

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
AS GCE**

**F792/01**

**GEOLOGY**

**Rocks – Processes and Products**

**TUESDAY 19 MAY 2015: Afternoon**

**DURATION: 1 hour 45 minutes  
plus your additional time allowance**

**MODIFIED ENLARGED**

<b>Candidate forename</b>		<b>Candidate surname</b>	
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<b>Centre number</b>						<b>Candidate number</b>				
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**Candidates answer on the Question Paper.**

**OCR SUPPLIED MATERIALS:**

**None**

**OTHER MATERIALS REQUIRED:**

**Ruler (cm/mm)**

**Protractor**

**Electronic calculator**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

**Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**

**Use black ink. HB pencil may be used for graphs and diagrams only.**

**Answer ALL the questions.**

**Read each question carefully. Make sure you know what you have to do before starting your answer.**

**Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.**

## **INFORMATION FOR CANDIDATES**

**The number of marks is given in brackets [ ] at the end of each question or part question.**



**Where you see this icon you will be awarded a mark for the quality of written communication in your answer.**

**You may use an electronic calculator.**

**You are advised to show all the steps in any calculations.**

**The total number of marks for this paper is 100.**

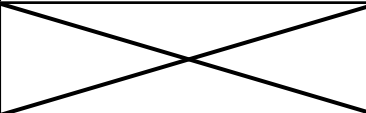
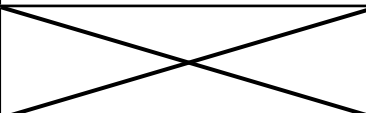
**Any blank pages are indicated.**

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**Answer ALL the questions.**

**1 (a) Rock cycle processes operate both at and below the Earth's surface.**

**(i) Put a tick (✓) in the correct column in the table below to show where each of the processes listed operate. [2]**

<b>Processes</b>	<b>At the Earth's surface</b>	<b>Below the Earth's surface</b>	<b>Rock group</b>
<b>diagenesis</b>			
<b>erosion</b>			
<b>magma accumulation</b>			
<b>recrystallisation</b>			
<b>weathering</b>			

**[2]**

**(ii) In the column labelled ROCK GROUP, state the rock group (igneous, metamorphic or sedimentary) which matches with the processes that produce them.**

**(b) (i) Describe how the process of abrasion operates when grains are transported by wind.**

\_\_\_\_\_

\_\_\_\_\_ **[1]**

- (ii) Describe how the process of attrition operates on grains transported by wind.**

\_\_\_\_\_

\_\_\_\_\_ [1]

- (iii) Use simple diagrams of a single grain of quartz or provide descriptions to show the TWO main effects of attrition and abrasion due to long transport. State these two effects.**

quartz grain before transport

quartz grain after transport

The image shows two large, empty rectangular boxes side-by-side, separated by a vertical line. Below each box is a label: 'quartz grain before transport' for the left box and 'quartz grain after transport' for the right box. These boxes are intended for students to draw their observations of quartz grains under a microscope.

**2** \_\_\_\_\_ **[2]**

- (iv) Name and describe the method of transporting sand-sized grains of quartz by wind.**

name \_\_\_\_\_

**description** \_\_\_\_\_

[2]

- (c) (i) Quartz grains may be held together by either a matrix or a cement.**

**Explain the difference between a matrix and a cement.**

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**[2]**

- (ii) Explain why the mineral quartz is found in sedimentary rocks.**

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**[1]**

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- (d) The graph opposite shows the cumulative frequency curve for sediment A.  
The table below shows the grain size distribution for sediment B.

SEDIMENT B		
grain size (phi)	mass (%)	cumulative mass %
-2	5	
-1	7	
0	9	
1	16	
2	21	
3	14	
4	9	
5	19	

- (i) Using the data:

complete the table to show the cumulative mass % for sediment B

plot the data for sediment B on the graph opposite

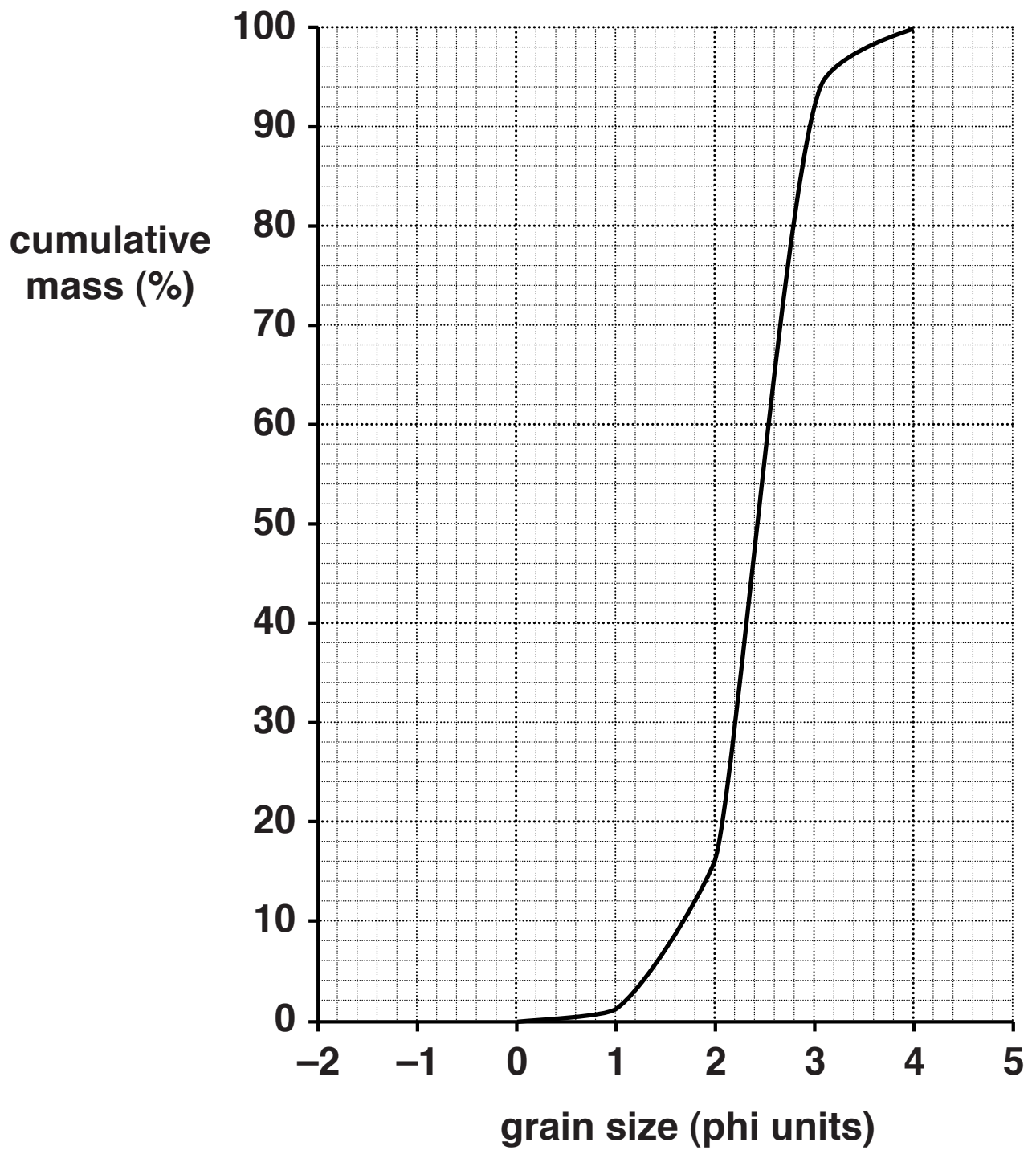
draw the cumulative frequency curve for sediment B on the graph opposite.

[3]



**KEY:**

— sediment A



- (ii) Using the cumulative frequency curve for sediment A, calculate the coefficient of sorting for sediment A. Show your working.

$$\text{coefficient of sorting} = \frac{\Phi_{84} - \Phi_{16}}{2}$$

(Where  $\Phi_{84}$  is the grain size of the cumulative mass of 84% of the sample and  $\Phi_{16}$  is the grain size of the cumulative mass of 16% of the sample.)

coefficient of  
sorting for  
sediment A = \_\_\_\_\_ [1]

- (iii) The table below shows the relationship of the coefficient of sorting to a description of sorting.

COEFFICIENT OF SORTING	DESCRIPTION OF SORTING
<0.35	very well sorted
0.35–0.50	well sorted
0.51–1.00	moderately sorted
1.01–2.00	poorly sorted
>2.00	very poorly sorted

**The coefficient of sorting for sediment B is 2.35.**

**Using your calculation for the coefficient of sorting for sediment A and information from the table, describe the differences in sorting between the two sediments. Use labelled diagrams to help your answer.**

<b>sediment A</b>
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<b>sediment B</b>
-------------------

\_\_\_\_\_

\_\_\_\_\_ [2]

- (iv) Identify a possible environment in which sediment B formed. Explain your answer.**

**environment** \_\_\_\_\_

**explanation** \_\_\_\_\_

\_\_\_\_\_ [2]

**[TOTAL: 21]**

**2 The cross-section opposite shows a sequence of rocks in a quarry face.**

**(a) (i) Draw a metamorphic aureole that extends 50 m from the granite. [1]**

**(ii) Label a xenolith on the diagram. [1]**

**(b) Identify the metamorphic rocks at C, D and E and for each rock type state its index mineral.**

	<b>Rock type</b>	<b>Index mineral</b>
<b>C</b>		
<b>D</b>		
<b>E</b>		

**[5]**

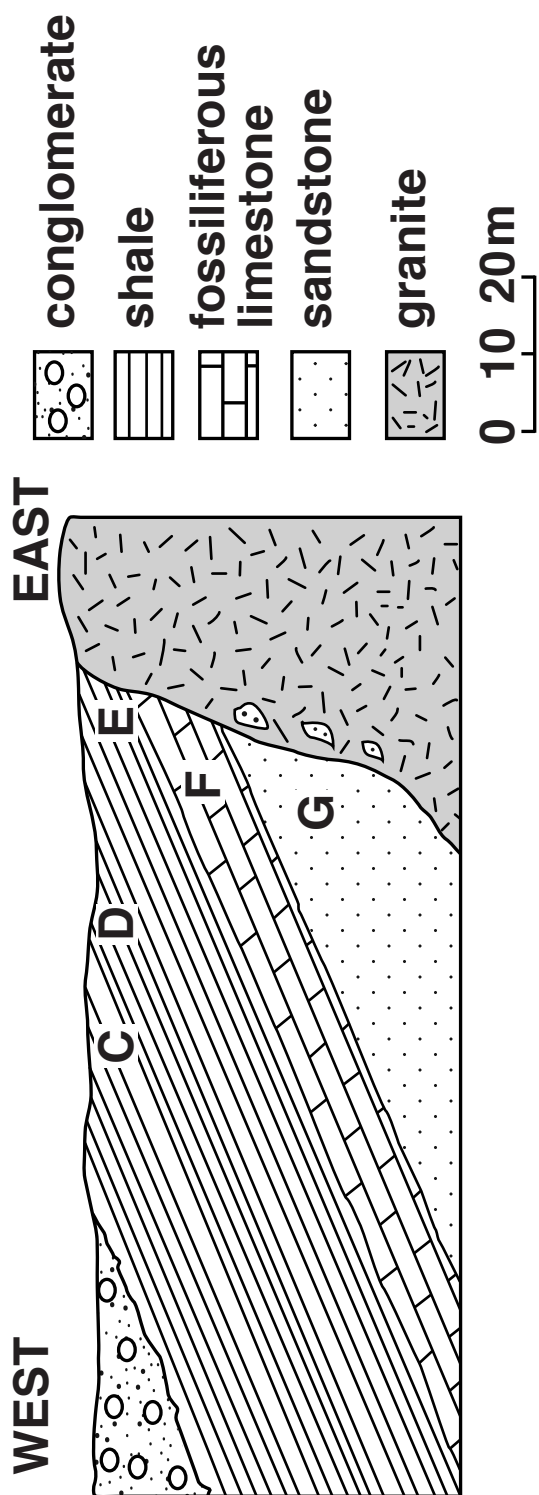
**(c) (i) Name metamorphic rock G and state its composition and texture.**

**name** \_\_\_\_\_

**composition** \_\_\_\_\_

**texture** \_\_\_\_\_

**[2]**



**(ii) Name metamorphic rock F and describe what happens to the fossils in the fossiliferous limestone.**

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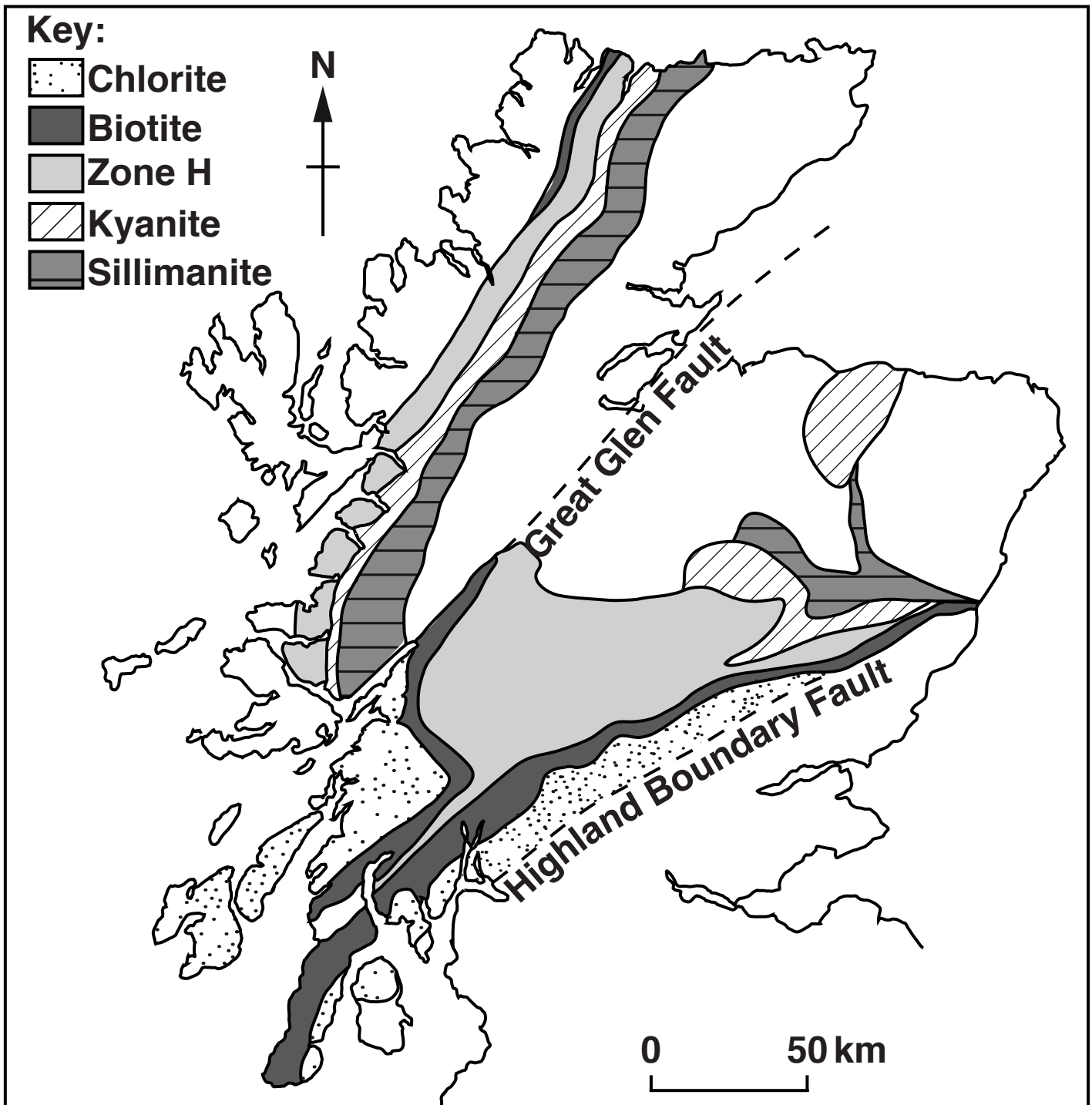
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**[2]**

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(d) The map below is a simplified geological map of the regional metamorphic zones in Scotland.



(i) Give the name for these regional metamorphic zones in Scotland.

[1]



**(ii) Identify the index mineral for zone H.**

\_\_\_\_\_ **[1]**

**(iii) Describe fully the THREE main metamorphic rocks that form in these regional metamorphic zones when the parent rock is shale.**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ **[3]**

**[TOTAL: 16]**

**3 The table opposite shows information about seven different minerals.  
The table also shows the mineral composition of a typical rock in each of the igneous rock groups.**

**(a) (i) Put ticks (✓) in the second column of the table to show which of the minerals listed in the first column are mafic. [1]**

**(ii) Using examples from the table, describe how the rock-forming minerals are used to classify igneous rocks.**

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**[2]**

**(iii) Compare diorite and basalt in terms of colour and silica content.**

**colour** \_\_\_\_\_

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**silica content** \_\_\_\_\_

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**[2]**

Mineral composition of igneous rock (%)						
Mineral name	Mafic mineral	Mineral density (g/cm <sup>3</sup> )	Silicic granite	Intermediate diorite	Mafic basalt	Ultramafic peridotite
Quartz		2.7	25	–	–	–
K feldspar		2.6	45	–	–	–
Plagioclase feldspar		2.7	20	60	40	–
Biotite		3.0	10	10	–	–
Hornblende		3.2	–	15	–	–
Pyroxene		3.4	–	15	50	25
Olivine		3.8	–	–	10	75

- (iv) Using the density data in the table, explain why there is a difference in density between silicic igneous rocks and ultramafic igneous rocks.

\_\_\_\_\_ [1]

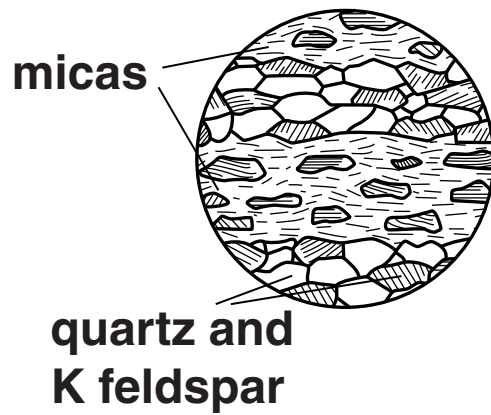
- (b) Indicate whether the following statements in the table are true or false by writing the letter T if the statement is true and F if the statement is false.

All silicic rocks are coarse grained.	
Obsidian is a black, silicic rock.	
There is a high percentage of felsic minerals in silicic rocks.	
The plagioclase in silicic rocks is calcium rich.	
Ultramafic rocks have the lowest silica percentage of all the igneous rocks.	

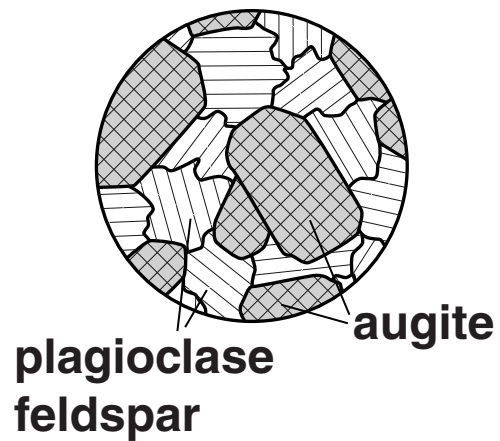
[3]

**(c) The thin-section drawings below show three rocks.**

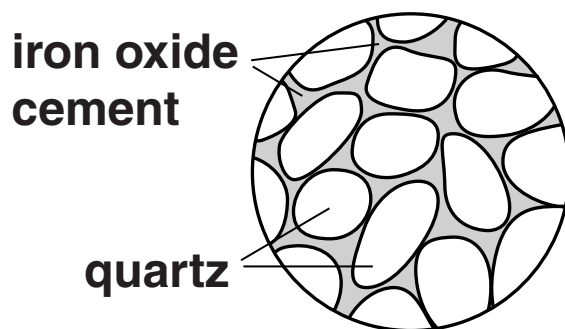
**rock 1**



**rock 2**



**rock 3**



**0 5 mm**

A scale bar with a horizontal line and vertical tick marks at 0 and 5 mm.

- (i) Put a tick (✓) in the correct box to classify each of the rocks 1, 2 and 3.

	<b>Igneous</b>	<b>Metamorphic</b>	<b>Sedimentary</b>
<b>rock 1</b>			
<b>rock 2</b>			
<b>rock 3</b>			

[2]

- (ii) Using the mineral composition, give a reason for your classification of rock 2.

\_\_\_\_\_

\_\_\_\_\_ [1]

- (iii) Identify rock type 3.

\_\_\_\_\_ [1]

[TOTAL: 13]

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**4 (a) The diagram opposite shows a cross-section of a tropical reef and lagoon which are situated far from land where there is no clastic sediment.**

**(i) Name the rock that will form at J.**

\_\_\_\_\_ [1]

**(ii) State and explain the energy conditions that exist in the shallow lagoon.**

\_\_\_\_\_  
\_\_\_\_\_ [1]

**(iii) Name and describe the rock that will form at K.**

**rock** \_\_\_\_\_

**description** \_\_\_\_\_

\_\_\_\_\_  
[2]

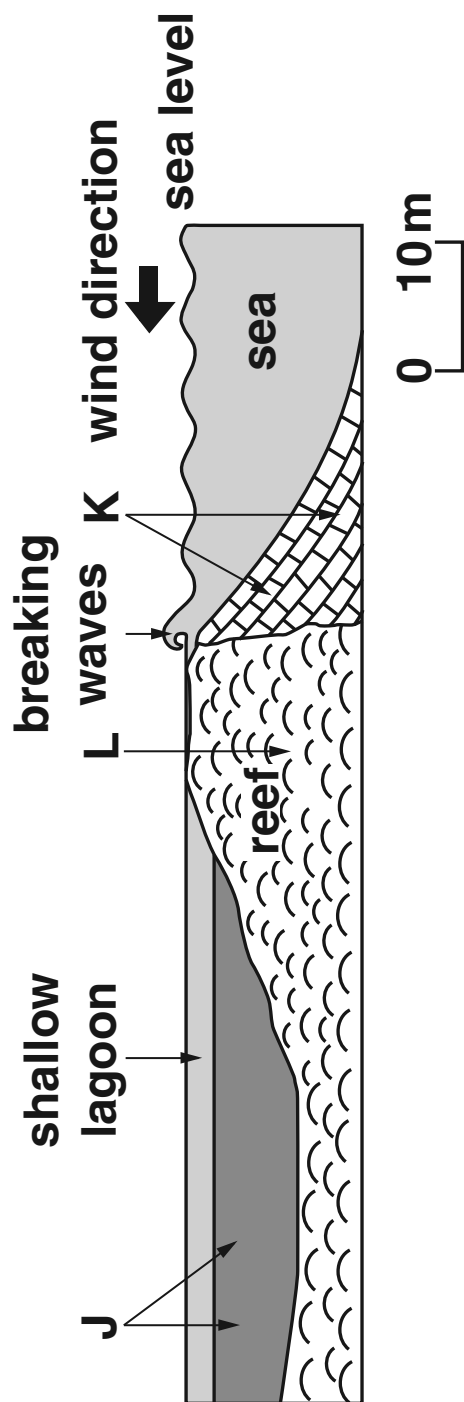
**(iv) The rock that forms at L contains many fossils. Name the main fossil group in rock L.**

\_\_\_\_\_ [1]

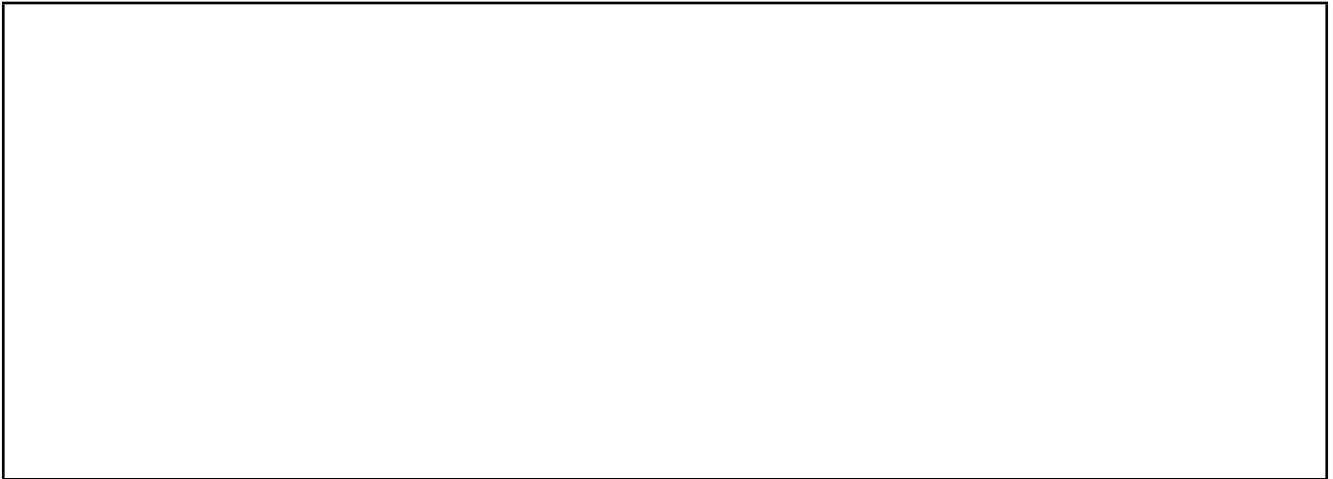
**(v) Explain why the rock at L has no bedding planes.**

\_\_\_\_\_  
\_\_\_\_\_ [1]





**(b) With the help of labelled diagrams describe the processes that form an oolitic limestone.**



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**[3]**

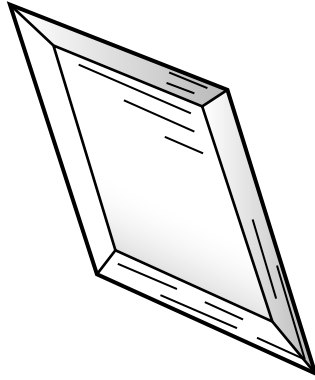
**(c) (i) The diagrams below show two different white minerals M and N. Both formed when sea water evaporated. Identify evaporite minerals M and N.**

**M  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$**

**hardness 2**

**forms early in an evaporite sequence**

**crystal can be fibrous**



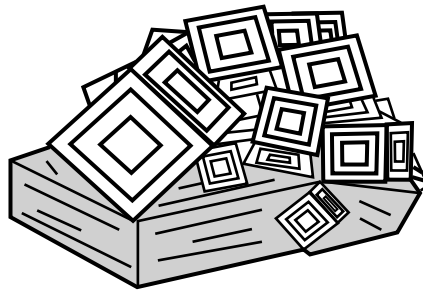
**x1**

**N  $\text{NaCl}$**

**hardness 2.5**

**forms late in an evaporite sequence**

**cubic “hopper” crystals**



**x1**

**M** \_\_\_\_\_

**N** \_\_\_\_\_

**[2]**

**(ii) Describe how evaporite minerals form in a shallow sea.**

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**[2]**

**[TOTAL: 13]**

**5 (a) Paricutin is a volcano in Mexico about 300 km inland from the Pacific coast. It started erupting in 1943 in a farmer's field and the lava and ash buried the nearby village. The eruption stopped in 1952, leaving a conical volcano that is now dormant.**

**(i) Describe the plate tectonic situation that allowed this volcano to form in Mexico.**

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**[2]**

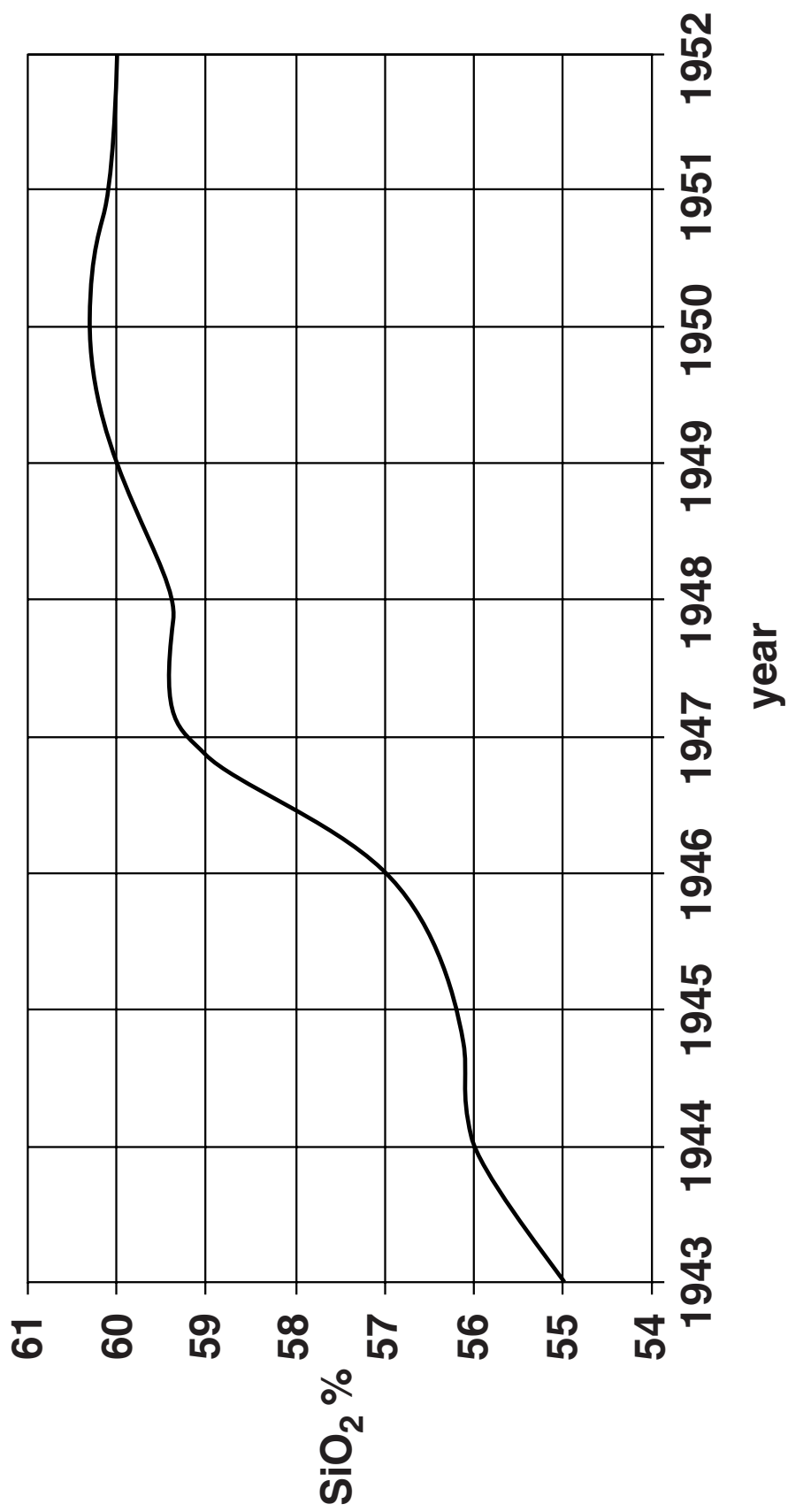
**The graph opposite shows how the SiO<sub>2</sub> percentage in the lavas changed over the time of the eruptions.**

- (ii) Identify the rock type formed by the 1945 eruption.**

\_\_\_\_\_ **[1]**

- (iii) Describe and explain the changes in composition of the lavas erupted.**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ **[2]**



- (b) (i) The map opposite shows the area around Paricutin volcano and isopachytes of the ash thickness in 1946. Describe and explain the pattern of ash deposition.**

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**[2]**



N



volcanic cone



lava flows

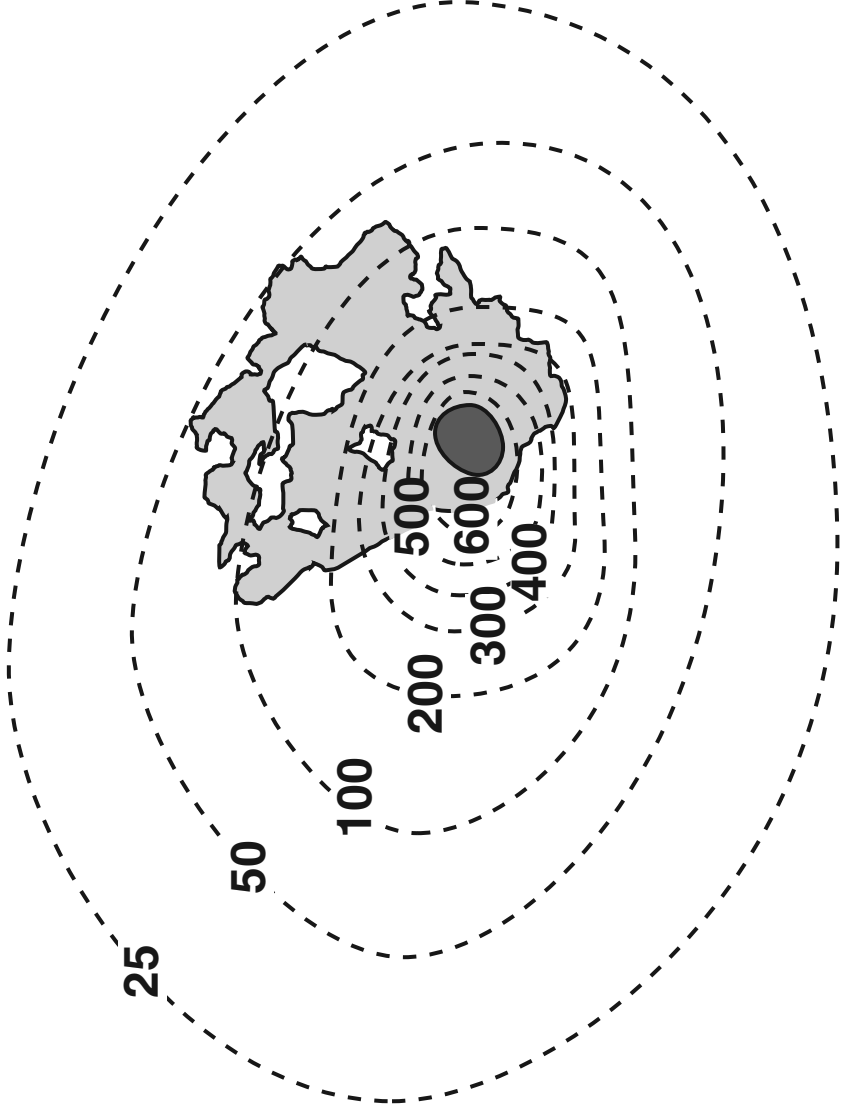
33

50

thickness of ash (cm)

0

5 km



- (ii) Draw a fully labelled cross-section of a volcano of the Paricutin type to show the:**
- shape of the cone**
  - internal structure of the cone**
  - vent and crater.**

**Alternatively you may provide a detailed description.**



**[3]**

- (c) Highly explosive volcanoes release enormous volumes of gases and ash into the atmosphere. An example of this type of volcano was the 1991 eruption of Mount Pinatubo in the Philippines.**

**Explain the effect this type of eruption could have on the Earth's climate.**

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**[2]**

- (d) Geysers occur in some volcanic areas. Describe how geysers erupt.**

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**[2]**

- (e) State TWO benefits that volcanoes can provide for human activity.**

**1** 

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**2** 

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**[1]**

- (f) Hazard maps are used to assess the likely damage from a volcanic eruption.**

**Describe the evidence used to construct hazard maps for a volcano.**

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**[2]**

**[TOTAL: 17]**

**6 Describe how you can DISTINGUISH BETWEEN intrusive and extrusive igneous rocks using:**

### crystal size (use named rock examples)

## textures

**margins of the igneous features.**

**You may use diagrams to illustrate your answer. [10]**



**In your answer, each point must be a comparison between intrusive and extrusive igneous rocks.**

[illegible]

[illegible]

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**[TOTAL: 10]**

**7 Describe deposition in fluvial environments. Include the following:**

**alluvial fan arkoses and breccias**

**channel sandstones**

**flood plain clays.**

**You may use diagrams to illustrate your answer. [10]**



**In your answer you should describe the characteristics of the rocks, bed features and possible sedimentary structures for each of the environments.**

**alluvial fan arkoses and breccias**

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## channel sandstones

## flood plain clays

41

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**[TOTAL: 10]**

**END OF QUESTION PAPER**

### ADDITIONAL ANSWER SPACE

**If additional answer space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margins.**

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