GCSE (9-1)

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WJEC Eduqas GCSE (9-1) in

GEOLOGY

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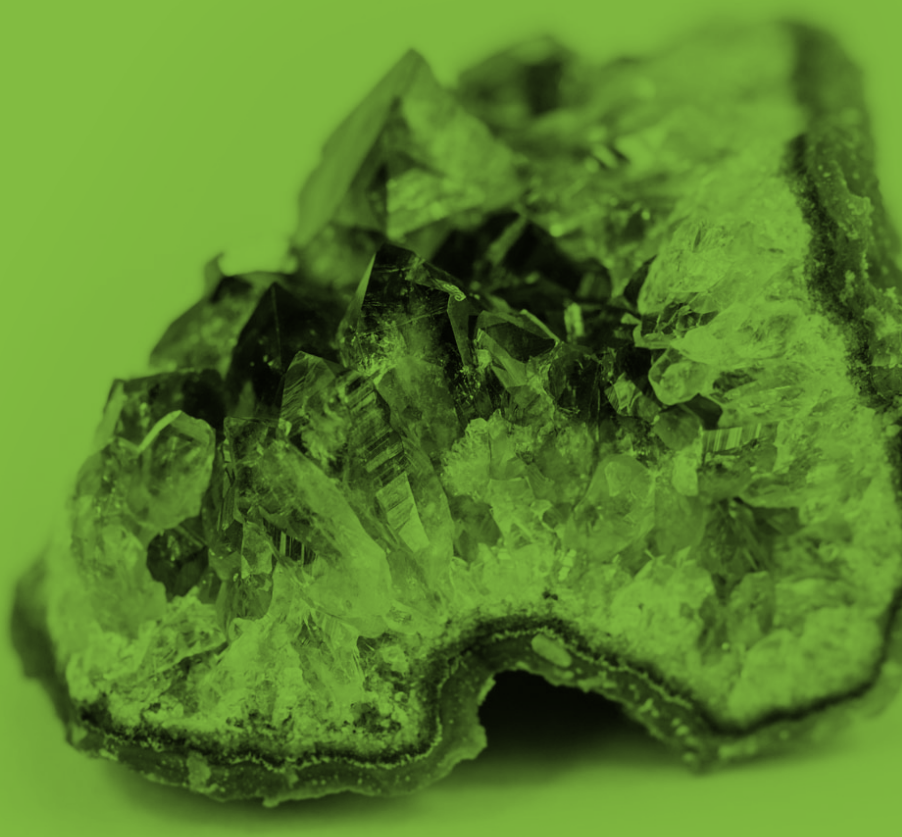
SAMPLE ASSESSMENT MATERIALS

Teaching from 2017
For award from 2019



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For teaching from 2017
For award from 2019

GCSE (9-1) GEOLOGY

SAMPLE ASSESSMENT MATERIALS

Contents

Candidate Name	Centre Number					Candidate Number				
						0				

GCSE

GEOLOGY

COMPONENT 1

Geological Principles

SAMPLE ASSESSMENT MATERIALS

(1 hour 15 minutes)

Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	14	
2.	25	
3.	9	
4.	8	
5.	11	
6.	13	
Total	**80**	

ADDITIONAL MATERIALS
In addition to this examination paper you will need the Data Sheet and 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 **2** and **5.**

*Answer **all** questions.*

1. **Figure 1a** is a geological cross-section.
Photograph 1b shows rock **A** in **Figure 1a**.
Photograph 1c shows a fossil specimen collected from rock **A** in **Figure 1a**.

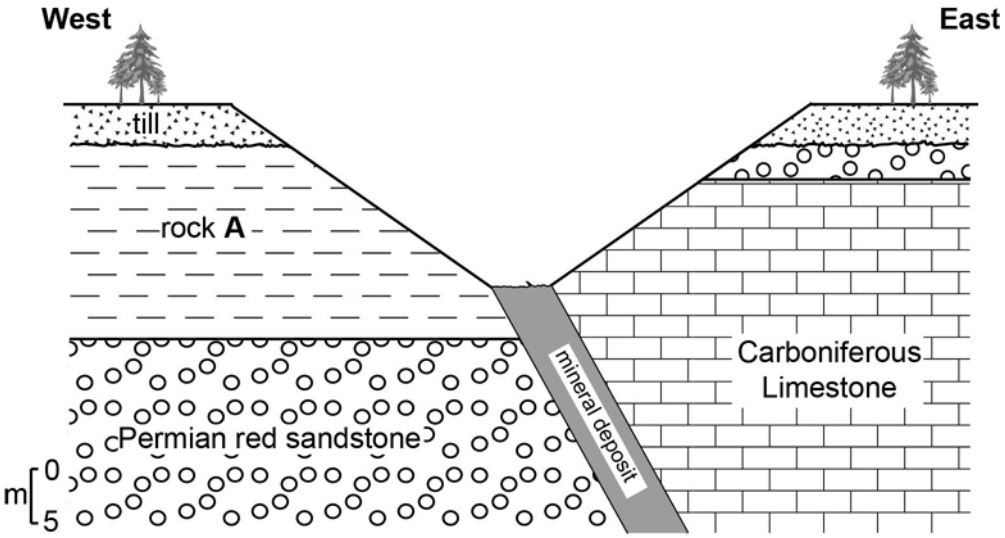
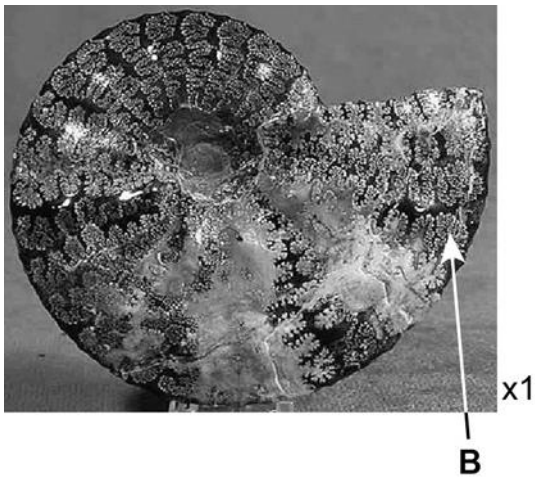


Figure 1a

Rock **A** – a grey, fine-grained, laminated rock

0 10
cm

Photograph 1b



Photograph 1c

(a) Refer to **Photographs 1b** and **1c**.

(i) Name rock **A** in **Photograph 1b.** Tick (✓) only **one** box. [1]

- ☐ limestone
- ☐ sandstone
- ☐ conglomerate
- ☐ shale
- ☐ breccia

(ii) Identify the part of the fossil labelled **B** on **Photograph 1c**. [1]

……

(iii) Rock **A** is Jurassic in age. Give **one** piece of evidence which was used to decide upon this age for rock **A**. [1]

……

……

(iv) State the most likely environment of deposition of rock **A**. Tick (✓) only **one** box. [1]

- ☐ formed by the evaporation of sea water
- ☐ deposited from melting ice
- ☐ deposited by a river
- ☐ deposited as wind-formed
- ☐ marine deposition

(b) **Figure 1d** shows a field sketch of the till in **Figure 1a**.

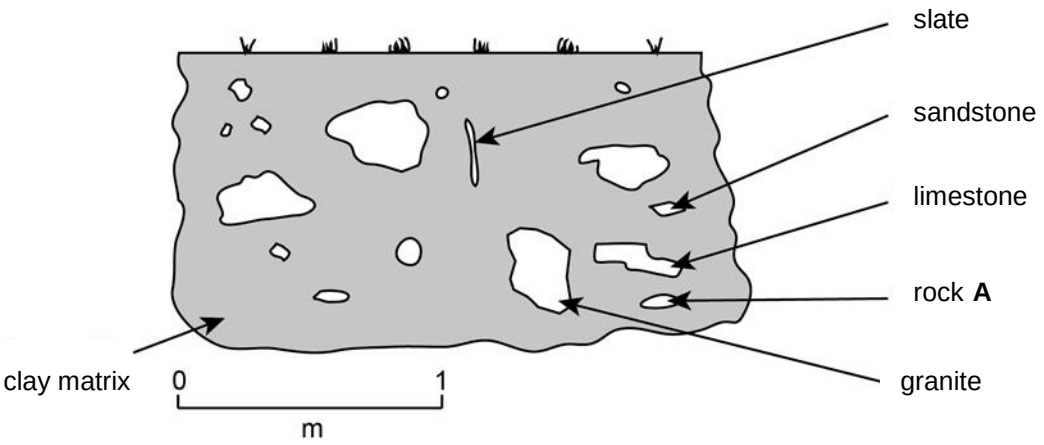


Figure 1d

(i) Use the **Data Sheet** to select the term which best describes the limestone boulder in the till in **Figure 1d**. Tick (✓) only **one** box. [1]

- ☐ rounded
- ☐ subrounded
- ☐ well rounded
- ☐ high sphericity
- ☐ low sphericity

(ii) State the most likely transporting medium for the till in **Figure 1d**. [1]

……

(c) **Figure 1e** demonstrates that a fault was involved in the formation of the mineral deposit shown.

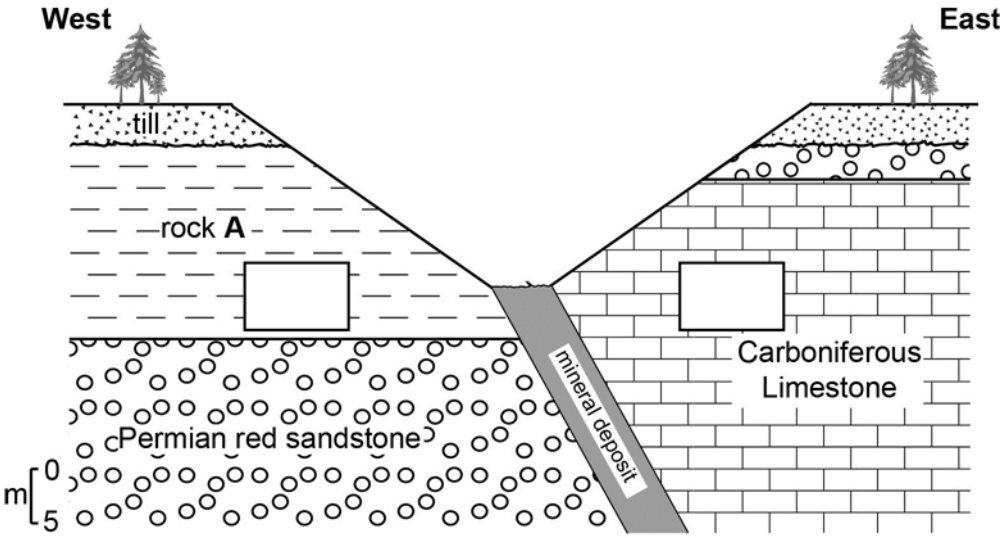


Figure 1e

(i) Draw arrows in the boxes on **Figure 1e** to indicate the downthrown and upthrown sides of the fault. [1]

(ii) Name the type of fault shown in **Figure 1e**. [1]

……

(d) (i) **Table 1** shows the properties of the metal ore and gangue mineral found in the mineral deposit in **Figure 1e**.

	Hardness	Streak	Cleavage
metal ore	2½	grey	breaks into cubes
gangue mineral	7	none	none

Table 1

Use the **Data Sheet** to identify the metal ore and the gangue mineral.

metal ore ☐ gangue mineral ☐

[1]

(ii) The mineral deposit in **Figure 1e** is a hydrothermal deposit. Explain how this hydrothermal deposit formed. [3]

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(iii) 7.5×10^4 tonnes of mineral deposit were extracted, from which 3×10^3 tonnes of metal ore were separated.

Calculate the percentage of metal ore in the mineral deposit. *Show your working*. [2]

Percentage of metal ore = …… %

14

2. **Figure 2a** shows the pattern and ages of magnetic stripes in the ocean crust at a mid-ocean ridge.

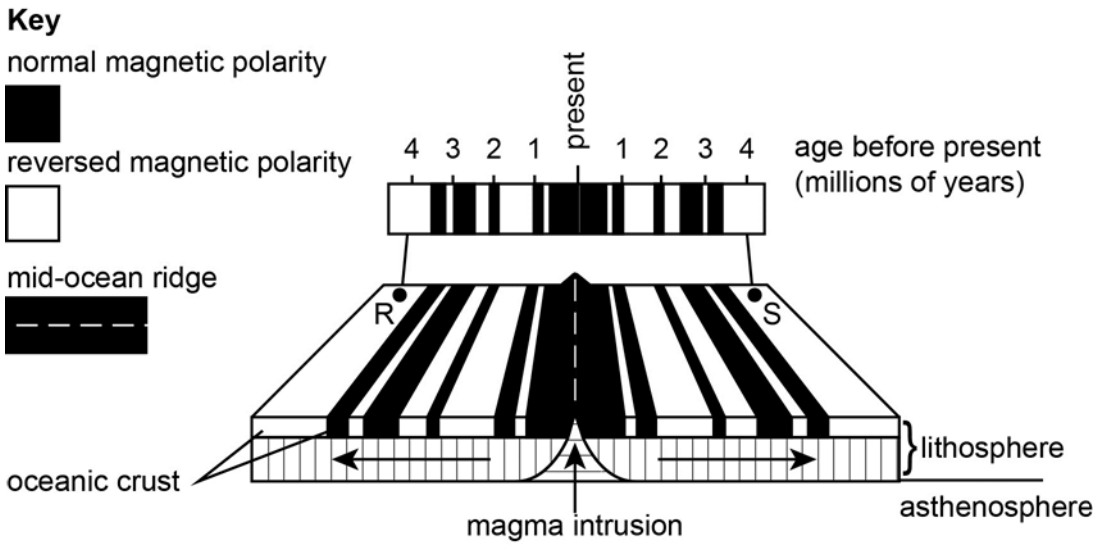

Figure 2a

(a) (i) Name the type of plate boundary shown in **Figure 2a.** Tick (✓) only **one** box. [1]

☐ convergent (destructive) ocean-ocean

☐ convergent (destructive) ocean-continental

☐ divergent (constructive)

☐ conservative (transform)

☐ convergent (destructive) continent-continent

(ii) Locations **R** and **S** in **Figure 2a** are 180 km apart on the ocean floor. State the mean distance, in centimetres, that **R** and **S** are spreading away from each other in one year.
Show your working. [2]

..…….. cm

(iii) Explain how the magnetic stripes in the rocks of the oceanic crust were formed. [4]

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(b) **Figure 2b** is a graph showing the change in latitude of the British area through geological time.

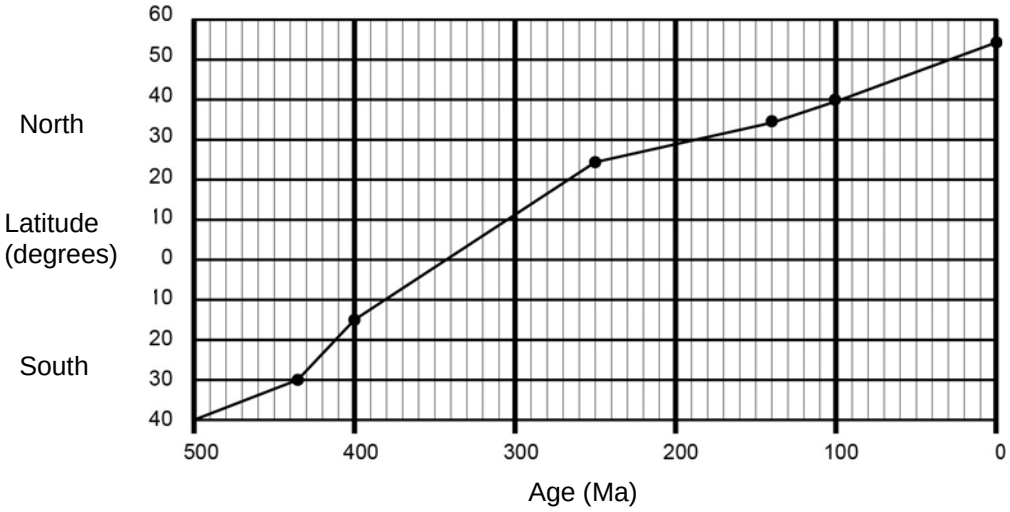


Figure 2b

Refer to **Figure 2b**.

(i) Using the **Data Sheet,** state during which geological period the British area crossed the equator. [1]

……

(ii) Calculate the rate of change in latitude of the British area between 400 and 250 Ma.
Show your working. Give your answer to two significant figures. [3]

. ……. degrees ma^{-1}

(iii) Using the **Data Sheet**, state which **two** of the following statements correctly interpret the information shown in **Figure 2b**. Tick (✓) only **two** boxes. [2]

- ☐ the rate of drift was constant
- ☐ the rate of drift was more rapid between 450 Ma and 250 Ma
- ☐ drift was away from the north pole during the Mesozoic
- ☐ drift was away from the equator during the Devonian
- ☐ the rate of drift slowed during the Mesozoic
- ☐ the rate of drift was faster in the Cenozoic than the Carboniferous

(iv) Indicate which of the following lines of evidence does **not** support the theory of continental drift. Tick (✓) only **one** box. [1]

- ☐ paleomagnetism
- ☐ mass extinctions
- ☐ fossil distributions
- ☐ age of the ocean floor
- ☐ jigsaw fit of opposing coastlines

(c) **Figure 2c** is a graph showing the relative amounts of evaporite deposits (such as halite) forming at different latitudes at the present day.

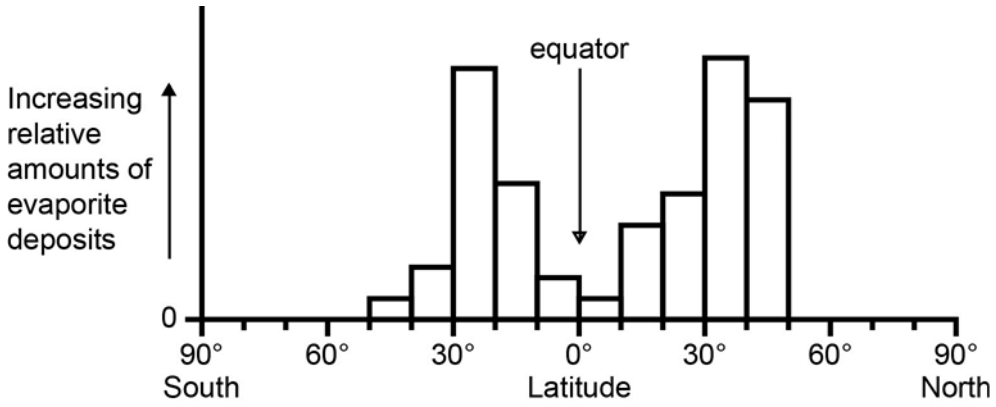


Figure 2c

(i) Refer to **Figure 2c**. Indicate between which latitudes most evaporite deposits are forming in the northern hemisphere.
Tick (✓) only **one** box. [1]

- ☐ 0º - 10º
- ☐ 20º - 30º
- ☐ 30º - 40º
- ☐ 40º - 50º
- ☐ 50 - 60º

(ii) In Cheshire in the UK there are evaporite deposits which are 200 metres thick.

On average a 5 centimetre thickness of evaporite is produced by the evaporation of 3 metres depth of sea water.

Calculate the depth of sea water that must have evaporated to produce a 200 metre thick layer of evaporite. *Show your working*. [3]

Depth of sea water =……..m

(d) **Figure 2d** is a sedimentary log of Upper Palaeozoic rocks in Britain. **Photograph 2e** shows desiccation cracks on a bedding plane within the red shale. **Photograph 2f** shows a fossil coral, found growing vertically within the limestone in **Figure 2d**.

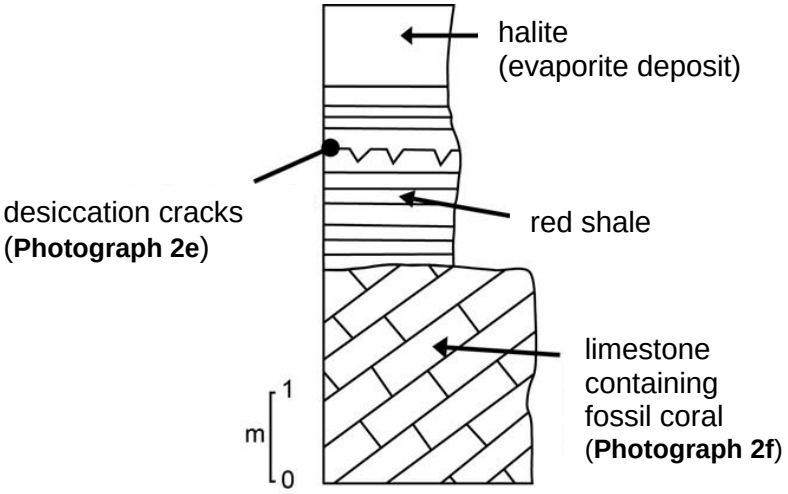
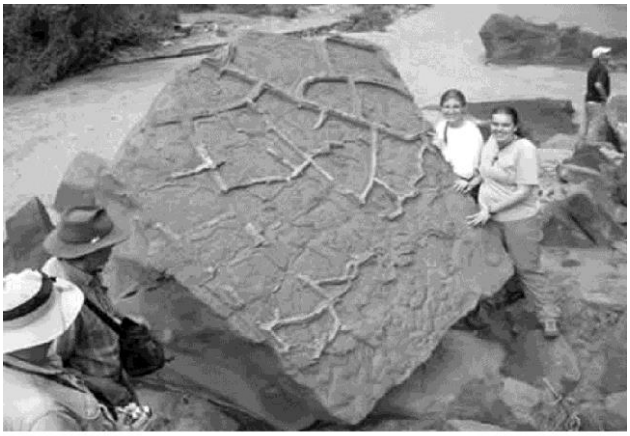
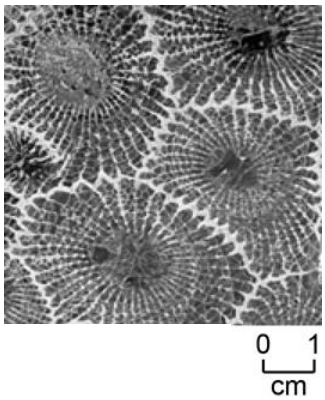


Figure 2d



Photograph 2e



Photograph 2f

(i) Describe the mode of life of the fossil coral in **Photograph 2f**.
Tick (✓) only **one** box. [1]

- ☐ lived as a colony fixed to the sea bed
- ☐ swam in fresh water
- ☐ not mobile and lived on land
- ☐ crawled around the sea bed
- ☐ floated in the surface waters of the oceans

(ii) Refer to **Figures 2c** and **2d**, and **Photographs 2e** and **2f**. Interpret and evaluate the evidence for changes in the latitude of the British area over geological time. [6 QER]

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3. **Figure 3a** is a geological map. **Figures 3b** and **3c** are photomicrographs of rocks **E** and **H**, collected from the area within the map **Figure 3a**.

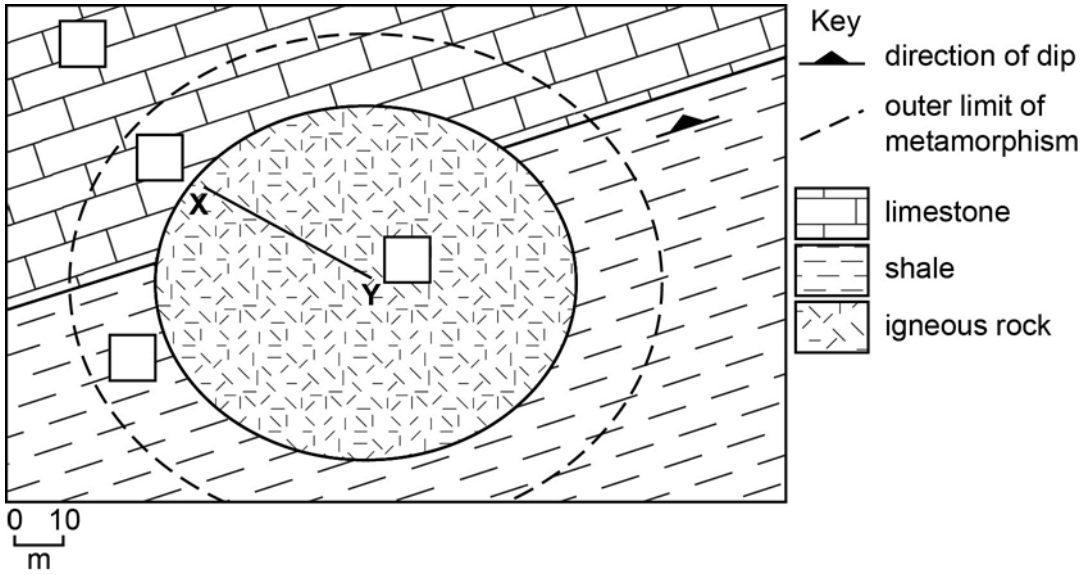

Figure 3a

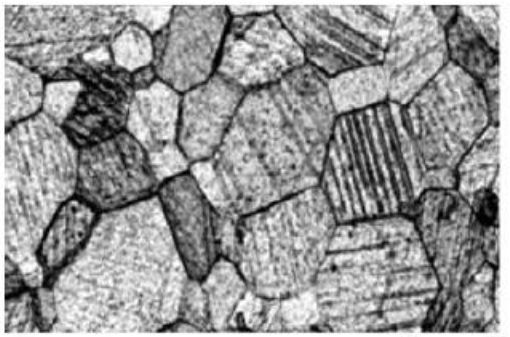

Figure 3b

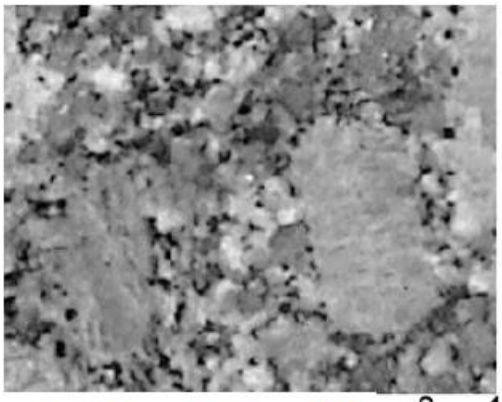

Figure 3c

(a) Refer to **Figure 3b**.

(i) Rock **E** is composed of a white mineral which scratches with a copper coin but is harder than a finger nail. Name this mineral. [1]

……

(ii) Describe the texture of rock **E** in **Figure 3b**. Tick (✓) only **two** boxes. [2]

- ☐ crystalline
- ☐ foliated
- ☐ non-foliated
- ☐ well sorted
- ☐ fragmental (clastic)
- ☐ schistose texture

(iii) Put a tick (✓) in **one** of the four blank boxes on **Figure 3a** to show the most likely location of rock **E**. Give **two** reasons for your choice. [3]

1 ……..

……

2 ……

……

(b) (i) Identify which **one** of the following processes in the rock cycle lead to the formation of rock **H** in **Figure 3c**. Tick (✓) only **one** box. [1]

- ☐ regional metamorphism
- ☐ recrystallisation
- ☐ crystallisation of magma
- ☐ extrusion
- ☐ rapid deposition

(ii) Explain why the size of the crystals in the igneous intrusion in **Figure 3a** becomes coarser along the line from **X** to **Y**. [2]

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4. **Figure 4a** is a map showing the location of the Indian Ocean earthquake on 26th December 2004 and the travel times for the resulting tsunami.

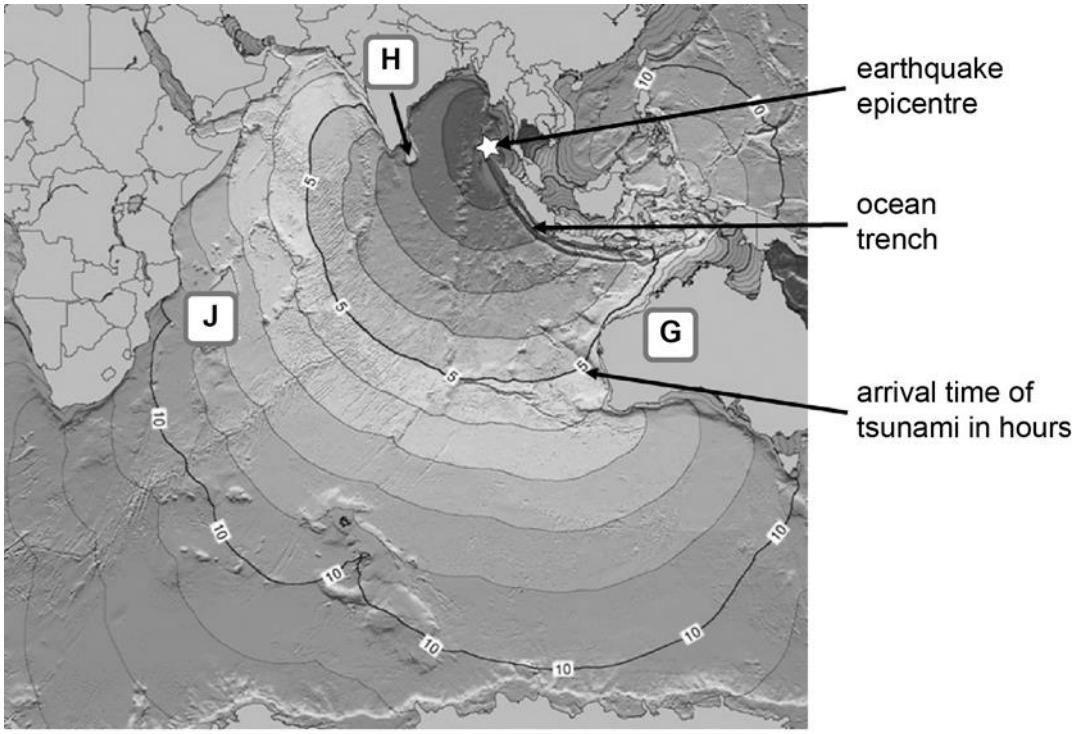

Figure 4a

(a) (i) State the process most likely to have caused the earthquake at this location. Tick (✓) only **one** box. [1]

☐ sea-floor spreading

☐ subduction

☐ changes in sea level

☐ cooling of magma

☐ flooding

(ii) The tsunami took 5 hours to reach Australia (**G**). State how long the tsunami took to reach Sri Lanka (**H**) to the nearest hour. [1]

☐ hours

(iii) The island of Madagascar (**J**) is 6,000 km from the earthquake epicentre. Calculate the speed of the tsunami across the Indian Ocean. *Show your working*. [2]

Speed = ……km hr^{-1}

(b) **Figure 4b** shows the behaviour of a tsunami as it reaches shallow water.

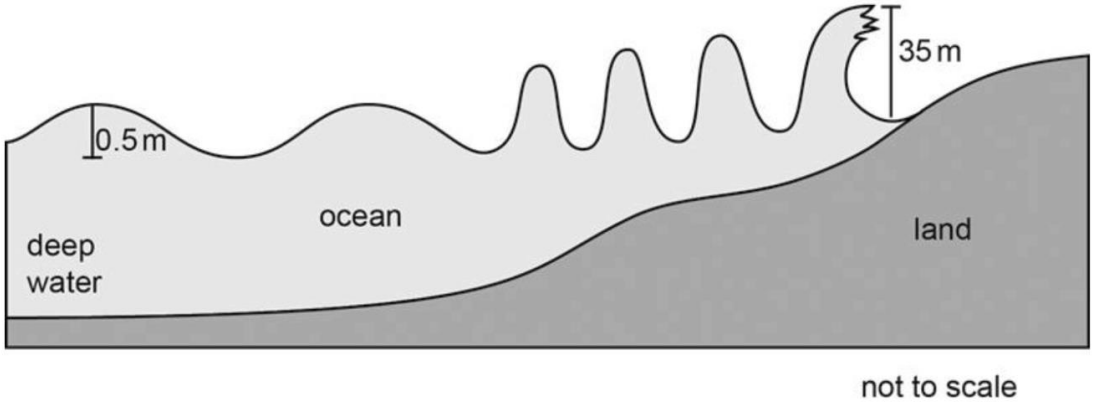

Figure 4b

(i) Refer to **Figure 4b**. Give **one** reason why tsunamis are difficult to detect in deep water. [1]

……

.....

(ii) Describe **three** methods which could be used to reduce the loss of life if a tsunami affected the Indian Ocean region again. [3]

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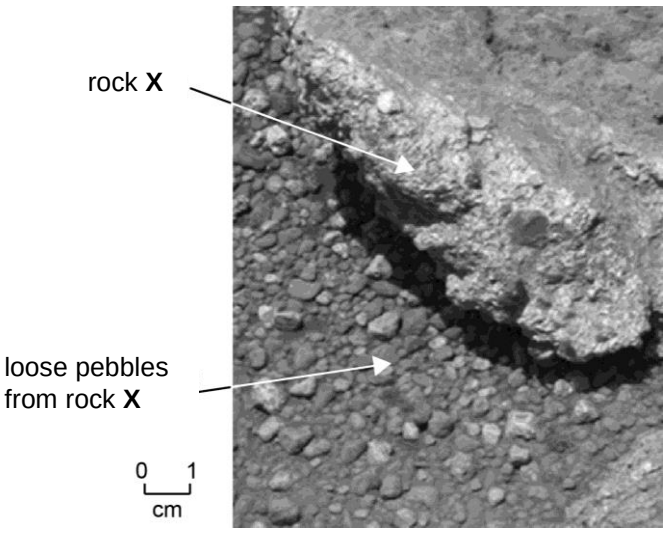
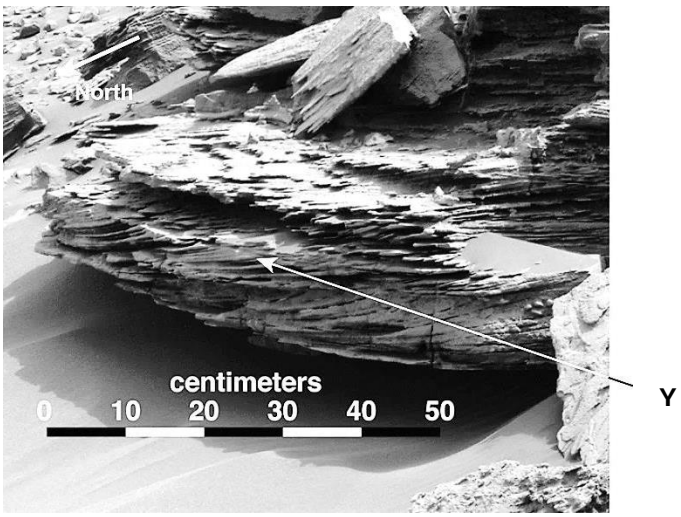
5. **Photographs 5a** and **5b** are photographs of sedimentary strata taken during the exploration of the Gale Crater on Mars.



Source:www.nasa.gov

Photograph 5a



Source:www.nasa.gov

Photograph 5b

(a) (i) Describe the texture of rock **X** in **Photograph 5a**. Tick (✓) only **two** boxes. [2]

- ☐ crystalline
- ☐ very well sorted
- ☐ coarse grained fragments
- ☐ poorly sorted
- ☐ fine grained fragments
- ☐ foliated

(ii) Describe the process that has caused the breakdown of rock **X** to produce the loose pebbles in **Photograph 5a**. [2]

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(b) Name the sedimentary structure labelled **Y** in **Photograph 5b**. Tick (✓) only **one** box. [1]

- ☐ graded bedding
- ☐ cross bedding
- ☐ unconformity
- ☐ desiccation cracks
- ☐ trace fossils

(c) Refer to **Photographs 5a** and **5b** and the principle of uniformitarianism. Analyse and interpret the evidence that enabled scientists to conclude that the rocks at Gale Crater were deposited by water flowing towards the East. [6 QER]

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6. **Figure 6a** is a cross-section showing the position of oil and gas traps (**K**, **L** and **M**).

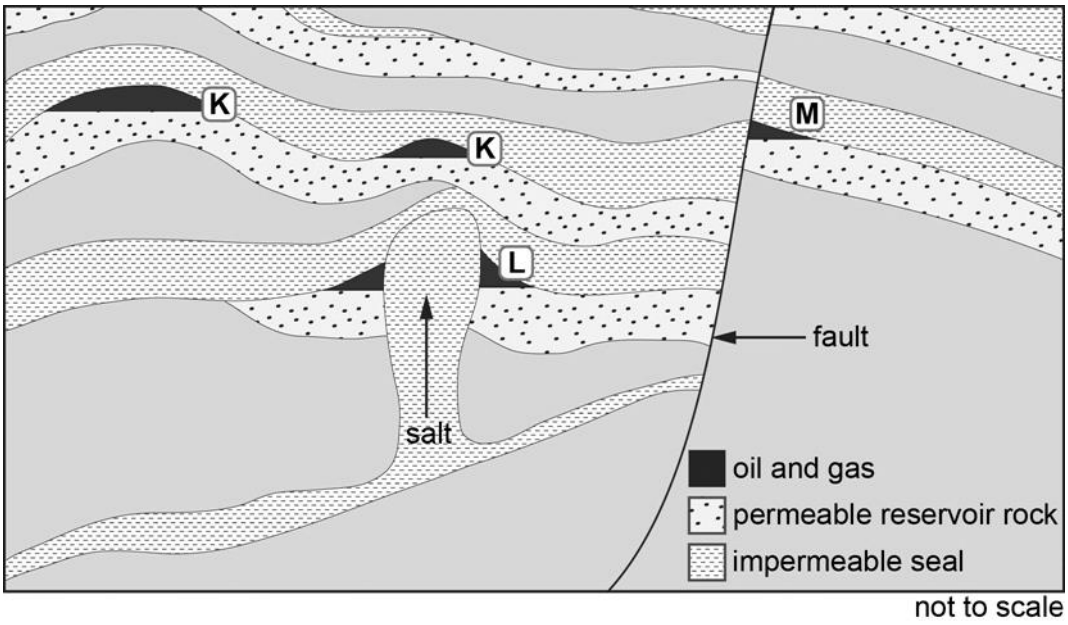

Figure 6a

(a) (i) Identify the types of oil traps represented by letters **K** and **L**. [2]

K ……

L ……

(ii) From the following list, select the **two** most suitable techniques for detecting the structures **K**, **L** and **M** containing oil and gas in **Figure 6a**. Tick (✓) only **two** boxes. [2]

- ☐ magnetic survey
- ☐ river sediment analysis
- ☐ seismic survey
- ☐ soil survey
- ☐ geological mapping
- ☐ vegetation survey

(iii) Describe **two** features of rock texture that make a sedimentary rock highly suitable as a reservoir for oil and gas. [2]

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(b) **Table 6** shows the amount of carbon dioxide released from volcanoes compared to that produced by humans by the burning of fossil fuels.

Carbon dioxide ($C0_2$) producers	**Billion metric tons per year (Gt/y)**
Total global volcanic emissions in 2010	0.35
Total produced by humans in 2010	35.0
Produced by eruption of Mount St. Helens, 18th May 1980	0.01
Produced by eruption of Mount Pinatubo, 15th June 1991	0.05

Table 6

(i) State which **one** of the following statements is **incorrect**. Tick (✓) only **one** box. [1]

☐ the amount of carbon dioxide produced globally by volcanoes in 2010 was less than that produced by humans

☐ humans produced 100 times more carbon dioxide than volcanoes in 2010

☐ it would take 3500 volcanic eruptions of Mount St Helens to equal the human production of carbon dioxide in 2010

☐ it would take 7 volcanic eruptions of Mount Pinatubo to equal the human production of carbon dioxide in 2010

☐ the largest volcanic eruptions produced much less carbon dioxide than humans did in 2010

(ii) State which **one** of the following rock cycle processes does **not** reduce the amount of carbon dioxide in the atmosphere. Tick (✓) only **one** box. [1]

- ☐ formation and burial of calcium carbonate shells
- ☐ deposition of organic-rich shales
- ☐ deposition of limestones
- ☐ deposition of coal
- ☐ metamorphism of limestone

(c) **Figure 6b** shows one of the effects of an increasing atmospheric temperature.

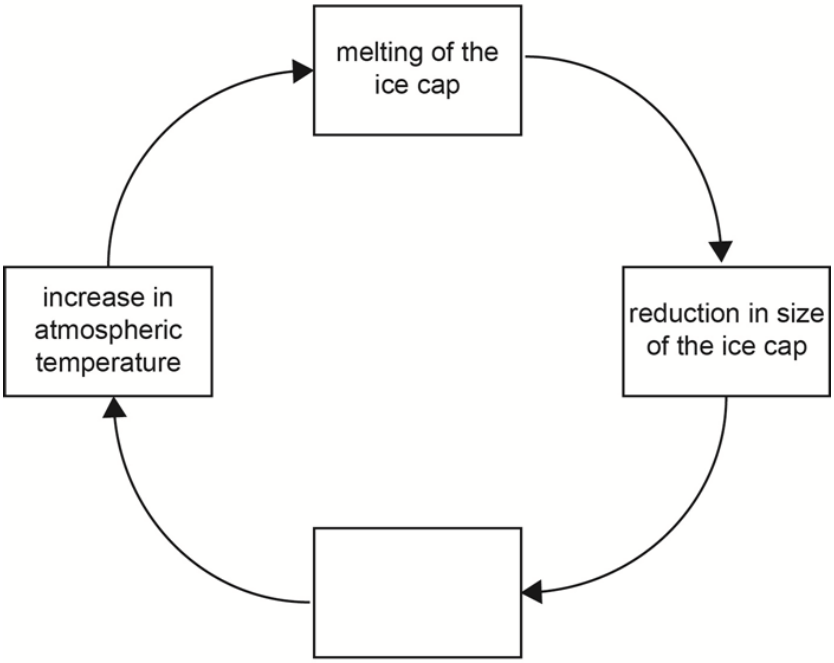


Figure 6b

Select the most suitable process to complete the feedback mechanism shown in **Figure 6b**. Tick (✓) only **one** box. [1]

- ☐ increased albedo
- ☐ decreased albedo
- ☐ greenhouse effect
- ☐ rising of sea level
- ☐ increase in carbon dioxide in the atmosphere

(d) **Figure 6c** shows an ice-core record of the change in carbon dioxide in the atmosphere.
Figure 6d shows the changes in global average temperature.

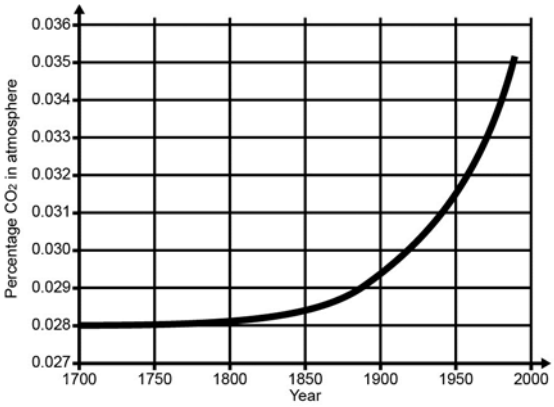


Figure 6c

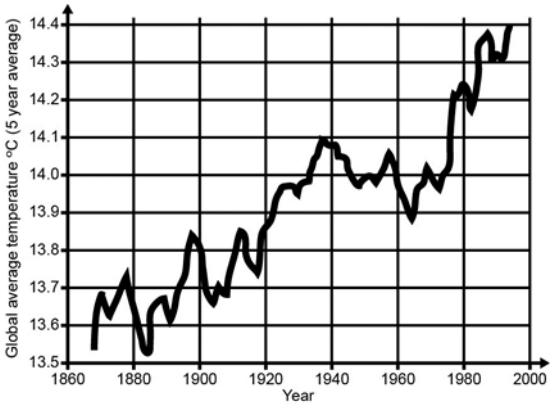


Figure 6d

(i) Describe the change in percentage of carbon dioxide in the ice-core record between 1700 and 1990 in **Figure 6c**. [2]

……

……

……

……

(ii) *"Increased amounts of carbon dioxide in the atmosphere cause the atmospheric temperature to rise".*

State **one** way in which the graphs in **Figures 6c** and **6d** support this statement and **one** way in which they do not support this statement. [2]

Support: ……

……

Do not support: ……

……

END OF PAPER

GCSE

GEOLOGY

DATA SHEET

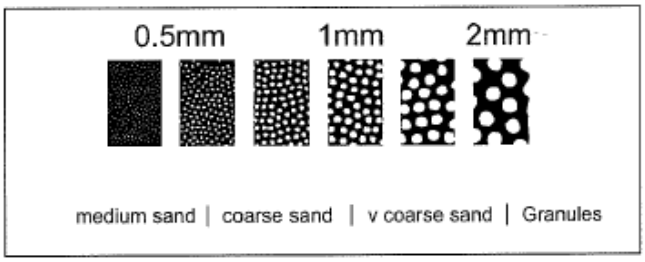
Physical properties of minerals in hand specimen

Name	***Hardness (Mohs' Scale)***	***Typical Colour***	***Streak***	***Lustre***	***Cleavage (number of directions)***
Quartz	7	colourless or white	scratches streak plate	glassy	none
Feldspar	6	white	scratches streak plate	pearly to glassy	2 good
Mica	2½	silvery or brown	white	pearly to glassy	1 good
Augite	5½	black	scratches streak plate	glassy	2 good
Olivine	6½	green	scratches streak plate	glassy	none
Halite	2½	white	white	glassy	3 good
Calcite	3	white	white	glassy	3 good
Haematite	5½	black or red-brown	red-brown	metallic or dull	none
Galena	2½	grey	grey	metallic	3 good
Garnet	7	red	scratches streak plate	glassy	none

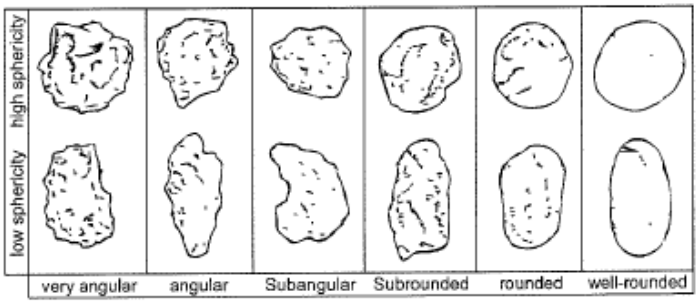
Mohs' Scale of hardness

Mineral/ hardness		*Common equivalent*
Diamond	10	
Corundum	9	
Topaz	8	
Quartz	7	
Orthoclase feldspar	6	← steel pin
Apatite	5	
Fluorite	4	
Calcite	3	← copper coin
Gypsum	2	← finger nail
Talc	1	

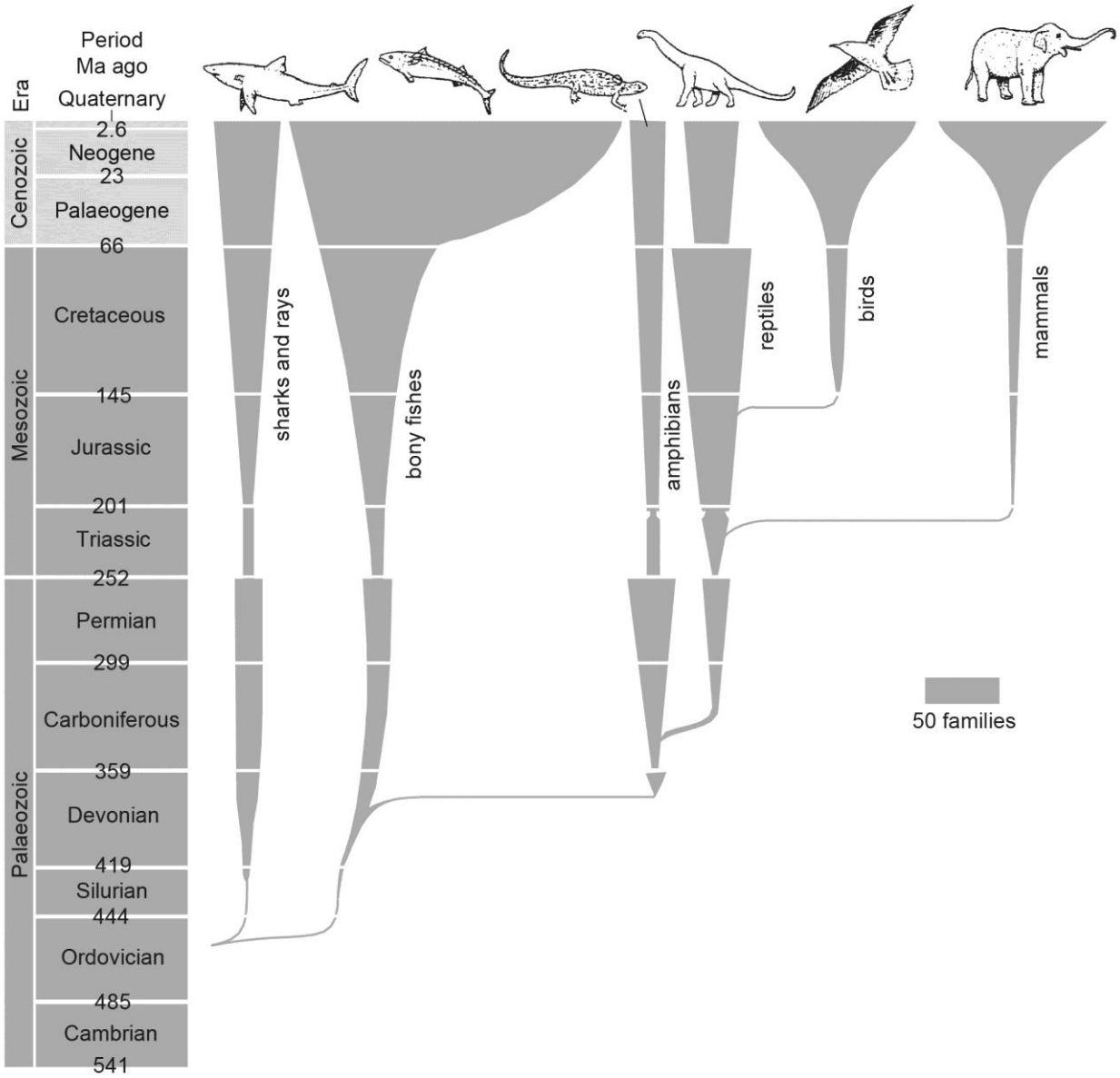
Grain size scale



Grain shape and sphericity scale



Geological ranges of vertebrates



WJEC Eduqas GCSE Geology

Mark scheme for use with Component 1

Geological Principles

SAMPLE ASSESSMENT MATERIALS

Instructions for examiners of GCSE 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 Multiple choice marking

For all questions involving multiple choice (tick box) answers, 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. The answers to these questions are indicated with a * in the mark scheme. This applies to both on-screen and paper versions of Component 1.

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)	Shale* (1)	1			1		
		(ii)	Suture line (1)	1			1		
		(iii)	Frilly lobes/frilly saddles/more complex suture line (1)		1		1		
		(iv)	Marine deposition* (1)		1		1		
	(b)	(i)	Low sphericity* (1)		1		1		1
		(ii)	Ice (1)		1		1		
	(c)	(i)	East side upthrown, west side downthrown (1)		1		1		
		(ii)	Reverse fault (1)	1			1		
	(d)	(i)	Galena and Quartz (1) (only 1 correct =0 marks)	1			1		1
		(ii)	**Any three x (1) from:** • water passing through joints in limestone or faults • dissolves metals from a large volume of rock **or** formed of mineral rich fluids from magma • watery fluids rise because they are hot and of lower density than surrounding water/rock • re-deposits minerals in a more concentrated form in the fault plane		3		3		
		(iii)	$\frac{3\times10^3}{7.5\times10^4}$ or $\frac{3000}{75000}$ or equivalent (1) 4 [%] (1)		2		2	2	
			Question 1 total	**4**	**10**	**0**	**14**	**2**	**2**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)	Divergent (constructive)* (1)	1			1		
		(ii)	$\frac{18000000}{4000000}$ or equivalent (1) 4.5 [cm] (1)		2		2	2	
		(iii)	**Any four x (1) from:** • as basalt/lava/magma cools the iron rich minerals/ magnetite takes on magnetic field • magnetic alignment orientated in same direction as today's field is Normal polarity • magnetic reversals occur • all stripes formed at ridge crest • crust split apart and moved sideways by later eruptions • forms stripes symmetrical about the ridge	4			4		
	(b)	(i)	Carboniferous (1)		1		1	1	
		(ii)	$\frac{40}{150}$ or equivalent (1) 0.2666 (1) 0.26 [degrees ma^{-1}] (1)		3		3	3	
		(iii)	Drift more rapid 450-250 Ma* (1) Drift slowed during Mesozoic (1)			2	2	2	
		(iv)	Mass extinctions* (1)	1			1		
	(c)	(i)	30º - 40º *(1)	1			1	1	
		(ii)	1m of rock formed by (20 x 3) or 60m depth of sea water (1) 200 x 60 (1) 12,000 [m] (1)		3		3	3	

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)	Lived as a colony fixed to the sea bed* (1)	1			1		
	(d)	(ii)	***Indicative content*** **Interpretation of evidence** Interpretation that the desiccation cracks indicate past desert lake environments. Interpretation that halite/evaporates indicate past deposition at 30-40º latitude. Interpretation that the coral indicates past location close to equator. Interpretation that limestone indicates deposition in tropical/warm seas.						
			5–6 marks There is a clear response which draws upon the interpretation of a minimum of three of the four pieces of evidence (desiccation cracks, halite, coral and limestone). The sources of evidence are interpreted coherently as outlined in the indicative content above. There is an evaluation of the evidence that takes into account that Britain is not at the latitudes indicated by the evidence now. Some recognition that global climate change could also bring about effects without need for a change in climate A conclusion is drawn that the evidence supports the view that has been argued (ie that it is caused by change in latitude or that it is caused by climate change) *There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant.*			6	6		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
			3–4 marks The response draws upon the interpretation of a minimum of two of the four pieces of evidence (desiccation cracks, halite, coral and limestone). The sources of evidence are interpreted quite well as outlined in the indicative content above. There is some attempt at an evaluation of the evidence. A conclusion is drawn that supports the view that has been argued (ie that it is caused by change in latitude or that it is caused by climate change). *There is a line of reasoning which is partially coherent, supported by some evidence and with some structure. Mainly relevant information is included but there may be some irrelevant information or minor errors.* **1–2 marks** The response makes use of the interpretation of only one or two of the four pieces of evidence (desiccation cracks, halite, coral and limestone) with rather superficial comment. There may be a lack of relevance in places. There is little evidence of evaluation, although there is a conclusion that supports the view that has been argued (ie that it is caused by change in latitude or that it is caused by climate change). *There is a basic line of reasoning which is not coherent, supported by limited evidence and with very little structure. There may be significant errors or the inclusion of much irrelevant information.* **0 marks** *No attempt made or no response worthy of credit.*						
			Question 2 total	**8**	**9**	**8**	**25**	**12**	**0**

Question			Marking details	Marks Available					
				AO1	**AO2**	**AO3**	**Total**	**Maths**	**Prac**
3	(a)	(i)	Calcite (1)	1			1		1
		(ii)	Crystalline*(1) Non-foliated* (1)	2			2		2
		(iii)	E within limestone box in metamorphic aureole (1) Limestone or marble contain calcite (1) Metamorphism creates crystalline texture (1)	 1 1	1		 3		
	(b)	(i)	Crystallisation of magma* (1)		1		1		
		(ii)	Rapid cooling at the edge (1) because chilled by cold country rock (1) **Or** Slow cooling in the centre (1) because far from chilling of country rock, insulated from effects of chilling (1)	 2			 2		
			Question 3 total	**7**	**2**	**0**	**9**	**0**	**3**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)	Subduction* (1)		1		1		
		(ii)	2 hours (1)	1			1	1	
		(iii)	$\frac{6000}{8}$ (1) 750 [km hr $^{-1}$] (1)		2		2	2	
	(b)	(i)	Wave height only 0.5m or little change in height of sea surface as tsunami passes in deep water (1)		1		1		
		(ii)	**Any three x (1) from:** • better warning system at sea • better evacuation procedures • warning notices on land • greater awareness and community preparedness • sea defences • tsunami resistant building design • building regulations/planning restrictions For each mark, the answer must provide a description of the point listed e.g. a brief description of a sea defence, a brief description of tsumani resistant building design.	3			3		
			Question 4 total	**4**	**4**	**0**	**8**	**3**	**0**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)	Coarse grained fragments * (1) Poorly sorted *(1)	2			2		2
		(ii)	Weathering (1) Description of weathering developed (1)	2			2		
	(b)		Cross bedding (1)	1			1		1
	(c)		**Indicative content** **Analysis and interpretation of evidence from the texture of the conglomerate** Analysis of grain size indicates coarse grain size, interpreted as indicating high energy conditions in a river. Analysis of grain shape indicates rounded grains, interpreted as indicative of abrasion in transport and high energy/long distance of transport. Analysis of sorting suggests poor sorting, interpreted as typical of deposition by floods. Interpretation based on the observed formation of conglomerates on Earth suggests that rivers once flowed on Mars. **Analysis and interpretation of evidence from the cross bedding** Analysis of the Cross bedding on Mars shows that it dips towards the East. Analysis of cross bedding can be interpreted as representing deposition from a water current in past. Interpretation of the dip of cross bedding indicates deposition from a flow to the left – East.						

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(c)		**5–6 marks** The answer draws upon evidence from at least **two** of the three textural elements of the conglomerate (size, shape and sorting), **and** the cross bedding. Clear reference to the fact that all interpretation is based upon the principle of uniformitarianism. Most or all of the sources of evidence are well analysed, interpreted and clearly linked effectively to the conclusion. *There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant.* **3–4 marks** The response draws upon evidence from at least **one** of the three textural elements of the conglomerate (size, shape and sorting), **and** the cross bedding. Relevant reference to the principle of uniformitarianism. Most of the evidence selected is quite well analysed and interpreted and linked to the conclusion. *There is a line of reasoning which is partially coherent, supported by some evidence and with some structure. Mainly relevant information is included but there may be some irrelevant information or minor errors.*			6	6		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
			1–2 marks The response draws upon evidence from at least one of the three textural elements of the conglomerate (size, shape and sorting), **or** the cross bedding. Limited reference to the principle of uniformitarianism. The evidence is discussed with some relevant basic comment. There may be significant error or inclusion of ideas irrelevant to the conclusion. *There is a basic line of reasoning which is not coherent, supported by limited evidence and with very little structure*. *There may be significant errors or the inclusion of much irrelevant information.* **0 marks** *No attempt made or no response worthy of credit*						
			Question 5 total	**5**	**0**	**6**	**11**	**0**	**3**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	K = anticline (1) L = salt dome (1)	2			2		
		(ii)	Seismic survey* (1) Geological mapping* (1)	2			2		
		(iii)	**Any two x (1) from:** • well sorted • rounded grains • poorly cemented	2			2		
	(b)	(i)	7 eruptions of Pinatubo* (1)		1		1	1	
		(ii)	Metamorphism of limestone *(1)	1			1		
	(c)		Decreased albedo* (1)	1			1		
	(d)	(i)	**Any two x (1) from:** • increases • exponential – Rate of increase has increased • 1700-1850 little change	2			2	2	
		(ii)	Support: 1860 onwards continuous rise in CO_2 and rise in temperature (1) Not support: oscillations on graph increase then decrease (1)		2		2	2	
			Question 6 total	**10**	**3**	**0**	**13**	**5**	**0**

Candidate Name	Centre Number					Candidate Number				
						0				

GCSE

GEOLOGY

COMPONENT 2

Investigative Geology

SAMPLE ASSESSMENT MATERIALS

(1 hour 30 minutes)

Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	12	
2.	9	
3.	10	
4.	24	
5.	13	
6.	12	
Total	**80**	

ADDITIONAL MATERIALS
In addition to this examination paper you will need Map 1, the Data Sheet and 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 at the end of each question or part-question.
The assessment of the quality of extended response (QER) will take place in question **6**.

*Answer **all** questions.*

1. Refer to **Map** 1.

(a) State the **angle of dip** and **directions of strike** of the limestone beds on **Map 1**. [2]

Angle of dip ……

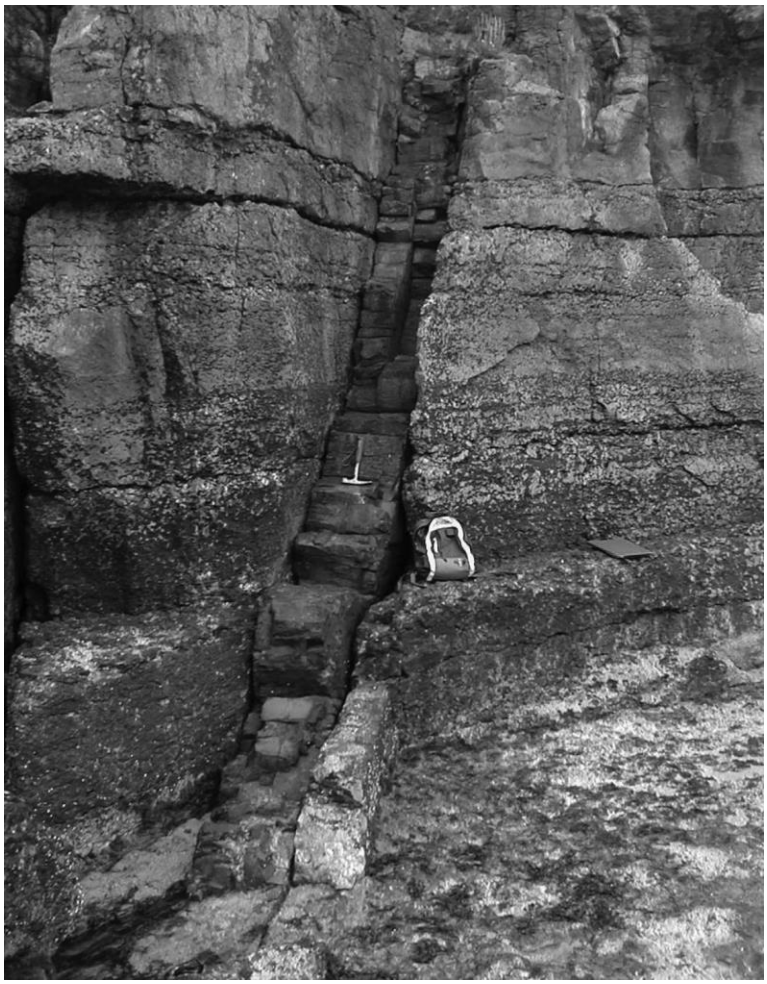
Directions of strike ……..……

(b) Draw a line from each of the three following descriptions to the correct geological term. [3]

The maximum angle of a bed from a horizontal surface	Compass
Measures the dip and strike directions	Clinometer
A line which is perpendicular to the dip direction	Strike
	Dip Direction
	Dip Angle

(c) **Photograph 1a** is a photograph of an igneous body looking north-west at **Locality 1** on **Map 1**.

30 cm hammer for scale



Photograph 1a

A student has correctly concluded that the igneous body in **Photograph 1a** is a dyke. Give **one** piece of evidence which supports this conclusion. [1]

.....

.....

(d) **Figure 1b** is a photomicrograph of a sample taken from the igneous body at **Locality 1** on **Map 1**.

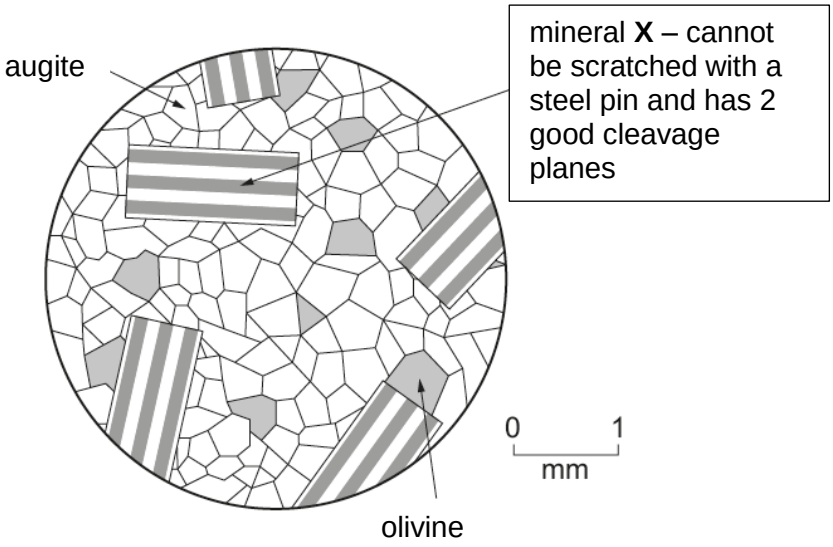


Figure 1b

(i) Describe the texture of the rock shown in **Figure 1b**. [3]

.....

.....

.....

.....

.....

(ii) State the name of mineral **X** in **Figure 1b**. You may wish to refer to the **Data Sheet**. [1]

.....

(iii) State **two** pieces of evidence which confirm that the rock shown in **Figure 1b** is basalt. [2]

1 .....

.....

2 .....

.....

2. **Figure 2a** is a photomicrograph of the limestone surrounding the igneous body at **Locality 1** on **Map 1**. **Figure 2b** is a photomicrograph of the rock found in the narrow zones on both sides of the igneous body.

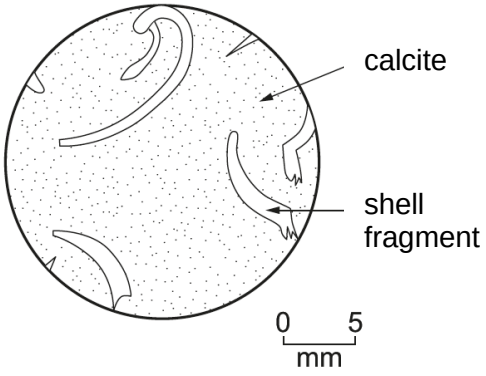


Figure 2a

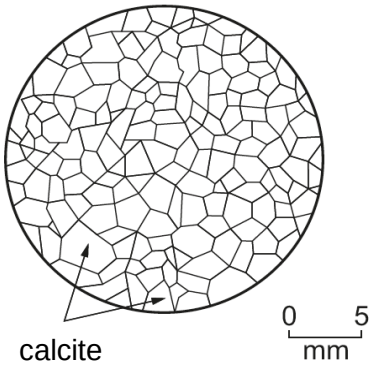


Figure 2b

(a) Describe **three** differences between the rocks in **Figures 2a** and **2b**. [3]

1. .....

.....

2. .....

.....

3. .....

.....

(b) Suggest an environment of deposition of the limestone in **Figure 2a**. Give **two** reasons for your answer. [3]

Environment of deposition .....

1.....

.....

2…… …….

…..…….....

(c) A student concluded that the rock in **Figure 2b** is linked to the rock in **Figure 2a** by the rock cycle. Explain this conclusion. [3]

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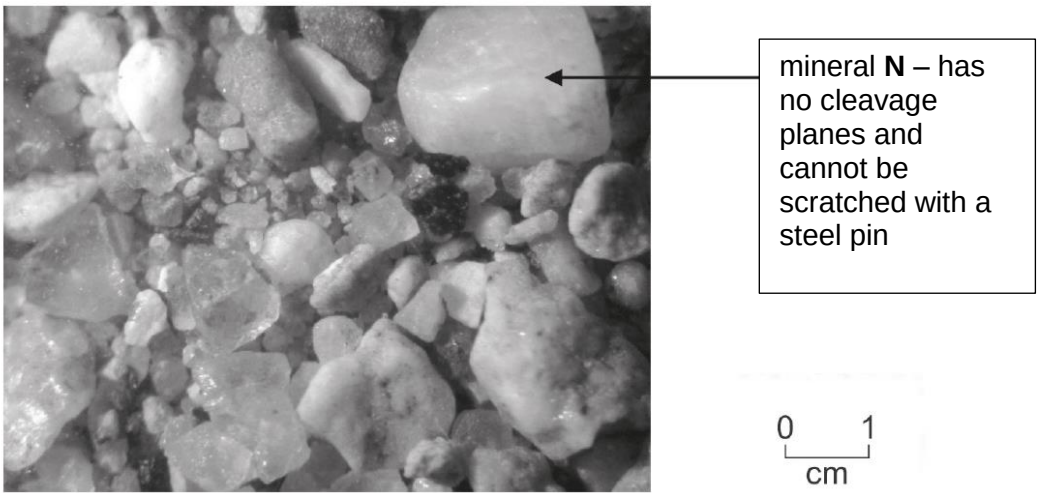
3. **Photograph 3a** shows a sample of sand collected at **Locality 2** on **Map 1**.



Source: www.thisoldearth.net

Photograph 3a

(a) (i) Explain why the sand in **Photograph 3a** is correctly described as poorly sorted. [2]

.....

.....

.....

(ii) State the name of mineral **N** in **Photograph 3a**. You may wish to refer to the **Data Sheet**. [1]

.....

(iii) Give **three** reasons why mineral **N** commonly forms the highest proportion of grains in a beach sand. [3]

1……..

…….....

2.....

.....

3……

……

Photograph 3b was taken at **Locality 2** on **Map 1** at low tide.

Source: © Garry and Susan Hayes www.geotripperimages.com

Photograph 3b

(b) (i) Name feature **R** shown in **Photograph 3b**. [1]

.....

(ii) Explain the evidence in **Photograph 3b** for the changes in sea level in the recent geological past. [3]

.....

.....

.....

.....

.....

.....

10

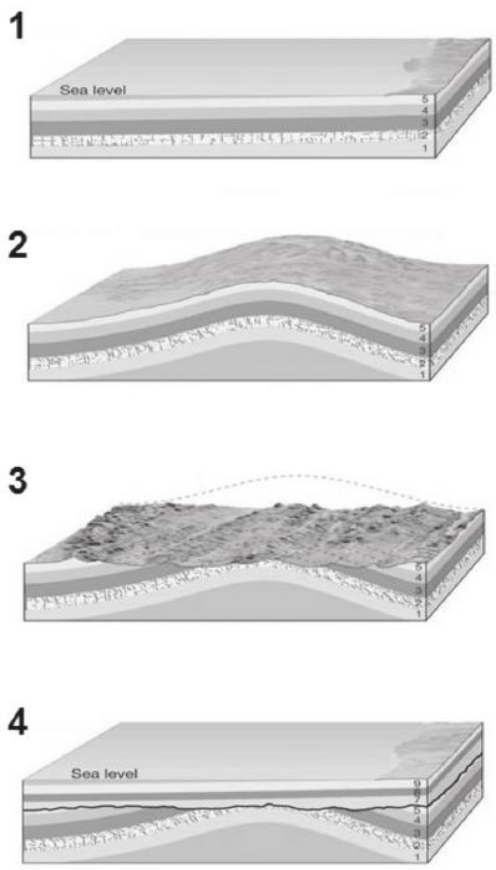
4. **Photograph 4a** was taken at **Locality 3** on **Map 1**.

Photograph 4a

(a) (i) Name boundary **J** in **Photograph 4a**. [1]

……

(ii) Annotate **Figure 4b** to explain how this type of boundary is formed. [4]



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Source: www.cosscience1.pbworks.com

Figure 4b

(*b)* Refer to **Photograph 4a**.

(i) State **two** pieces of evidence which confirm that it is correct to label the rock above boundary **J** as a breccia. [2]

1 ……

.....

2 ……

……

(ii) The fragments in the breccia were transported by a river. Explain how the **size** and **shape** of the fragments indicate:

- the energy of the river
- the distance of transport in the river. [2]

.....

.....

.....

(c) Describe **three** pieces of evidence in **Photograph 4a** which suggest that the breccia is younger than the sandstone. [3]

1 ……

……..

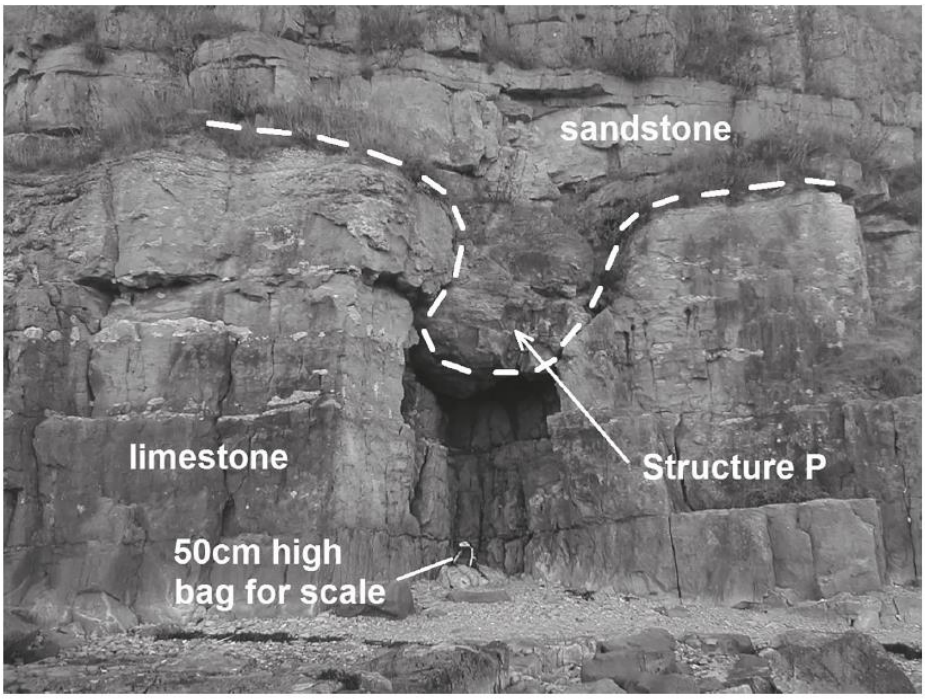
2 ……

……...

3 ……

……...

(d) A student was investigating the boundary between the sandstone and limestone shown in **Photograph 4c** The photograph was taken within the area shown on **Map 1**.



Photograph 4c

Refer to **Photograph 4c**.

(i) Draw in **Figure 4d**, below, the main geological features in **Photograph 4c**. Add a scale to your drawing. [4]

Figure 4d

(ii) Describe the boundary shown by the dashed line in **Photograph 4c**. [2]

.....

.....

(iii) Describe how the student could confirm that the lower rock is limestone. [2]

.....

.....

(iv) State and explain the evidence that structure **P** is not a synform. [2]

.....

.....

.....

(v) State **two** safety precautions that the student should take when visiting the site shown in **Photograph 4c**. Describe why each is important. [2]

1 .....

…….....

2 .....

…….....

24

5. A mineral vein containing quartz and haematite is associated with fault **F** on **Map 1**.

(a) State which metal can be extracted from haematite. [1]

.....

(b) Calculate the relative density of haematite using the data in **Table 5** and the formula below.
Show your working. Give your answer using an appropriate number of significant figures. [3]

$$\text{Relative density} = \frac{\text{weight in air}}{\text{weight in air} - \text{weight in water}}$$

Mineral	**Haematite**
weight in air (N)	0.01
weight in water (N)	0.0081

Table 5

Relative density = ...

(c) **Figure 5** shows a graph and a geological cross-section.

The graph shows some of the results of a magnetic survey along part of the line **A-B** on **Map 1**.

The geological cross-section is for the area beneath the survey line. The key is the same as that for **Map 1**.

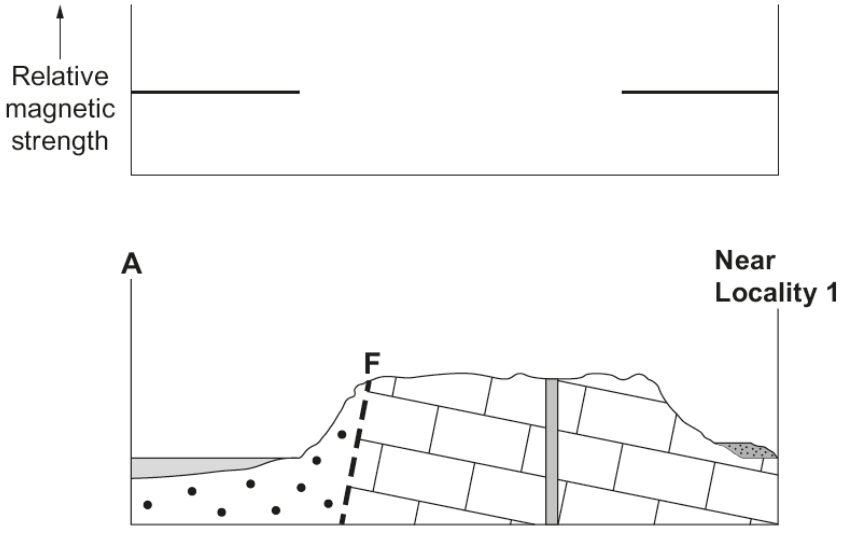


Figure 5

(i) Complete the graph in **Figure 5** to show the relative magnetic strength along the survey line. [3]

(ii) Explain the variations in the magnetic field strength along the survey line. [3]

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(iii) Describe a geochemical technique that could be used to identify the presence of the mineral vein. [3]

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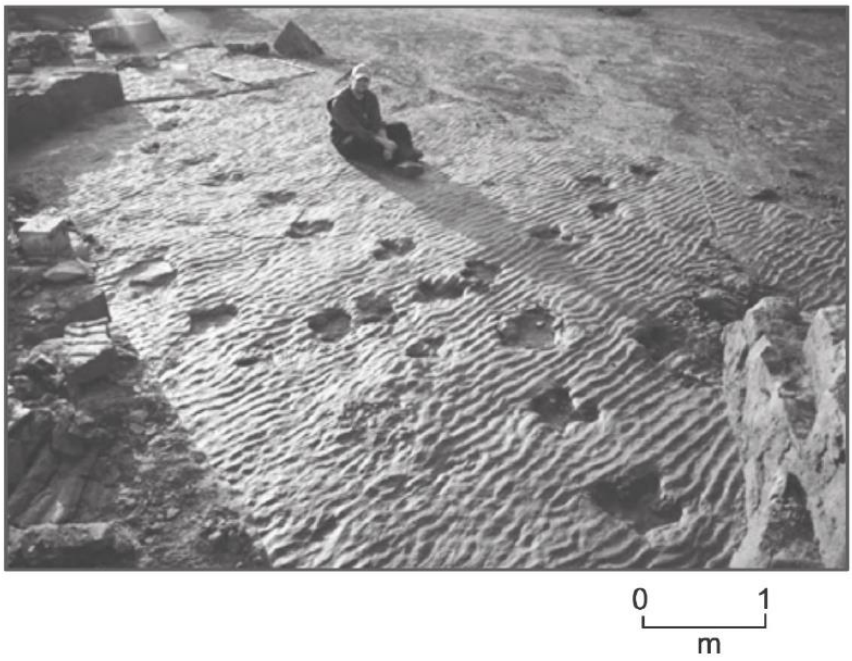
6. **Photograph 6a** shows a fossil on a bedding plane of the sandstone on **Map 1**.



Photograph 6a

The sandstone seen on **Map 1** and in **Photograph 6a** shows the following characteristics:

- rounded grains
- moderately sorted
- mean grain size of 1mm
- grain size ranging from 0.5 – 2 mm.

(a) In **Figure 6b**, draw a diagram of the sandstone described above, using the scale provided. [4]

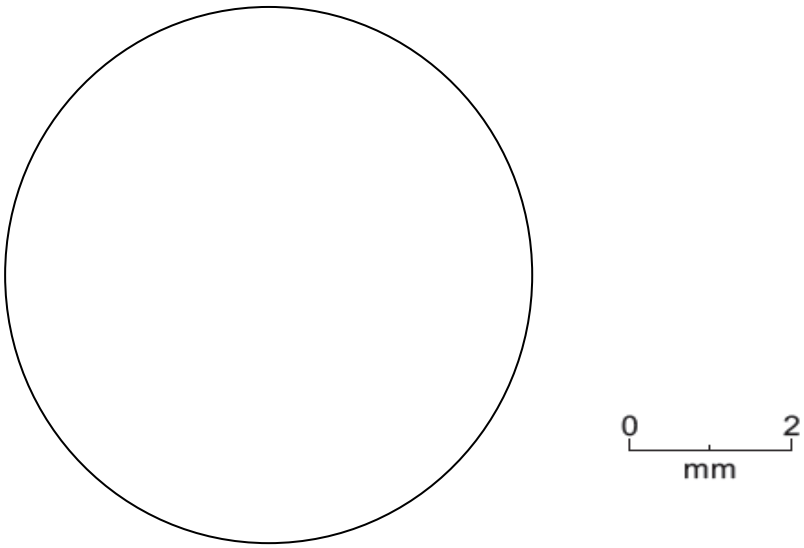


Figure 6b

(b) (i) State the type of fossil shown in **Photograph 6a**. [1]

.....

(ii) Name the type of sedimentary structure shown in **Photograph 6a**. [1]

.....

(c) Evaluate the statement 'the sandstone formed in a marine environment' with reference to your analysis of the evidence in **Photograph 6a** and **Figure 6b**. [6 QER]

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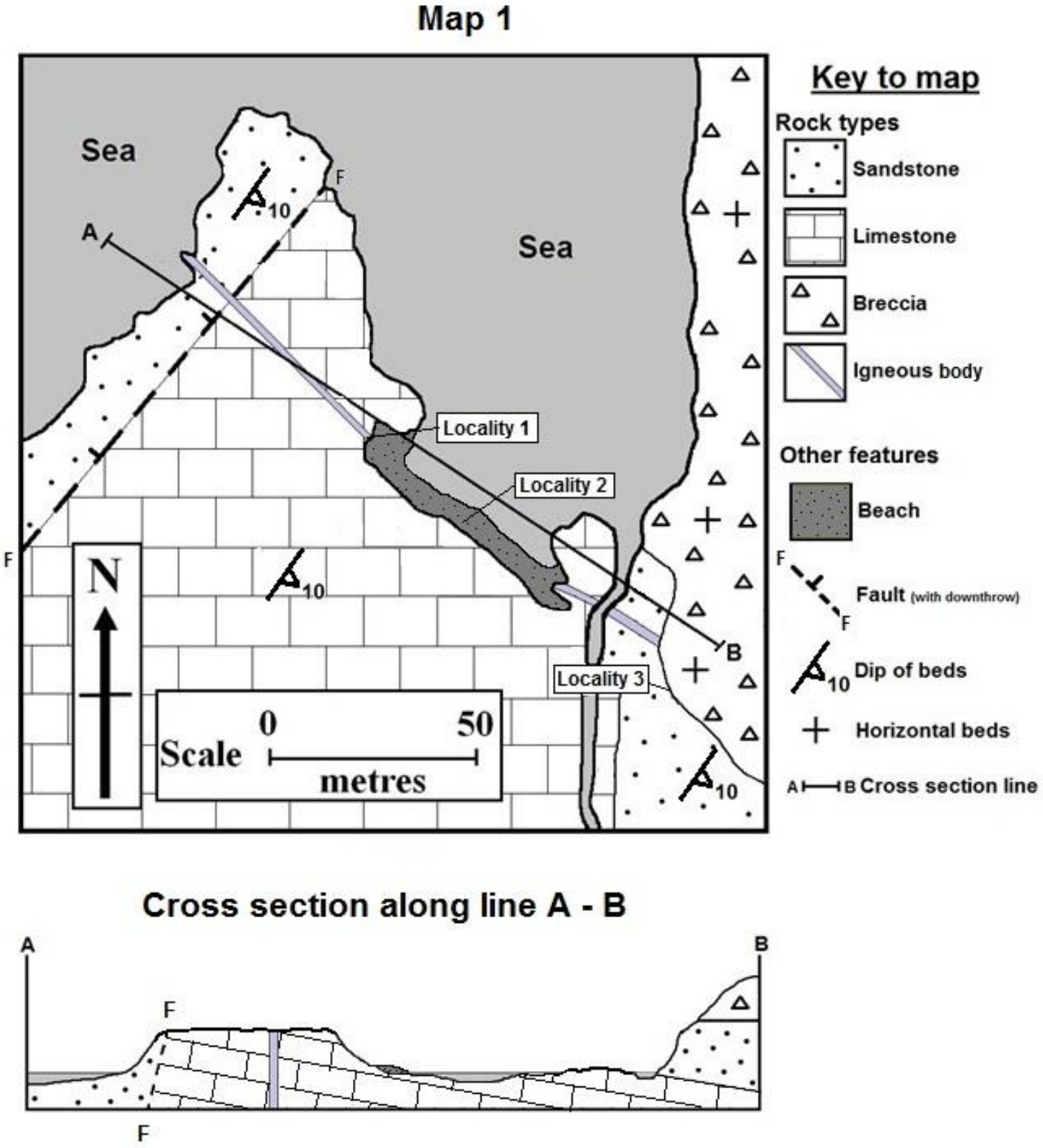
END OF PAPER

12

Map 1 for use in GCSE Geology Component 2 Investigative Geology Sample Paper



WJEC Eduqas GCSE Geology

Marking scheme for use with Component 2

Investigative Geology

SAMPLE ASSESSMENT MATERIALS

Instructions for examiners of GCSE Geology when applying the marking scheme

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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 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)		Angle of dip = 10^0 (1) Directions of strike = NE/SW (1)	2			2		
	(b)		The maximum angle of a bed from a horizontal surface = dip angle (1) Measures the dip and strike directions = compass (1) A line which is perpendicular to the dip direction = strike (1)	3			3		3
	(c)		Discordant (or equivalent) (1)	1			1		1
	(d)	(i)	**Any three x (1) from:** • crystalline or interlocking crystals • fine crystals or size stated of groundmass (between 0.5 – 1 mm) or size of phenocrysts stated (2 mm) • larger crystals / phenocrysts / porphyritic • smaller groundmass • random crystals	3			3		3
		(ii)	Feldspar (1)	1			1		1
		(iii)	Fine crystal size (1) Contains mafic minerals/olivine/augite (1)		2		2		
			Question 1 total	**10**	**2**	**0**	**12**	**0**	**8**

Question			Marking details	Marks Available					
				AO1	**AO2**	**AO3**	**Total**	**Maths**	**Prac**
2	(a)		**Any three x (1) from:** • 2b crystalline / 2a not crystalline • 2a is limestone / 2b is marble • 2a is finer / 2b is coarser • 2a has fossils / 2b lack of fossils	3			3		3
	(b)		Environment: shallow marine (1) plus **any 2 x (1) from:** • limestone forms in shallow marine conditions today (1) • shells (or shell fagments) only form in shallow marine conditions today (1) • shells broken by waves (1)			3	3		
	(c)		Recrystallisation (1) Limestone changes to marble (1) By contact or thermal metamorphism (1)			3	3		
			Question 2 total	**3**	**0**	**6**	**9**	**0**	**3**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)	Wide range of grain size (1) Grain size range quantified 2mm – 2.5 cm (1)		2		2		
		(ii)	Quartz (1)	1			1		1
		(iii)	Quartz is resistant to chemical breakdown (1) Quartz has no cleavage (1) Quartz has a hardness of 7 (1)		3		3		
	(b)	(i)	Submerged or drowned forest/Tree stumps (1)	1			1		1
		(ii)	**Any three x (1) from:** • trees or peat formed on land/form on land today using uniformitarianism • submerged forest / peat / soil now on beach • eustatic sea level rise / land has fallen • lower /fall in sea level in the past			3	3		
			Question 3 total	**2**	**5**	**3**	**10**	**0**	**2**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)	Unconformity (1)	1			1		1
		(ii)	Layers deposited (horizontally) (1), Layers are folded (1) Top layers are eroded (1) New layers deposited on top (1)		4		4		
	(b)	(i)	One or more sizes quoted from within range from 2 -15 cm (1) Angular (1)		2		2		2
		(ii)	Coarse fragments indicate high energy (1) Angular fragments indicate short distance of transport (1)			2	2		
	(c)		Law of superposition or equivalent (1) Includes fragments of the rocks below in the bed above (1) Upper bed cross cuts lower bed (1)		3		3		
	(d)	(i)	Horizontal beds (1), Vertical fractures (1), Boundary (1) To correct scale (based on bag height of 0.5m) (1)		4		4	1	4
		(ii)	**Any two x (1) from:** • irregular • cross cutting • structure P extends into the limestone by 4-5m (accept a value within a range of 3 -6 m).	2			2		
		(iii)	Fizzes/reacts/effervesces (1) When tested with HCl (1)	2			2		2
		(iv)	Bedding planes are horizontal (1) Beds interpreted as not having been folded (1)		1	1	2		1
		(v)	**Any two x (1) from:** • hard hats to protect from falling rocks • walking boots for grip on rocks • awareness of the tide times to avoid being cut off by the tide • no climbing on the rock face to avoid falling Credit other sensible answer directly related to features in the photograph.		2		2		
			Question 4 total	**5**	**16**	**3**	**24**	**1**	**10**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)		Iron (1)	1			1		
	(b)		$\frac{0.01}{0.0019}$ (1) 5.26315789 or equivalent (1) 5.3 or 5.26 (do not accept 5.2 or 5.263 or more significant figures) (1)		3		3	3	
	(c)	(i)	Higher reading over the dyke (1) Higher reading over the fault (1) Line at same level as starting line between dyke and fault (1)		3		3		
		(ii)	Dyke has magnetic minerals / olivine / augite (1) Limestone and sandstone are weakly magnetised (1) Fault/ Haematite contains iron which is magnetic (1)		3		3		
		(iii)	Analysis of soil (1) Reveals hidden ore body / anomaly (1) More concentrated near ore body and dispersed away (1)	3			3		
			Question 5 total	**4**	**9**	**0**	**13**	**3**	**0**

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)		Rounded grains (1) Moderately sorted (1) Mean grain size 1 mm (1) Grain size ranging from 0.5 – 2 mm		4		4	1	4
	(b)	(i)	Trace fossil / foot prints (1)	1			1		1
		(ii)	Ripple marks (1)	1			1		1
	(c)		***Indicative content*** Analysis of evidence from ripple marks Ripple marks form in shallow marine/beach environments. Ripple marks are not only formed in shallow marine, but can form in alternative examples of environments e.g. in rivers or on sand dunes/wind or in deep marine turbidites. Analysis of evidence from footprints Footprints indicate land/terrestrial environment. Footprints could be made by land animals walking in very shallow marine conditions/beach environment. Analysis of evidence from the texture of the sandstone Evidence that grains of sandstone could have been deposited by wind e.g. rounded. Evidence that grains of sandstone are not wind-blown or could have been deposited in shallow marine conditions e.g. only moderately rather than well sorted, well rounded could be due to wave action, grain size ranges fit with a beach/shallow marine location.			6	6		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
			5–6 marks There is a clear response which makes at least **one** valid analytical comment from **each** of the three sources of evidence (the ripples, the footprints and the texture of the sandstone grains), as outlined in the indicative content above. The statement is evaluated coherently with some recognition and appraisal of potentially conflicting evidence e.g. likelihood of the ripple marks forming in shallow marine conditions alongside the likelihood of the sand grains forming in aeolian conditions. A conclusion regarding the statement 'the sandstone formed in a marine environment' is drawn that is consistent with the evidence as interpreted. *There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant.*						
			3–4 marks The response makes at least **one** valid analytical comment from each of a minimum of **two** of the three sources of evidence (the ripples, the footprints and the texture of the sandstone grains) as outlined in the indicative content above. There is some attempt at evaluation of the statement through a weighing up of the evidence. A conclusion regarding the statement 'the sandstone formed in a marine environment' is drawn that is consistent with the evidence as interpreted. *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.*						

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
			1–2 marks The response makes at least **one** valid analytical comment from a minimum of **one** of the three sources of evidence (the ripples, the footprints and the texture of the sandstone grains) as outlined in the indicative content above. There is little evidence of evaluation of the statement. A conclusion regarding the statement 'the sandstone formed in a marine environment' is drawn that is consistent with the evidence as interpreted. *There is a basic line of reasoning which is not coherent, supported by limited evidence and with very little structure. There may be significant errors or the inclusion of much irrelevant information.*						
			0 marks *No attempt made or no response worthy of credit.*						
			Question 6 total	**2**	**4**	**6**	**12**	**1**	**6**