



**ADVANCED GCE**  
**GEOLOGY**  
 Petrology

**2835**

Candidates answer on the question paper

**OCR Supplied Materials:**  
 None

**Other Materials Required:**  
 • Ruler (cm/mm)

**Monday 8 June 2009**  
**Morning**

**Duration:** 1 hour 30 minutes



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **90**.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- Some questions in this paper are synoptic in nature. In your answers to these questions you are encouraged to show your knowledge and understanding of different areas of Geology and apply these and the geological skills you have learned, to the situations in the questions.
- This document consists of **16** pages. Any blank pages are indicated.

**FOR EXAMINER'S USE**

Qu.	Max	Mark
1	14	
2	17	
3	13	
4	21	
5	25	
<b>TOTAL</b>	<b>90</b>	

Answer **all** the questions.

- 1 Volcanoes at plate boundaries have different magma compositions and a range of volcanic products.

(a) (i) Describe the differences between the volcanic rocks **tuff** and **agglomerate**.

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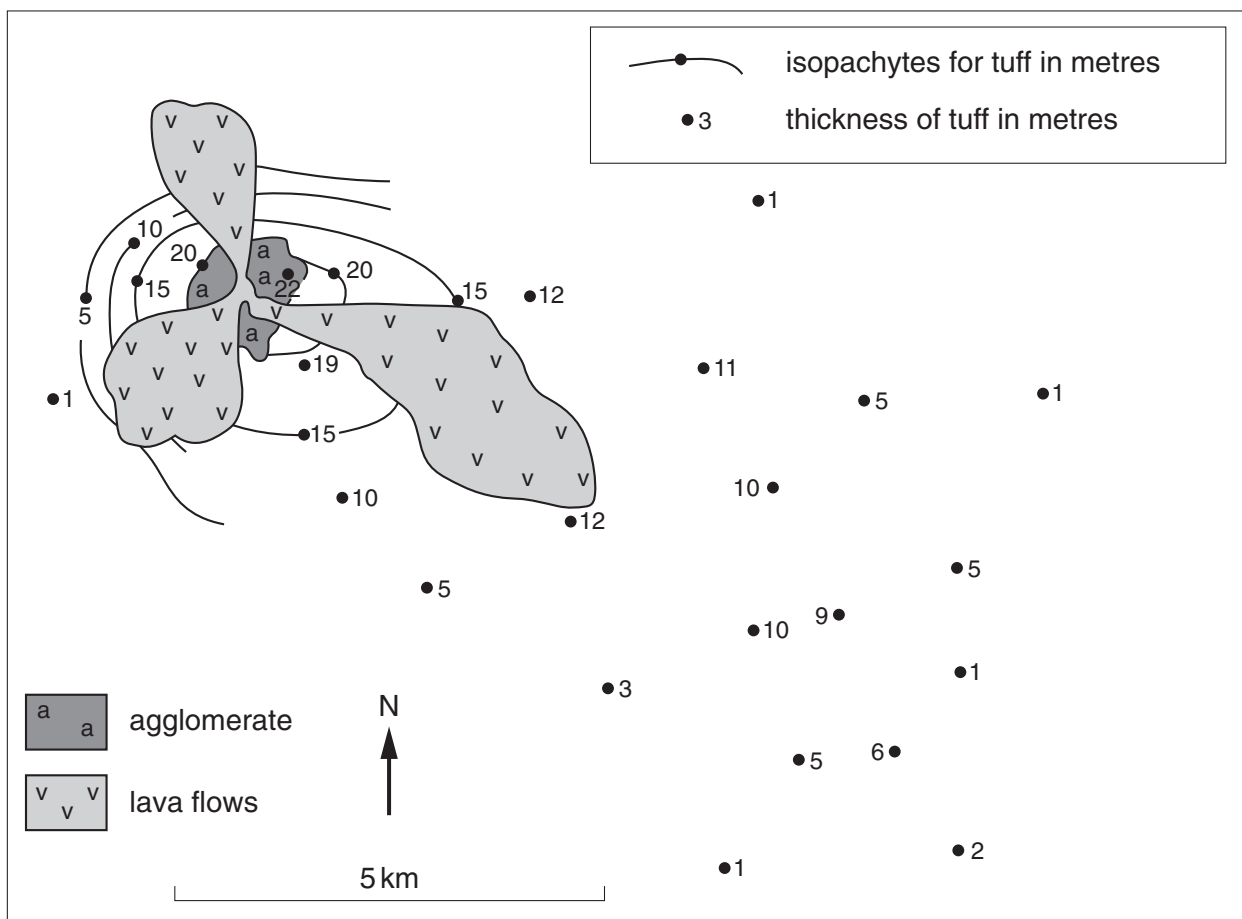
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.....

..... [2]

(ii) Complete the isopachytes on the map below.

[2]



- (iii) Describe and explain the distribution of tuff shown by the isopachytes.

.....

.....

.....

..... [2]

- (b) (i) State the relative ages of the volcanic rocks and give a reason for your answer.

youngest rock .....

.....

oldest rock .....

reason .....

..... [2]

- (ii) Describe a method of dating that could be used to give an absolute age for these rocks.

.....

.....

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.....

.....

..... [3]

- (c) (i) Describe the most likely type of plate margin where the volcanic activity shown on the map took place.

..... [1]

- (ii) State the magma composition and describe the type of volcanic activity that produced the volcanic rocks shown on the map.

.....

.....

.....

..... [2]

[Total: 14]

2 Descriptions of three metamorphic rocks are given in the table below.

	description
rock <b>D</b>	<ul style="list-style-type: none"> <li>• medium sized crystals aligned</li> <li>• porphyroblasts of red crystals</li> <li>• contains potash feldspar, kyanite and biotite mica</li> </ul>
rock <b>E</b>	<ul style="list-style-type: none"> <li>• grey colour</li> <li>• granoblastic texture</li> <li>• composed of quartz</li> </ul>
rock <b>F</b>	<ul style="list-style-type: none"> <li>• spots of black minerals 4 mm in size</li> <li>• fine grained rock with green grey colour</li> <li>• contains clay minerals, muscovite mica and chlorite</li> </ul>

(a) (i) Identify the three metamorphic rocks.

**D** .....

**E** .....

**F** ..... [3]

(ii) Describe the texture of rock **D** with the aid of a labelled sketch.

.....  
 .....  
 ..... [3]

(iii) Describe the granoblastic texture of rock **E** using a labelled sketch with a suitable scale.

.....  
 ..... [2]

- (b) (i) Describe the differences between biotite and muscovite mica.

.....  
..... [1]

- (ii) The porphyroblasts of red crystals in rock **D** have a hardness of 7 with a vitreous lustre. Identify the mineral.

..... [1]

- (c) Explain why kyanite is never found in rocks produced by thermal metamorphism.

.....  
.....  
.....  
..... [2]

- (d) (i) Explain with the aid of a diagram how regional metamorphism produces a paired metamorphic belt at a subduction zone (destructive plate margin).

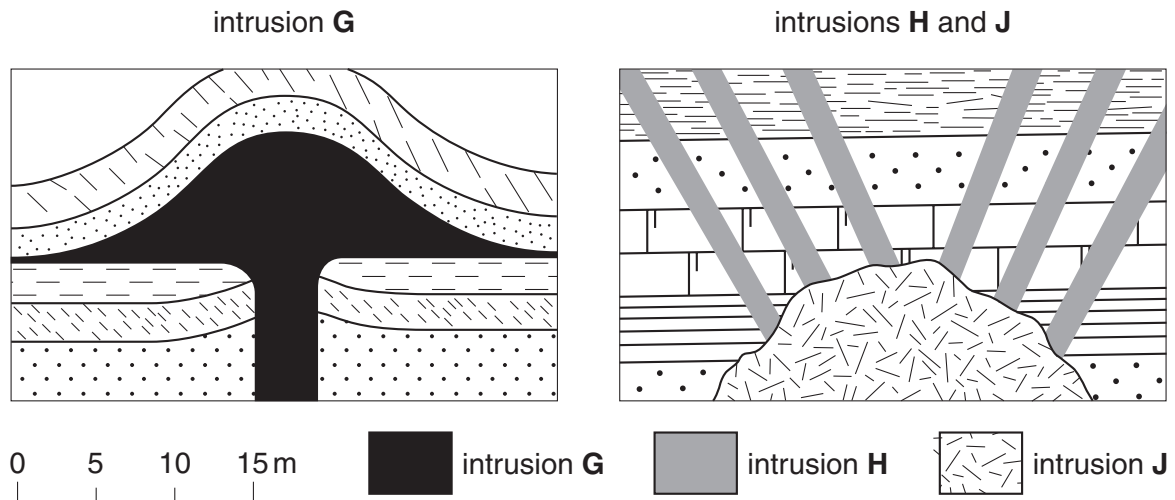
.....  
.....  
.....  
..... [3]

- (ii) Explain how regional metamorphism occurs in orogenic belts at a continental-continental destructive plate margin.

.....  
.....  
.....  
..... [2]

[Total: 17]

3 The diagrams below show cross sections through basic igneous intrusions.



(a) (i) Identify the igneous intrusions **G** and **H** shown above.

**G** .....

**H** ..... [2]

(ii) Describe how the basic igneous rocks in intrusions **H** and **J** will differ.

.....

..... [1]

(iii) Draw and label a diagram to show a transgressive sill.

[1]

(b) Describe how water rich fluids produce pegmatites in the last stages of crystallisation of a batholith.

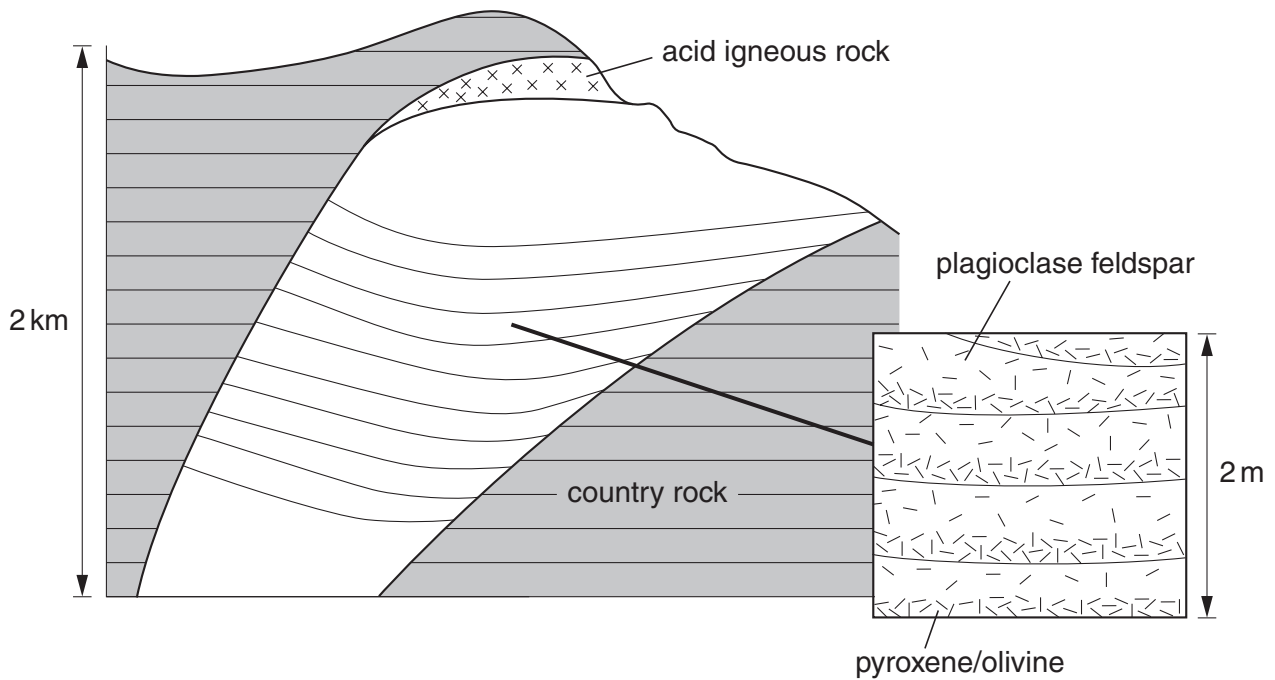
.....

.....

.....

..... [2]

- (c) The diagram below is a cross section through a major igneous intrusion which shows differentiation.



- (i) Mark on the diagram the area of the intrusion where the rock will be of the original composition of the magma. [1]
- (ii) What term is used to describe the layered features shown on the inset diagram above? [1]
- .....
- (iii) Explain why these layers form in the intrusion. [2]
- .....
- .....
- .....
- .....

- (iv) Describe how the acid igneous rock shown on the diagram was produced by the processes of differentiation from a basic magma.

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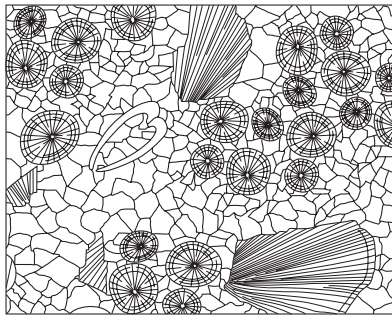
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..... [3]

[Total: 13]



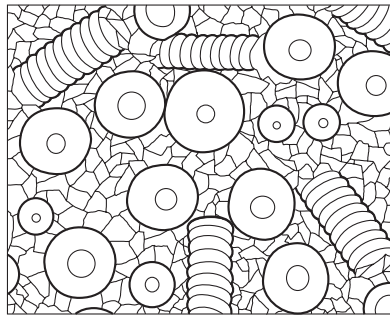
- 4 The diagrams below are drawn from cut and polished surfaces of limestones used as building stones.



limestone **K** 0 1 2 cm



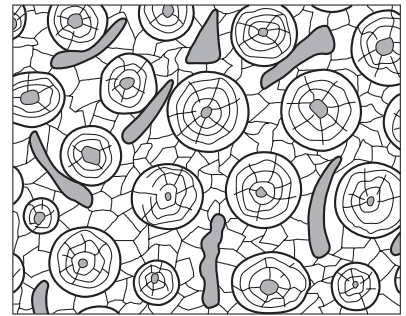
calcite  
cement



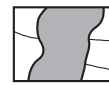
limestone **L** 0 1 2 cm



shell  
fragments



limestone **M** 0 1 2 mm



shell or clastic  
fragments

- (a) (i) Identify limestone **K** and describe the fossil content.

.....

.....

..... [2]

- (ii) Identify and describe the fossils in limestone **L**.

.....

.....

..... [2]

- (iii) Describe the environment in which limestones **K** and **L** form.

.....

..... [1]

- (iv) Explain how limestone **M** forms.

.....

.....

.....

..... [2]

- (b) Limestones are often used as building stone. Suggest **two** reasons to explain why they make good building stone.

.....

.....

.....

..... [2]

- (c) (i) Chalk is a limestone that can be 96%  $\text{CaCO}_3$  and is used in the manufacture of cement. Describe how any other rock materials are used in the manufacture of cement.

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.....

.....

..... [2]

- (ii) Describe the environmental implications of quarrying Chalk for cement.

.....

.....

.....

..... [2]

- (d) Explain how limestones may be formed as deep sea oozes.

.....

.....

.....

..... [2]

- (e) The Zechstein Sea extended from Germany across the North Sea to North East England during the Upper Permian. A thick sequence of salts formed in five sedimentary cycles.

(i) Describe and explain the sequence of salts that formed in one complete cycle.

.....

.....

.....

.....

.....

..... [3]

(ii) Name a sedimentary structure that could be found in an evaporite sequence.

..... [1]

(iii) Explain how these evaporite deposits can be used to interpret the palaeoclimate of the British Isles in Permian times.

.....

.....

.....

..... [2]

[Total: 21]

**5** In this question, two marks are available for the quality of written communication.

Answer **both** parts of the question.

- (a)** Describe the rocks and sedimentary structures formed in fluvial environments. Refer in your answer to alluvial fans, river channels and flood plains. You may use diagrams to illustrate your answer.

[illegible]

This image shows a full page of a worksheet designed for handwriting practice. It features 18 horizontal dashed lines spaced evenly across the page, providing a guide for letter height and placement. The background is plain white, and there are no other markings or text present.

**[Total: 25]**

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**15**  
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