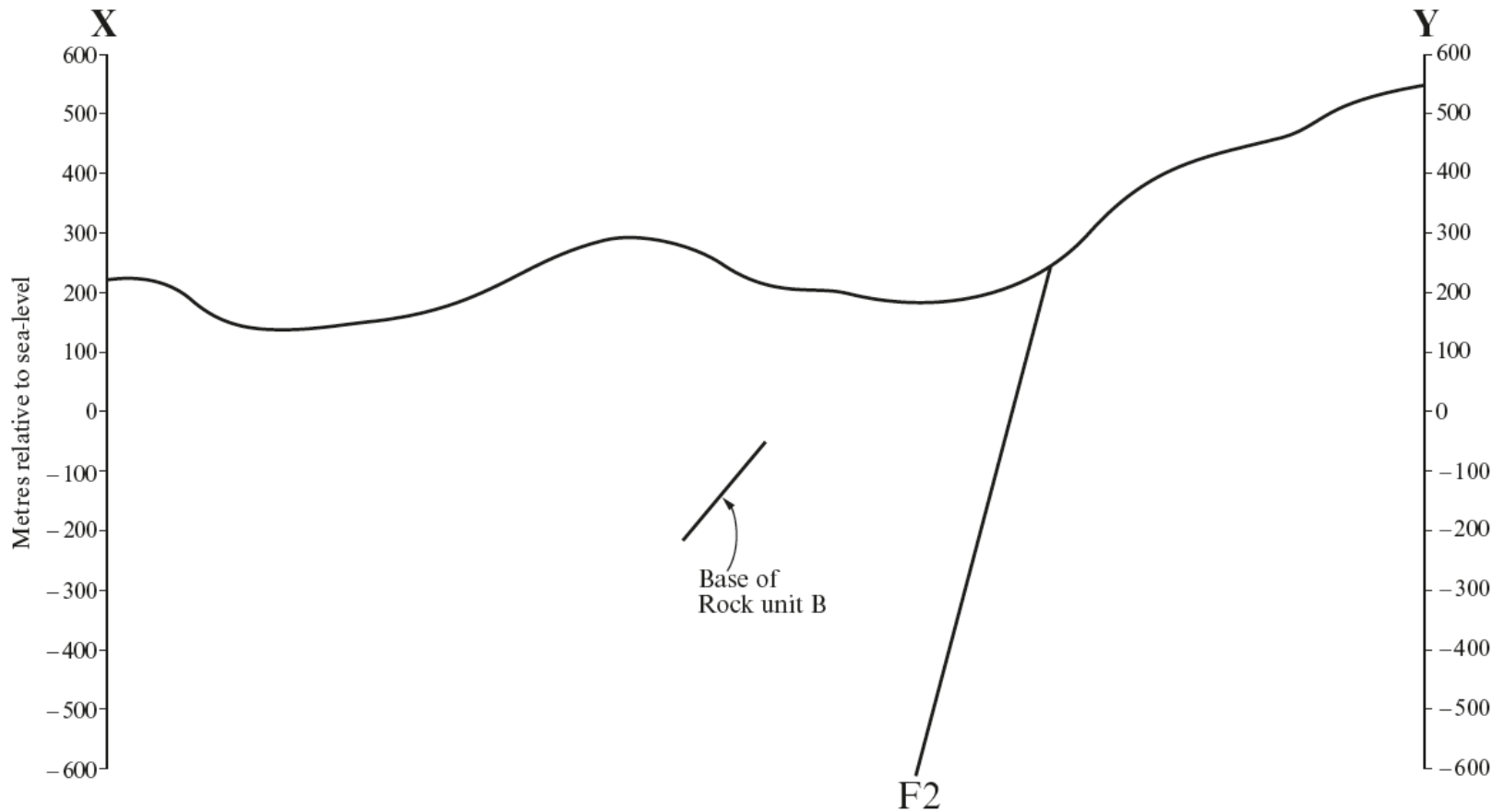
Name of mineral **Specimen H**

5. The topographic profile below was taken along line X-Y on **Map 1**. Part of the base of **Rock Unit B** and **Fault F2** have been inserted.

Complete the sketch of the geological cross-section along this line using **Map 1**.

- Draw the **Rock Units**. Use similar ornament or letters for these as on **Map 1**.
- Draw and label any **faults** using the letters on **Map 1**, drawing arrows to show movement.
- Draw and label any **fold axes**.
- Project the **Rock Units** and structures above the ground surface to illustrate any cross-cutting relationships.

[13]





AS

GEOLOGY

COMPONENT 1

Practical Geology

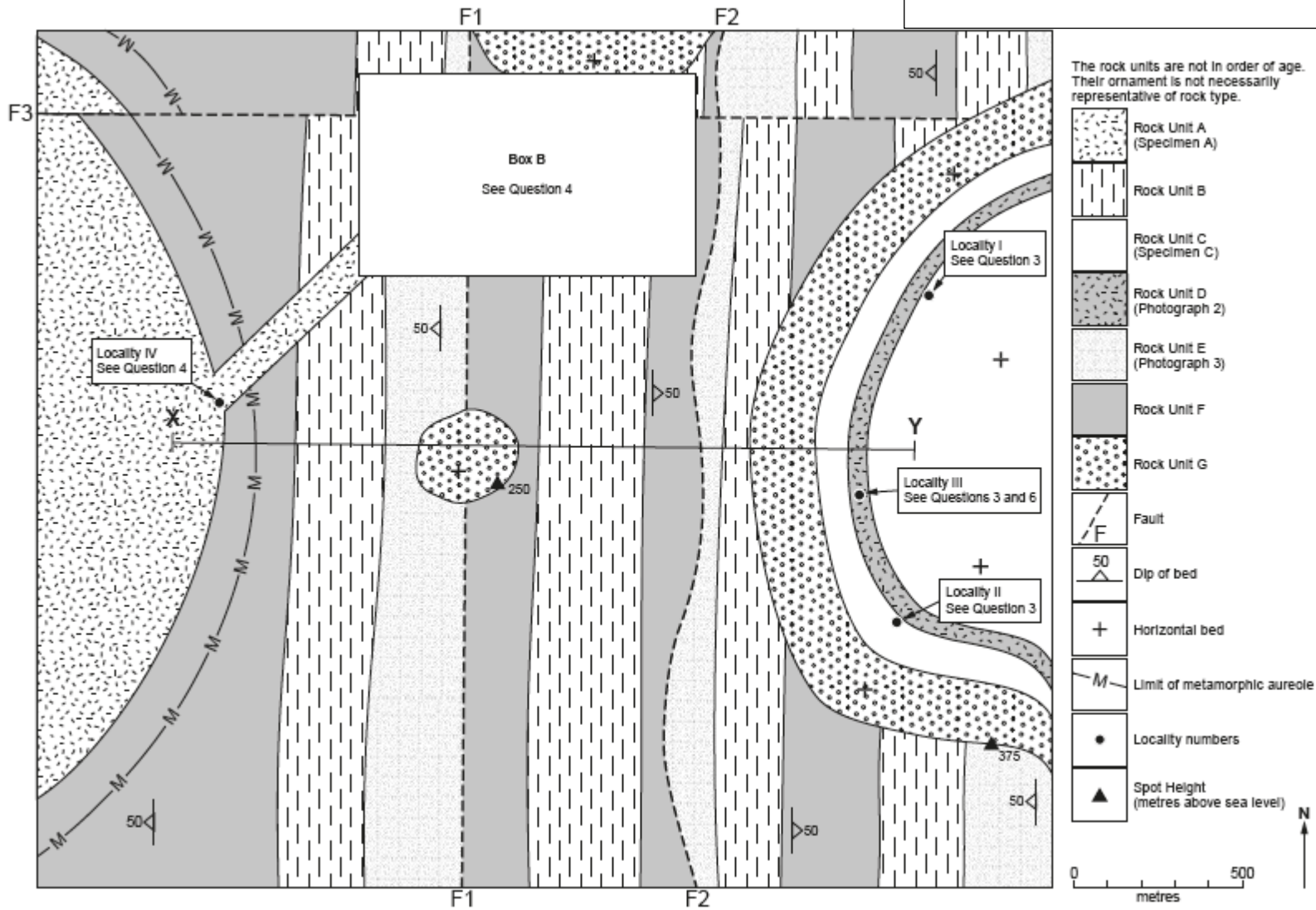
RESOURCE SHEET

SAMPLE ASSESSMENT MATERIALS



Map 1

This map will be printed in A3 format



Photograph 1 For use in Question 2



Photograph 2 For use in Questions 3 and 6

Taken at **Locality III** on **Map 1** looking east



© Colin Vosper



GEOLOGY

MINERAL DATA SHEET

Name	Cleavage/Fracture	Hardness	Density (gcm ⁻³)	Streak	Lustre	Colour	Other diagnostic properties
Quartz	RF *none/conchoidal	7	2.65	scratches streak plate	vitreous	colourless, milky but variable	hexagonal prisms terminated by pyramids
Orthoclase Feldspar	RF *2 good, 90	*6	2.6	scratches streak plate	vitreous	flesh, pink, white	*simple twin
Plagioclase Feldspar	RF *2 good, 90	*6	2.7	scratches streak plate	vitreous	creamy-white, grey, colourless	*repeated multiple twin
Muscovite Mica	RF *1 perfect (basal)	*2.5	2.7-3.1	white	pearly	colourless or pale yellow, green or brown	*flaky
Biotite Mica	RF *1 perfect (basal)	*2.5-3	2.7-3.1	white	pearly	brown/black	*flaky
Hornblende	RF *2 good, 60/120	*5-6	3.0-3.5	scratches streak plate	vitreous	black, dark green	prismatic crystals
Augite	RF *2 good, 90	*5-6	3.2-3.5	scratches streak plate	vitreous	greenish black	prismatic crystals
Olivine	RF none/conchoidal	*6-7	3.2-4.3	scratches streak plate	vitreous	*olive green	
Chistolite/Andalusite	poor 1/uneven fracture	7.5	3.1-3.3	scratches streak plate	vitreous	pearly grey/pink	needle crystals with square x-sections, black centre
Garnet	none	*6.5-7.5	3.5-4.3	scratches streak plate	vitreous	red/brown	*12 sided crystals - each face rhomb shaped
Calcite	RF *3 good, not at 90, perfect rhombs	*3	2.71	white	vitreous	colourless, white, tints	*effervesces with 0.5M HCl, rhombic shape
Fluorite	*4 good, parallel to octahedron	*4	3.0-3.2	white	vitreous	colourless purple/green/yellow	fluoresces in uv light, cubic or octahedral crystals
Halite	3 good, 90 cubic	*2.5	2.2	white	vitreous	colourless, white, often stained	*salty taste cubic crystals, often stained
Gypsum	1 good (basal)	*1.5-2	2.3	white	silky, pearly	colourless, white, often stained	fibrous or twinned crystals
Barites	2 good, 90	*3-3.5	*4.5	white	vitreous, resinous	white, pink	bladed crystals
Chalcopyrite	poor/conchoidal	4	4.2	*black	metallic	bronze yellow	*tarnished to peacock colours
Pyrite	none/conchoidal	*6	5.0	*greenish black	metallic	brass yellow	crystals often striated cubes
Galena	*3 good, 90 cubic	*2.5	*7.5	*lead grey	metallic	lead grey	cubic crystals
Haematite	poor/subconchoidal	*5.5-6.5	4.9-5.3	*cherry red	metallic-dull	red/black skin/steel grey	kidney shaped masses, fibrous

* - Useful property for diagnosis RF - Common rock-forming mineral

This table should not be memorised.

Marks in the examinations will be awarded for description of the outcomes of tests on minerals and, on some occasions, identification from test results.

WJEC Eduqas AS Geology

Mark scheme for use with Component 1

Practical Geology

SAMPLE ASSESSMENT MATERIALS

Instructions for examiners of AS Geology when applying the mark scheme

1 Positive marking

It should be remembered that candidates are writing under examination conditions and credit should be given for what the candidate writes, rather than adopting the approach of penalising him/her for any omissions. It should be possible for a very good response to achieve full marks and a very poor one to achieve zero marks. Worthwhile answers that meet the requirements of the question, but do not appear on the mark scheme are to be given credit.

2 Tick marking

Low tariff questions should be marked using a points-based system. Each credit worthy response should be ticked in red pen. The number of ticks must equal the mark awarded for the sub-question. The mark scheme should be applied precisely using the marking details box as a guide to the responses that are acceptable. Do not use crosses to indicate answers that are incorrect.

3 Annotated Diagrams

Where a candidate has answered a question wholly or partly by use of an annotated diagram, credit must be awarded to the annotations which form credit-worthy responses as outlined in the marking details box. Candidates must be credited only once for valid responses which appear both as annotations to diagrams and within a section of prose in the answer to the same question.

4 Banded mark schemes

Banded mark schemes are divided so that each band has a relevant descriptor. The descriptor for the band provides a description of the performance level for that band. Each band contains marks. Examiners should first read and annotate a learner's answer to pick out the evidence that is being assessed in that question. **Do not use ticks** on the candidate's response. Once the annotation is complete, the mark scheme can be applied. This is done as a two stage process.

Stage 1 – Deciding on the band

When deciding on a band, the answer should be viewed holistically. Beginning at the lowest band, examiners should look at the learner's answer and check whether it matches the descriptor for that band. Examiners should look at the descriptor for that band and see if it matches the qualities shown in the learner's answer. If the descriptor at the lowest band is satisfied, examiners should move up to the next band and repeat this process for each band until the descriptor matches the answer.

If an answer covers different aspects of different bands within the mark scheme, a 'best fit' approach should be adopted to decide on the band and then the learner's response should be used to decide on the mark within the band. For instance if a response is mainly in band 2 but with a limited amount of band 3 content, the answer would be placed in band 2, but the mark awarded would be close to the top of band 2 as a result of the band 3 content.

Examiners should not seek to mark candidates down as a result of small omissions in minor areas of an answer.

Stage 2 – Deciding on the mark

Once the band has been decided, examiners can then assign a mark. During standardising (marking conference), detailed advice from the Principal Examiner on the qualities of each mark band will be given. Examiners will then receive examples of answers in each mark band that have been awarded a mark by the Principal Examiner. Examiners should mark the examples and compare their marks with those of the Principal Examiner.

When marking, examiners can use these examples to decide whether a learner's response is of a superior, inferior or comparable standard to the example. Examiners are reminded of the need to revisit the answer as they apply the mark scheme in order to confirm that the band and the mark allocated is appropriate to the response provided.

Indicative content is also provided for banded mark schemes. Indicative content is not exhaustive, and any other valid points must be credited. In order to reach the highest bands of the mark scheme a learner need not cover all of the points mentioned in the indicative content but must meet the requirements of the highest mark band. Where a response is not creditworthy, that is contains nothing of any significance to the mark scheme, or where no response has been provided, no marks should be awarded.

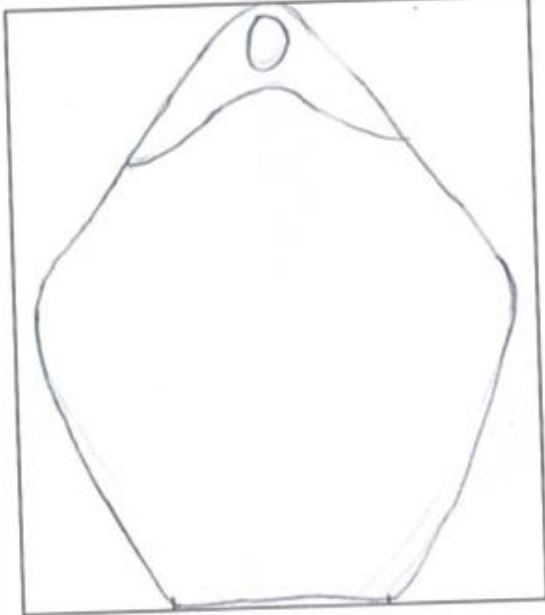
Question		Marking details	Marks Available					
			AO1	AO2	AO3	Total	Maths	Prac
1	(a)	Crystalline ie. no pores or floating grains (1) Porphyritic ie obviously larger crystals surrounded by smaller (1) Shape ie well shaped phenocrysts (1) Phenocrysts (1-3 cm) or groundmass (3-7 mm) (1)		4		4	1	4
	(b)	Any one x (1) from: <ul style="list-style-type: none"> • large igneous body • large intrusion • Metamorphic aureole • Discordant or equivalent • Offshoot of a dyke • Non sheet-like Coarse or a value between 2-7 mm (1)		2		2		
	(c)	1 mark awarded for one mineral name from the list below and up to two marks awarded for two correct results of tests/observations Quartz (1) Any two x (1) from: <ul style="list-style-type: none"> • no cleavage • conchoidal fracture • did not scratch steel pin • vitreous lustre, • colourless/milky or						

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
			<p>Orthoclase (1)</p> <p>Any two x (1) from:</p> <ul style="list-style-type: none"> • 2 good cleavages at 90 • did not scratch steel pin • vitreous, • flesh/pink/white <p>or</p> <p>Plagioclase (1)</p> <p>Any two x (1) from:</p> <ul style="list-style-type: none"> • 2 good cleavages at 90 • did not scratch steel pin • vitreous • white <p>or</p> <p>Biotite (1)</p> <p>Any two x (1) from:</p> <ul style="list-style-type: none"> • 1 perfect cleavage • scratched by finger nail or copper coin • pearly lustre • colourless • flakey (habit) 						
					3		3		3

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)	<p>Correct working:</p> $\frac{63.2}{23.4} \text{ (1)}$ <p>2.7 (accept 2.70, do not accept any other answer) and correct units ie (g/cm³) (1)</p>		2		2	2	2
		(ii)	<p>Award one mark for an answer which links one mineral from the list below and that mineral's density, to the density of the rock unit sample.</p> <p>e.g. There is Orthoclase present in Specimen A which has a density of 2.6, close to the density of 2.7 for Rock Unit A. (1)</p> <ul style="list-style-type: none"> • Orthoclase has a relative density of 2.6 • Plagioclase has a relative density of 2.7 • Quartz has a relative density of 2.65 • Biotite has a relative density of 2.7-3.1 	1			1		
			Question 1 total	1	11	0	12	3	9

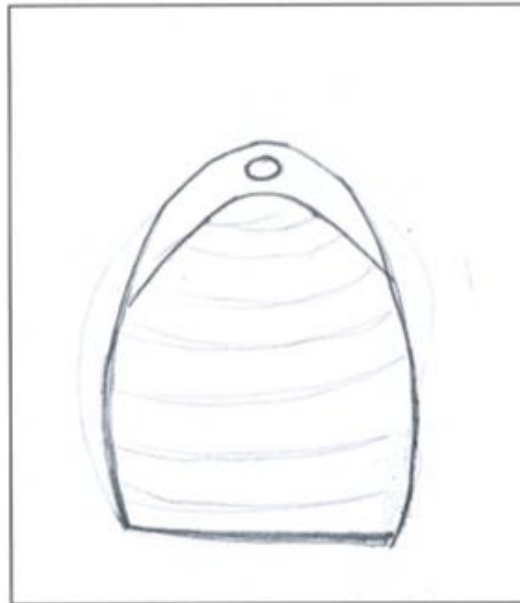
Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)	Drawn to correct scale (it should fill box vertically). Allow a minimum "height" of 7.5 cm and maximum of 10 cm (which will be just longer than the box) (1) Correct ratio of "height" to width (ie it looks correct rather than too fat or too elongated) and relatively accurate shape (see examples attached) (1) Shows top edge of brachial valve (1)					1	
		(ii)	Foramen correctly labelled (1)	1			1		
		(b)	Brachiopod (1)	1			1		
			Question 2 total	2	3	0	5	1	3

Examples for Q2 (a) (i)



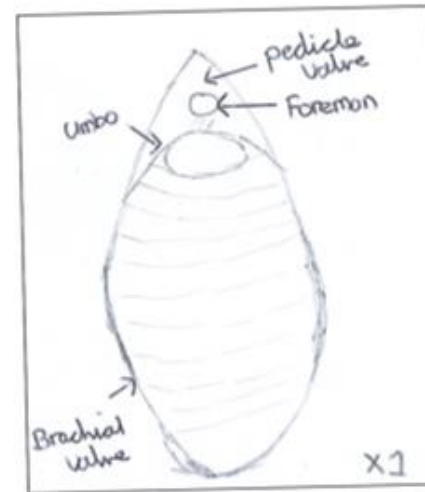
Scale correct (fills box vertically) (1)
Ratio and shape correct (1)
Top edge of brachial valve shown (1)

Total 3



Scale incorrect (0)
Ratio and shape (shape not good enough) (0)
Top edge of brachial valve shown (1)

Total 1



Scale correct
(fills box enough vertically: ignore x1 in the box) (1)

Ratio and shape (too thin) (0)

Top edge of brachial valve shown (1)

Total 2

Question		Marking details		Marks Available						
				AO1	AO2	AO3	Total	Maths	Prac	
3	(a)		Evidence from Specimen C Locality I	Evidence from Figure 3 Locality II	1	2	1	6	2	2
		Crystalline texture (yes / no)		Crystalline (1)						
		Mean size of grains / crystals (mm)	1 mm (0.5–1.5) (1)	2mm (1.7-2.7) (1)						
		Composition	Test Test with acid (1) Result and composition It effervesces or equivalent so is composed of calcium carbonate/calcite/limestone/calcareous (1)							
		Name of rock	Oolitic/shelly/bioclastic limestone or limestone (1)							

Question		Marking details	Marks Available					
			AO1	AO2	AO3	Total	Maths	Prac
	(b)	<p>Any two x (1) from:</p> <ul style="list-style-type: none"> • contact/thermal/heat/baked • metamorphism • due to/by Rock unit D or “an igneous body” 		2		2		
	(c)	<p>Indicative content</p> <p>Analysis/evaluation of evidence from outcrop pattern of Rock Unit D on Map 1 Curved linear outcrop suggests sill or lava flow. Concordant with surrounding beds suggests sill or lava flow. Cannot tell whether sill or lava flow from outcrop pattern.</p> <p>Analysis/evaluation of evidence from structures in Rock Unit D in Photograph 2 Photograph shows pillow structures. Indicative of eruption into water. So this is a lava flow not a sill.</p> <p>Analysis/evaluation of evidence from the rocks at locality 1 and 2 on Map 1 Rocks at locality I and II show that there has been metamorphism only on the lower contact of Rock Unit D. A sill would cause metamorphism both above and below Rock Unit D. A lava flow would cause metamorphism below Rock Unit D only. This is a lava flow not a sill.</p>			6	6		6

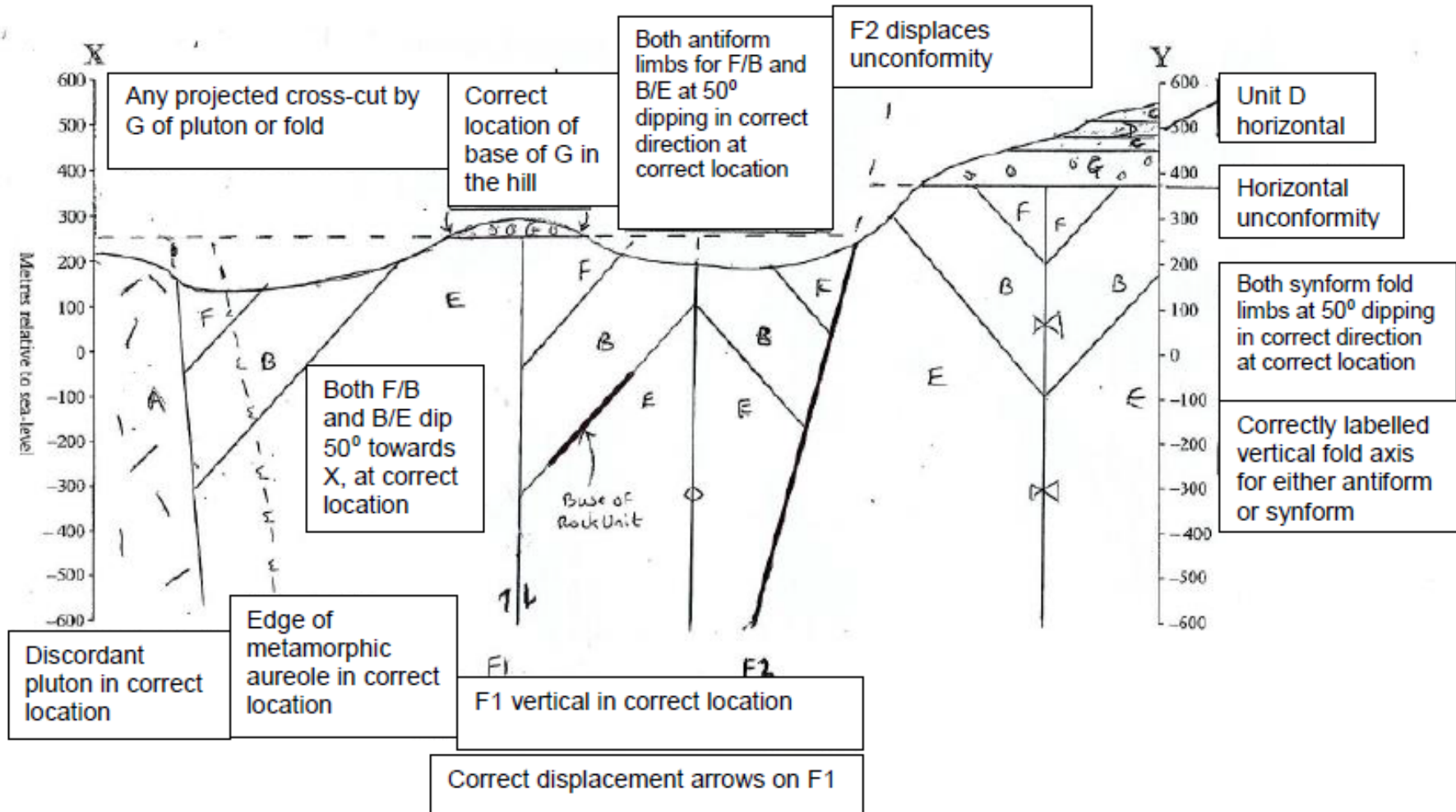
		<p>5–6 marks</p> <p>There is a clear response which makes at least one valid analytical comment from each of the three sources of evidence (the outcrop pattern, photograph 2 and the rocks at locality I and II), as outlined in the indicative content above.</p> <p>The statement is evaluated coherently with some recognition that the evidence from the outcrop pattern is not entirely conclusive, whereas the other two sets of evidence are conclusive.</p> <p>A conclusion regarding the statement "Rock Unit D is a sill" is drawn that is consistent with the evidence as interpreted.</p> <p><i>There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant.</i></p>						
		<p>3–4 marks</p> <p>The response makes at least one valid analytical comment from each of a minimum of two of the three sources of evidence (the outcrop pattern, photograph 2 and the rocks at locality I and II), as outlined in the indicative content above.</p> <p>There is some attempt at evaluation of the statement through a weighing up of the evidence.</p> <p>A conclusion regarding the statement "Rock Unit D is a sill" is drawn that is consistent with the evidence as interpreted.</p> <p><i>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.</i></p>						
		<p>1–2 marks</p> <p>The response makes at least one valid analytical comment from a minimum of one of the three sources of evidence (the outcrop pattern, photograph 2 and the rocks at locality I and II) as outlined in the indicative content above.</p> <p>There is little evidence of evaluation of the statement.</p>						

			<p>A conclusion regarding the statement "Rock Unit D is a sill" is drawn that is consistent with the evidence as interpreted.</p> <p><i>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.</i></p>						
			<p>0 marks <i>No attempt made or no response worthy of credit.</i></p>						
			Question 3 total	1	6	7	14	2	10

Question		Marking details	Marks Available					
			AO1	AO2	AO3	Total	Maths	Prac
4	(a)	Antiform APT trending N-S anywhere within rock unit B between F1 and F2 (1) Synform APT trending N-S anywhere within Rock Unit F to the east of F2 (1)		2		2		2
	(b)	Rock Unit A and Rock Unit F: Cross cutting relationships (1) Rock Unit G and Rock Unit C: Superposition of strata (1)	2			2		2
	(c)	Dyke 100 m wide (1.5 cm) (1) Dyke strikes approx NE-SW (1) Dyke disappears beneath outcrop of rock unit G (1) (dyke must appear on both sides of G south of F3) Dyke is displaced by F3 (1)		4		4		4

Question			Marking details		Marks Available										
					AO1	AO2	AO3	Total	Maths	Prac					
	(d)	(i)	<table border="1"> <tr> <td>Description of test/observation</td> <td>Result of the test/observation described</td> </tr> <tr> <td>Scratch the mineral with a steel pin</td> <td>Did scratch with a steel pin (1)</td> </tr> <tr> <td> Any one x (1) from: <ul style="list-style-type: none"> heft in hand or equivalent look for/at the crystal habit or equivalent </td> <td> Any one x (1) from: <ul style="list-style-type: none"> Feels heavy or equivalent Bladed/tabular crystals Has 2 good cleavages planes at 90° Can be scratched by a copper coin Cannot be scratched by a finger nail Has a white streak Has a vitreous (or resinous) lustre Correct colour for the specimen e.g white, yellow white, pink Does not react with dilute acid </td> </tr> </table>	Description of test/observation	Result of the test/observation described	Scratch the mineral with a steel pin	Did scratch with a steel pin (1)	Any one x (1) from: <ul style="list-style-type: none"> heft in hand or equivalent look for/at the crystal habit or equivalent 	Any one x (1) from: <ul style="list-style-type: none"> Feels heavy or equivalent Bladed/tabular crystals Has 2 good cleavages planes at 90° Can be scratched by a copper coin Cannot be scratched by a finger nail Has a white streak Has a vitreous (or resinous) lustre Correct colour for the specimen e.g white, yellow white, pink Does not react with dilute acid 		1	1	3		3
Description of test/observation	Result of the test/observation described														
Scratch the mineral with a steel pin	Did scratch with a steel pin (1)														
Any one x (1) from: <ul style="list-style-type: none"> heft in hand or equivalent look for/at the crystal habit or equivalent 	Any one x (1) from: <ul style="list-style-type: none"> Feels heavy or equivalent Bladed/tabular crystals Has 2 good cleavages planes at 90° Can be scratched by a copper coin Cannot be scratched by a finger nail Has a white streak Has a vitreous (or resinous) lustre Correct colour for the specimen e.g white, yellow white, pink Does not react with dilute acid 														
		(ii)	<ul style="list-style-type: none"> Barite (1) 		1		1								
Question 4 total				2	9	1	12	0	11						

Question	Marking details	Marks Available					
		AO1	AO2	AO3	Total	Maths	Prac
5	<p>Pluton A discordant and in correct location (1)</p> <p>Edge of metamorphic aureole in correct location (1)</p> <p>Base of G horizontal and in correct location (above F1) (1)</p> <p>Base of G horizontal and in correct location (close to Y) (1)</p> <p>Unit D horizontal at correct location (1)</p> <p>Both F/B and B/E in correct location and dipping 50° towards X between F1 and pluton (1)</p> <p>Both F/B and B/E drawn at correct location, angle and direction on both limbs of the antiform (1)</p> <p>Fault F1 vertical in correct location (1)</p> <p>Both F/B and B/E drawn at correct location, angle and direction on both limbs of the synform (1)</p> <p>Correctly labelled, vertical fold axis for either antiform or synform (1)</p> <p>Correct displacement arrows for F1 (1)</p> <p>F2 displaces unconformity (base of G) above ground (1)</p> <p>Any projected cross-cut by unconformity (base of G) of intrusion or folded beds above ground (1)</p>		6	7	13	13	13
	Question 5 total	0	6	7	13	13	13



Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
6			Pillows have rounded tops (1) Pillows have and keels or “pinched bottoms” (1) Vesicles more concentrated in the upper margin (1) Upper margin has a glassy rim (1)	4			4		
			Question 6 total	4	0	0	4	0	0

Candidate Name	Centre Number				Candidate Number			
					0			



AS

GEOLOGY

COMPONENT 2

Foundation Geology

SAMPLE ASSESSMENT MATERIALS

1 hours 30 minutes



For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	14	
2.	14	
3.	14	
4.	17	
5.	14	
6.	17	
Total	90	

ADDITIONAL MATERIALS

In addition to this examination paper you will need a calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen. Do not use correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets alongside each question or part-question. The assessment of the quality of extended response (QER) will take place in questions **5** and **6**.

Answer **all** questions.

1. **Figure 1a** is a sketch showing a cross-section through an igneous body and country rock exposed on a wave-cut platform on the coast.

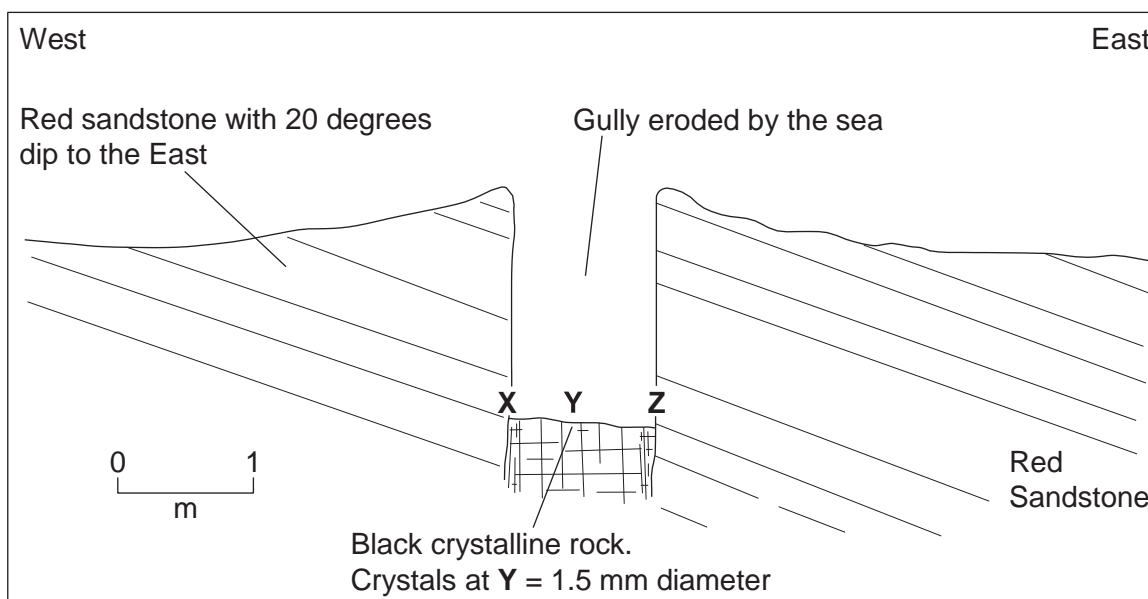


Figure 1a

- (a) (i) Name the igneous rock exposed at location **Y** on **Figure 1a**. [1]

.....

- (ii) State the type of igneous body contained within the gully. Give **one** reason for your answer. [2]

Type of igneous body.....

Reason.....

.....

.....

- (b) (i) Complete **Figure 1b** to show the most likely variation in mean crystal size across the igneous body between **X** and **Z** in **Figure 1a**. [2]

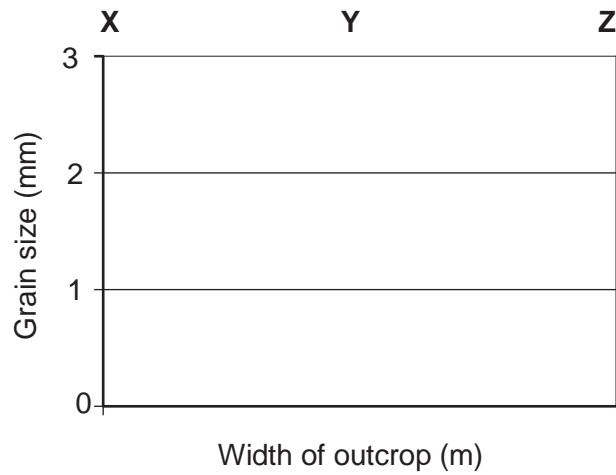


Figure 1b

- (ii) Explain why crystal size varies across igneous bodies such as that shown in **Figure 1a**. [2]

.....
.....
.....

- (c) Explain why the sandstone at the edge of the gully in **Figure 1a** is higher than the sandstone further away. [3]

.....
.....
.....
.....
.....

- (d) Analysis of the grains of the red sandstone in **Figure 1a** suggests that they were deposited under aeolian conditions. Draw in **Figure 1c** how the sandstone might appear if viewed through a hand lens. Label your diagram. [4]

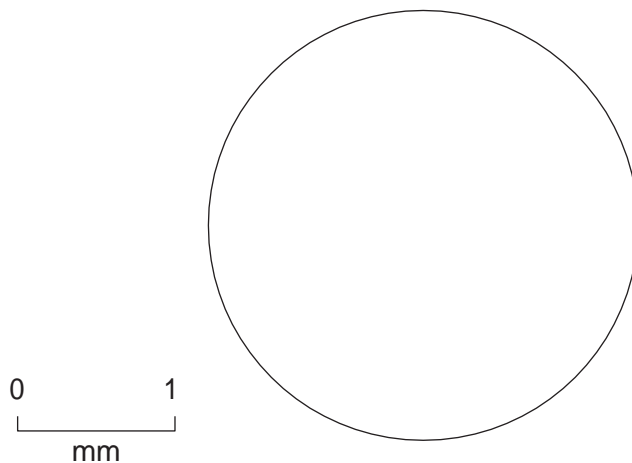


Figure 1c

2. **Table 2** shows information about radioactive isotopes and their relationship to the number of half-lives elapsed.

Number of half-life elapsed	% parent isotope	% daughter isotope
0	100	0
1		50
2		

Table 2

- (a) (i) State what is meant by the half-life of a radioactive isotope. [1]

.....

- (ii) Complete **Table 2** to show the percentage of parent and daughter isotopes. [2]

- (iii) A rock contains a radioactive mineral with a percentage of parent isotopes of 3.125%. Calculate the number of half-lives which have elapsed since the mineral formed. *Show your working.* [2]

Number of half-lives

(b) **Figure 2** is a geological map.

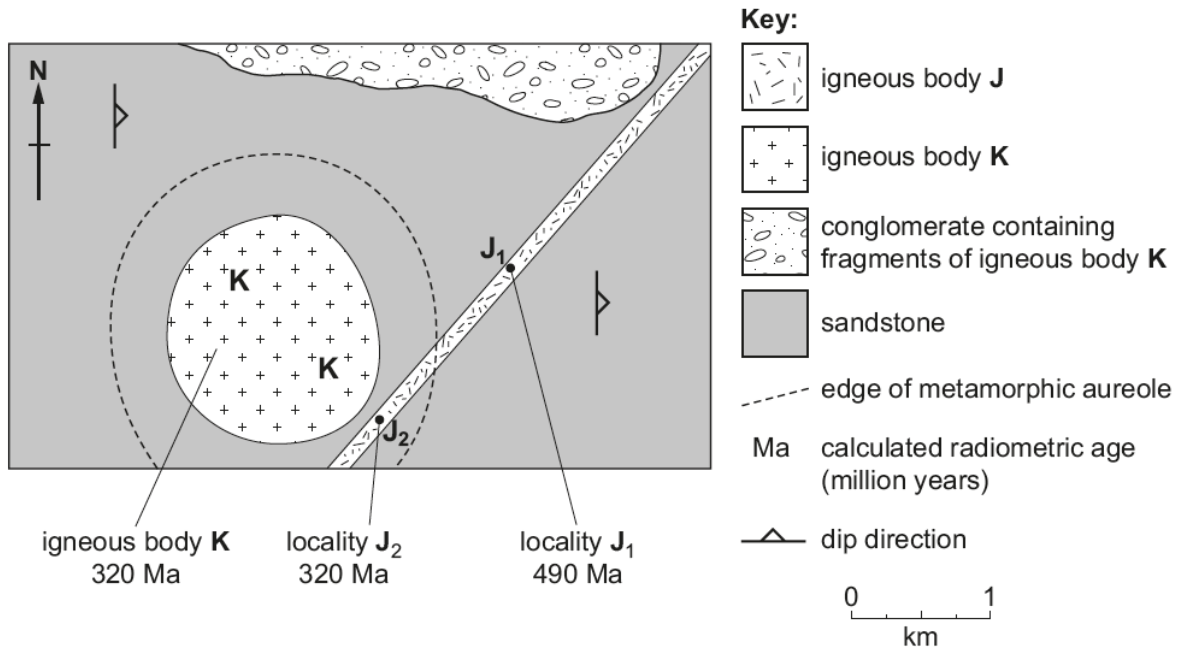


Figure 2

Refer to **Figure 2**.

- (i) State the type of igneous body represented by igneous body K. Give **two** reasons for your answer. [3]

Type of igneous body

Reason 1.....

.....

Reason 2.....

.....

- (ii) State the difference in the calculated radiometric ages of igneous body J at localities J₁ and J₂. [1]

..... Ma

- (iii) Explain the different radiometric age of igneous body J at locality J₂ compared to locality J₁. [2]

.....

.....

.....

- (iv) State the relative age of the conglomerate and igneous body **J**.
Explain the evidence for your answer. [3]

.....

.....

.....

.....

.....

.....

3. The following passage contains information concerning fossil graptolites. Graptolites are an extinct group of fossils, often best preserved in black shales. The graptolite of genus **A** is thought to have been fixed to the sea bed by a root-like structure, unlike the other graptolites which are thought to have floated in the oceans.

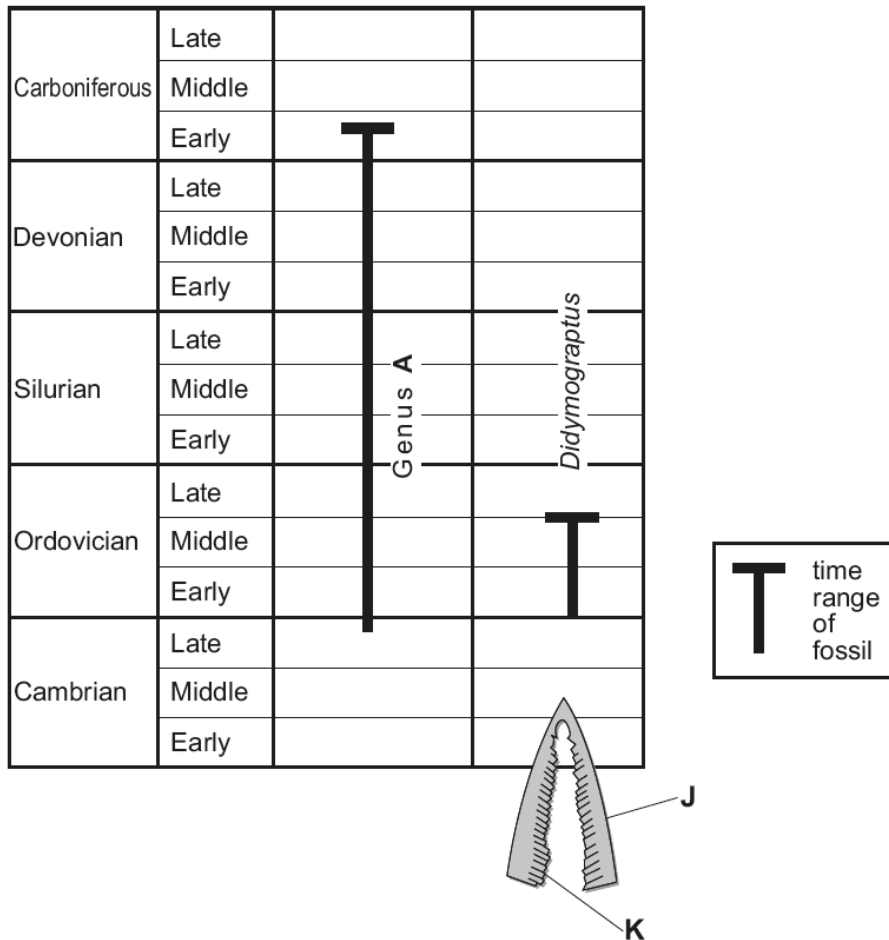


Figure 3

- (a) (i) Name the morphological features labelled **J** and **K** on *Didymograptus* in **Figure 3**. [2]
- Feature **J**
- Feature **K**.....
- (ii) With reference to **Figure 3**, state the time of the appearance and extinction of the graptolite of genus **A**. [1]
- Appearance.....
- Extinction.....

- (b) Complete **Table 3** to explain why most graptolites demonstrate the following characteristics. Give **one** reason to explain each characteristic. [3]

Characteristics of most graptolites	Explanation
Geographically widespread	•
Easily identifiable	•
Usually poorly preserved	•

Table 3

- (c) With reference to **Figure 3** and the **information in the passage**, compare the value of the graptolite of genus **A** and *Didymograptus* as zone fossils. Explain your answer. [3]

.....

.....

.....

.....

.....

- (d) Give **three** reasons why graptolites are ‘often best preserved in black shales.’ [3]

1.

.....

2.

.....

3.

.....

(e) Explain why it is difficult to be precise about how graptolites lived. [2]

.....
.....
.....

4. **Figure 4** is a **geological map**. The land in the area is flat.

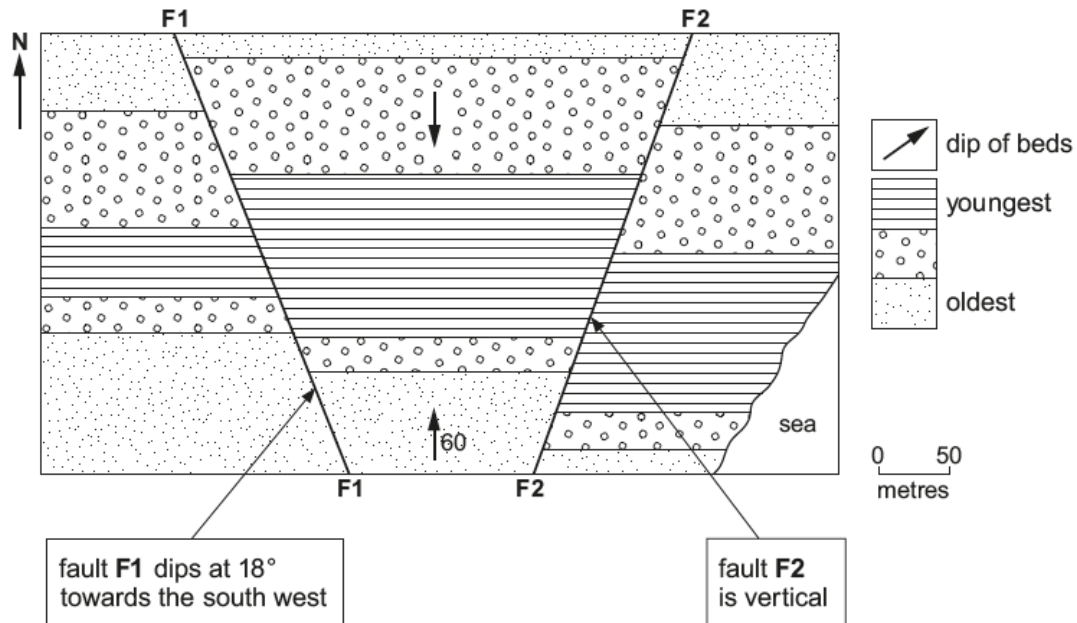


Figure 4

(a) Refer to **Figure 4**.

(i) State which **two** of the following statements are correct. Tick only **two** boxes. [2]

- The fold is an anticline
- The fold has limbs of equal dips
- The fold is a syncline
- The fold is younger than the faults
- The fold has been overturned
- The northern limb of the fold dips at less than 60°

(ii) Draw in the axial plane trace of a fold between faults **F1** and **F2** and between fault **F2** and the eastern edge of the map on **Figure 4**. [2]

(b) Fault **F1** is a dip-slip fault with a downthrow to the east.

(i) State **one** piece of evidence in **Figure 4** that confirms **F1** is a dip-slip fault. [1]

.....
.....

(ii) Explain the evidence in **Figure 4** that confirms F1 being downthrown to the east. [2]

.....
.....
.....
.....
.....

(iii) **F1** is a thrust fault. State **two** pieces of evidence in **Figure 4** which support this statement. [2]

1.
.....
2.
.....

(c) (i) Fault **F2** is a strike-slip fault. State **two** pieces of evidence in **Figure 4** which support this statement. [2]

1.
.....
2.
.....

(ii) State the amount and direction of horizontal displacement that has occurred along fault **F2**. [2]

Displacement metres

Direction of movement

- (d) A student came to the **two** following conclusions about the geological structures shown in **Figure 4**.

Evaluate each conclusion giving reasons for your answers. [4]

The fold and fault **F1** were formed by the same type of stress.

.....
.....
.....
.....

F2 is younger than **F1**

.....
.....
.....
.....

5. **Figure 5a** is a map showing South America and part of the Pacific Ocean. The Pacific sea floor is subdivided based on the age of the deepest ocean floor sediments.

Figure 5b is a graph of data collected along line **B-C** on **Figure 5a**.

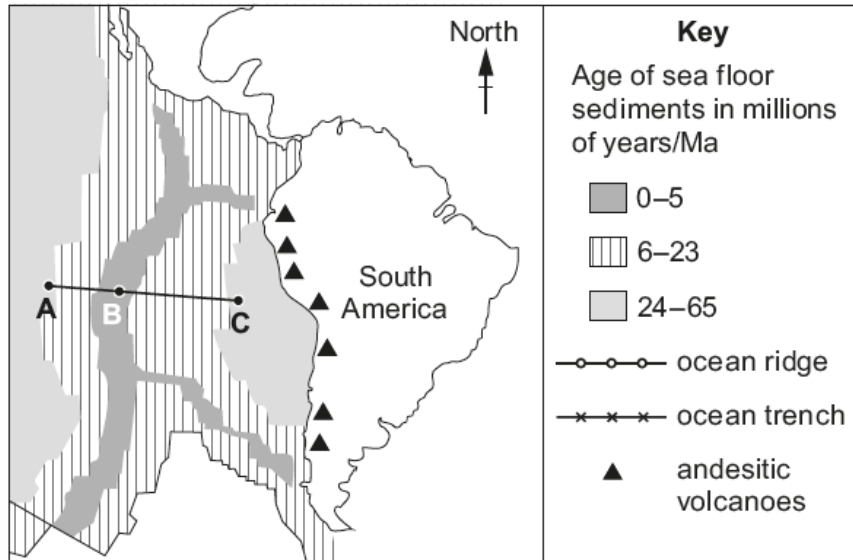


Figure 5a

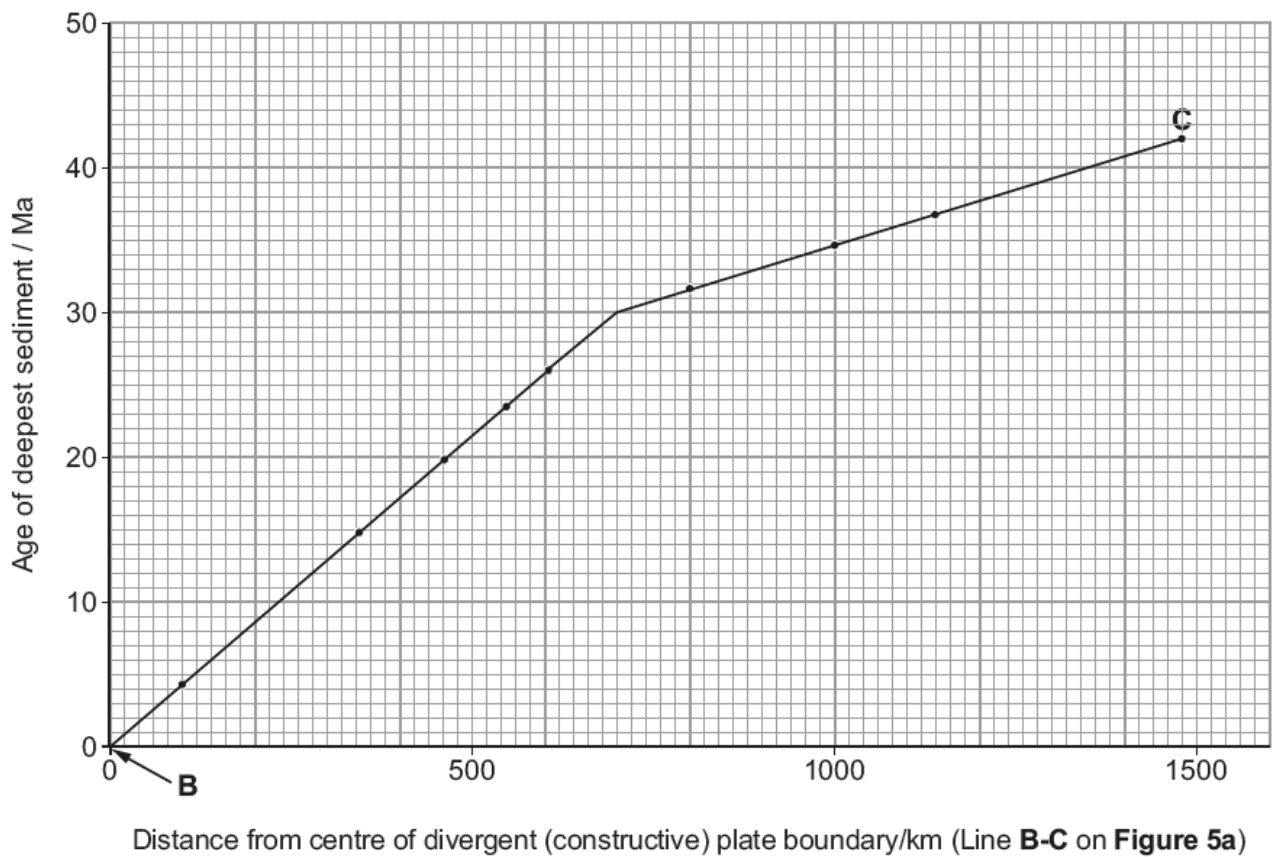


Figure 5b

(a) Refer to **Figure 5a**.

(i) Using the symbols in the key mark on **Figure 5a**, the most likely position of:

- 1. An ocean ridge
- 2. An ocean trench. [2]

(ii) Describe how the age of the Pacific Ocean floor varies along line **A-B-C**. [2]

.....
.....
.....

(b) Refer to **Figure 5b**.

(i) Calculate the average rate of spreading (in cm yr^{-1}) from the divergent boundary over the last 30 million years. *Show your working.* [2]

..... cm yr^{-1}

(ii) Describe how the rate of spreading has changed over the last 42 million years. [2]

.....
.....
.....

6. **Figure 6a** shows the travel paths of P-waves and S-waves for an earthquake. **Figure 6b** shows a seismogram for the earthquake shown in **Figure 6a**.

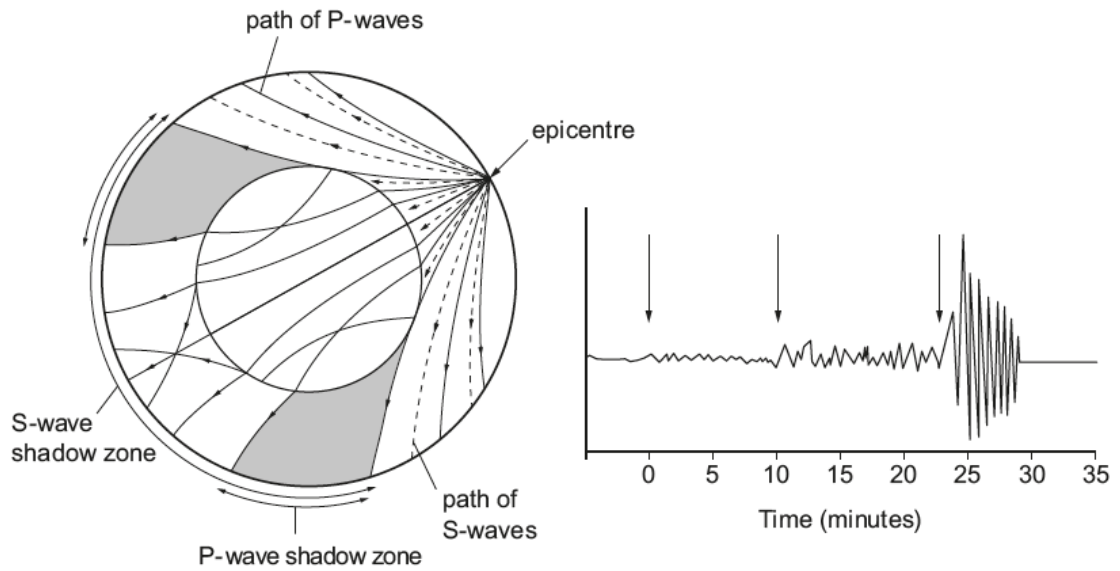


Figure 6a

Figure 6b

- (a) (i) State what is meant by the epicentre of an earthquake. [1]

.....

- (ii) Explain why no S-waves are recorded in an S-wave shadow zone. [2]

.....

- (b) (i) Label **each** of the three arrows in **Figure 6b** to indicate the first arrival of the following seismic waves. [2]

Surface Wave

P-Wave

S-Wave

- (ii) Explain why the three types of seismic waves arrive at different times on the seismogram **Figure 6b**. [2]

.....

.....

.....

- (iii) Indicate on **Figure 6a** with an arrow labelled **N** (**N** →), a likely location on the Earth's surface where a seismic station could have recorded the seismogram shown in **Figure 6b**. Give a reason for your answer. [2]

.....

.....

.....

- (c) **Figure 6c** shows travel times (in minutes) for one of the types of seismic waves generated by an earthquake in New Zealand. The wave was not recorded in the shaded area.

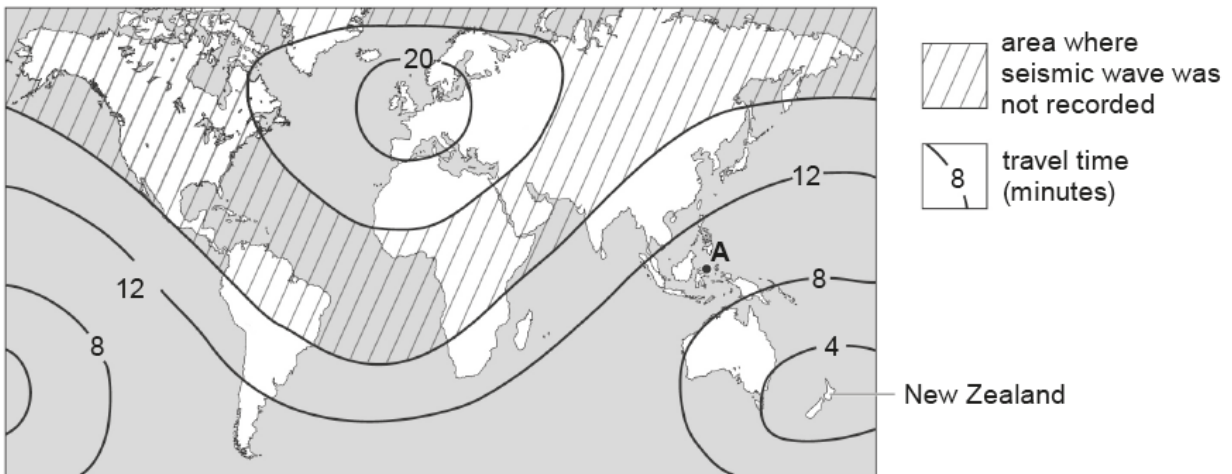


Figure 6c

Refer to **Figure 6c**.

The seismic wave travel path from the epicentre in New Zealand to seismic station A is 6600km long.

Calculate the mean velocity of these seismic waves (in km sec^{-1}) reaching station A. *Show your working.* [2]

..... km sec^{-1}

WJEC Eduqas AS Geology

Mark scheme for use with Component 2

Foundation Geology

SAMPLE ASSESSMENT MATERIALS

Instructions for examiners of AS Geology when applying the mark scheme

1 Positive marking

It should be remembered that candidates are writing under examination conditions and credit should be given for what the candidate writes, rather than adopting the approach of penalising him/her for any omissions. It should be possible for a very good response to achieve full marks and a very poor one to achieve zero marks. Worthwhile answers that meet the requirements of the question, but do not appear on the mark scheme are to be given credit.

2 Tick marking

Low tariff questions should be marked using a points-based system. Each credit worthy response should be ticked in red pen. The number of ticks must equal the mark awarded for the sub-question. The mark scheme should be applied precisely using the marking details box as a guide to the responses that are acceptable. Do not use crosses to indicate answers that are incorrect.

3 Annotated Diagrams

Where a candidate has answered a question wholly or partly by use of an annotated diagram, credit must be awarded to the annotations which form credit-worthy responses as outlined in the marking details box. Candidates must be credited only once for valid responses which appear both as annotations to diagrams and within a section of prose in the answer to the same question.

4 Banded mark schemes

Banded mark schemes are divided so that each band has a relevant descriptor. The descriptor for the band provides a description of the performance level for that band. Each band contains marks. Examiners should first read and annotate a learner's answer to pick out the evidence that is being assessed in that question. **Do not use ticks** on the candidate's response. Once the annotation is complete, the mark scheme can be applied. This is done as a two stage process.

Stage 1 – Deciding on the band

When deciding on a band, the answer should be viewed holistically. Beginning at the lowest band, examiners should look at the learner's answer and check whether it matches the descriptor for that band. Examiners should look at the descriptor for that band and see if it matches the qualities shown in the learner's answer. If the descriptor at the lowest band is satisfied, examiners should move up to the next band and repeat this process for each band until the descriptor matches the answer.

If an answer covers different aspects of different bands within the mark scheme, a 'best fit' approach should be adopted to decide on the band and then the learner's response should be used to decide on the mark within the band. For instance if a response is mainly in band 2 but with a limited amount of band 3 content, the answer would be placed in band 2, but the mark awarded would be close to the top of band 2 as a result of the band 3 content.

Examiners should not seek to mark candidates down as a result of small omissions in minor areas of an answer.

Stage 2 – Deciding on the mark

Once the band has been decided, examiners can then assign a mark. During standardising (marking conference), detailed advice from the Principal Examiner on the qualities of each mark band will be given. Examiners will then receive examples of answers in each mark band that have been awarded a mark by the Principal Examiner. Examiners should mark the examples and compare their marks with those of the Principal Examiner.

When marking, examiners can use these examples to decide whether a learner's response is of a superior, inferior or comparable standard to the example. Examiners are reminded of the need to revisit the answer as they apply the mark scheme in order to confirm that the band and the mark allocated is appropriate to the response provided.

Indicative content is also provided for banded mark schemes. Indicative content is not exhaustive, and any other valid points must be credited. In order to reach the highest bands of the mark scheme a learner need not cover all of the points mentioned in the indicative content but must meet the requirements of the highest mark band. Where a response is not creditworthy, that is contains nothing of any significance to the mark scheme, or where no response has been provided, no marks should be awarded.

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)	Dolerite (1)	1			1		
		(ii)	Dyke (1) Discordant or equivalent (1)		2		2		
	(b)	(i)	Correct grain size in centre 1.5mm (1) Finer grained at both edges (1)		2		2	2	2
		(ii)	Faster cooling at edge/chilled margin (1) produces small crystals (1) or Slower cooling towards centre (1) produces coarser crystals (1)	2			2		
	(c)	<p>Any three x (1) from:</p> <ul style="list-style-type: none"> the raised edge is in the baked margin/has undergone contact metamorphism this makes the edge higher-harder/more resistant to weathering and/or erosion recrystallization of sandstone reduction in porosity 			3	3			
	(d)	<p>Any four x (1) from:</p> <p>Sketch to illustrate</p> <ul style="list-style-type: none"> max 1mm size grains drawn to scale well sorted well rounded <p>Labels</p> <ul style="list-style-type: none"> red haematite coating/cement pore spaces/porosity <p>No labels = maximum of 3</p>	4			4		4	
	Question 1 total			7	4	3	14	2	6

Question			Marking details	Marks Available																	
				AO1	AO2	AO3	Total	Maths	Prac												
2	(a)	(i)	Time taken for half of parent isotope to decay to daughter (1)	1			1														
		(ii)	<table border="1" style="margin-left: 20px;"> <thead> <tr> <th>number of half-lives elapsed</th> <th>% parent isotope</th> <th>% daughter isotope</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>100</td> <td>0</td> </tr> <tr> <td>1</td> <td>• 50</td> <td>50</td> </tr> <tr> <td>2</td> <td>• 25</td> <td>• 75</td> </tr> </tbody> </table> <p>1 mark per correct row of table (2x1)</p>	number of half-lives elapsed	% parent isotope	% daughter isotope	0	100	0	1	• 50	50	2	• 25	• 75	2			2		
number of half-lives elapsed	% parent isotope	% daughter isotope																			
0	100	0																			
1	• 50	50																			
2	• 25	• 75																			
		(iii)	Credit any relevant working that shows that 3.125% is reached after 5 "halving" calculations (1) 5 half-lives (1)		2		2	2	2												
	(b)	(i)	Pluton (1) Reserved mark plus any two x (1) from: <ul style="list-style-type: none"> • large or over 1km in diameter or circular/oval in shape • metamorphic aureole • discordant 			3	3														
		(ii)	170 Ma		1		1														
		(iii)	Any two x (1) from: <ul style="list-style-type: none"> • heat/metamorphism from intrusion K • re-sets radiometric clock • loss of daughter atoms 			2	2														
		(iv)	Conglomerate younger than dyke J or equivalent (1) Conglomerate younger than K because included fragments (1) Dyke J older than K as cut by metamorphic aureole from K or re-set by metamorphism or use of stated ages (1)			3	3		3												
			Question 2 total	3	6	5	14	2	5												

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)	Feature J – Stipe (1) Feature K – Theca (1)	2			2		
		(ii)	Appearance Late Cambrian and Extinction Early Carboniferous (1) (1 correct = 0 marks)	1			1		
	(b)		Geographically widespread floated in the oceans or planktonic or moved by ocean currents (1) Easily identifiable unique appearance or reference to stipes and thecae variation (1) Poorly preserved fragile skeleton or easily broken or lack of hard parts (1)	3			3		
	(c)		Genus A less valuable than Didymograptus because: Any three x (1) from: <ul style="list-style-type: none"> • genus A has longer time range • genus A allows less precise dating • genus A fixed not floating • genus A less widespread 			3	3		
	(d)		Any three x (1) from: <ul style="list-style-type: none"> • shale fine grained gives best detail • low energy so less fragmentation (1) • black = anaerobic so slow decay (1) • shale impermeable so limited percolation to dissolve (1) • deep so low temps or low light so limited predators (1) 	3			3		
	(e)		Extinct (1) so nothing to compare with today/cannot apply uniformitarianism (1)	2			2		
			Question 3 total	11	0	3	14	0	0

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)	Syncline (1) Northern limb dips at less than 60 degrees (1) Where a candidate has ticked more than the required number of boxes, deduct 1 mark for each box which is wrongly chosen, to a minimum of 0.		2		2		
		(ii)	APT trending E-W in youngest bed between F1 and F2 (1) APT trending E-W in youngest bed between F2 and eastern edge of map (1)		2		2		2
	(b)	(i)	Core of syncline changes width across F1 (1)		1		1		
		(ii)	Downthrown to the east Thinner on upthrown side/wider on downthrow side (1) Due to upthrown side being eroded/downthrow side not being eroded (1) or Younger beds on east side of fault outcrop against older beds to the west (1) Younger beds are on the downthrown side (1)		2		2		
		(iii)	Hanging wall has gone up or footwall has gone down or dips to upthrown side (1) Low angle (18°) (1)		2		2		
	(c)	(i)	Core of syncline offset (1) Same width on both sides of fault or Distance between limbs same at the surface (1)		2		2		
		(ii)	48 – 62 metres (1) To the right or dextral (1)		2		2	2	2

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(d)		F1 and fold -Yes both same type of stress because Folds are formed by compression (1) Thrust faults are formed by compression (1) F1 and F2 – cannot tell or insufficient evidence (1) No cross cutting relationship (1)			4	4		4
			Question 4 total	0	13	4	17	2	8

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)	Ocean ridge symbol drawn within the age band 0-5 Ma (1) Ocean trench symbol drawn offshore and parallel to/along the coastline of South America (1)		2		2		
		(ii)	Symmetrical/repeated pattern (1) Increases in age to west and east, or A to B gets younger and B to C gets older, or credit reference to ages quoted (1)	2			2		
	(b)	(i)	Credit any relevant working that shows that $700 \text{ km in } 30 \text{ million years} = \frac{700,000,000}{30,000,000} \text{ (1)}$ 2.33 cm per year (accept 2.2-2.5 cm per year) (1)		2		2	2	2
		(ii)	Spreading rate changed at 30 Ma (1) Faster 30-42 Ma (6.5cm/yr), Slower 0-30 Ma (2.33 cm/yr) (1)		2		2	2	2
	(c)	<p>Indicative content</p> <p>Subduction of oceanic/mafic crust/lithosphere/plate Reference to slab pull or ridge push mechanisms Increase in temperature with depth Release of water from subducting slab lowers melting point Partial melting of mantle wedge/subducted plate Minerals with lowest melting point melt first – feldspars Magma lower density so more buoyant than surroundings so rises Stoping Contamination/assimilation of xenoliths/continental material Reference to silica rich/viscous magma</p>	6			6			

Question			Marking details	Marks Available						
				AO1	AO2	AO3	Total	Maths	Prac	
			<p>5–6 marks There is a clear response which describes and explains in detail most of the processes involved in the formation the magma and the volcanic activity. This includes processes related to each of the following: subduction, partial melting, the rise of magma. A logical sequence of the processes is clearly developed in the order subduction, partial meting and the rise of magma. <i>There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant.</i></p> <p>3–4 marks The response describes and explains many of the processes involved in the formation the magma and the volcanic activity. This includes processes related to subduction, and partial melting but processes occurring during the rise of magma may be missing. A logical sequence of the processes is developed in places but not throughout. <i>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.</i></p> <p>1–2 marks The response describes and explains only a few of the processes involved in subduction and partial melting. There is a lack of detail in the response and comment is rather superficial. There may be a significant lack of relevance in places. <i>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.</i></p> <p>0 marks <i>No attempt made or no response worthy of credit</i></p>							
			Question 5 total	8	6	0	14	4	4	

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	The point on the Earth's surface above the focus/above the origin of the earthquake (1)	1			1		
		(ii)	S-waves cannot pass through liquid (1) Outer core liquid (1) (or S-waves cannot pass through liquid outer core = (2))	2			2		
	(b)	(i)	P S Surface (2) 3 correct = 2 marks, 1 or 2 correct = 1 mark	2			2		
		(ii)	Any two x (1) from: <ul style="list-style-type: none"> they travel at different velocities or equivalent they travel along different paths-body waves within the Earth, surface waves over the surface reference to the different nature of wave transmission e.g. P-waves compressive but S-waves shear 	2			2		
	(iii)	Located within 0-103° of epicentre (1) All three (or P and S) are recorded or not in a shadow zone (1)							
	(c)	$\frac{6660 \text{ km}}{10 \text{ minutes or } 600 \text{ seconds}}$ (1) 11 km s^{-1} (1)							

Question		Marking details	Marks Available					
			AO1	AO2	AO3	Total	Maths	Prac
	(d)	<p>Indicative content Discontinuity-boundary within Earth where there is a change in the physical properties of the rocks (density/rigidity) For seismic stations more than 200km away from epicentre The two sets of P and S waves received represent direct waves and refracted waves Direct waves travel only in the crust Refracted waves travel within the mantle Refracted waves arrive before Direct waves Reference to speeds: Direct P wave 6km/sec, Refracted P wave 8km/sec Refracted waves bent towards the horizontal in the mantle Which is more rigid/incompressible than the crust Credit description of depth to Moho (1)</p> <p>5–6 marks There is a clear response which describes in detail the seismic evidence for the Moho, referring to direct and refracted seismic waves. A detailed explanation of the cause of evidence is developed which refers to the effects of density and rigidity/incompressibility of crust and mantle materials There is a well-developed and logical sequence involved in the explanation of the evidence.</p> <p><i>There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant.</i></p>	6			6		

		<p>3–4 marks</p> <p>The response describes the seismic evidence for the Moho with reference to direct and refracted seismic waves. There is a reasonable attempt to explain the cause of the direct and refracted waves, referring to the effects of density and rigidity/incompressibility, although this may lack some clarity. A logical sequence of ideas occurs in places but not throughout.</p> <p><i>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.</i></p>						
		<p>1–2 marks</p> <p>The response describes only a few details of the seismic evidence involved with brief reference to direct and refracted waves. There is some explanation for the cause of the direct and refracted waves. All comment is rather superficial. There may be a lack of relevance in places.</p> <p><i>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.</i></p>						
		<p>0 marks</p> <p><i>No attempt made or no response worthy of credit</i></p>						
		Question 6 total	13	4	0	17	2	4