OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE **2835**

GEOLOGY

Petrology

MONDAY 11 JUNE 2007 Morning

Time: 1 hour 30 minutes

Additional materials: Ruler (cm/mm)

Candidate Name

Centre Number

Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

- The number of marks for each question 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 answer 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.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	20	
2	13	
3	14	
4	18	
5	25	
TOTAL	90	

This document consists of **16** printed pages.

Answer **all** the questions.

1 Descriptions of **three** igneous rocks are given in the table below.

	description
rock A	• flow banded • light grey or red or brown colour • very fine crystals <1mm
rock B	• conchoidal fracture • black colour • no crystals
rock C	• coarse crystal grain size • greenish black crystals of augite and hornblende • white crystals of plagioclase feldspar • white crystals of potash feldspar

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

A .....

B .....

C ..... [3]

(ii) Describe with the aid of a sketch the term *flow banding*.

.....

..... [2]

(iii) Explain why igneous rock **B** has no crystals.

.....

..... [1]

(iv) Define the term *conchoidal fracture*.

.....

..... [1]

(b) (i) With the aid of simple sketches, distinguish between the two greenish black minerals augite and hornblende found in igneous rock **C**.

.....

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..... [2]

(ii) Give **two** diagnostic properties of plagioclase feldspar.

1. .....

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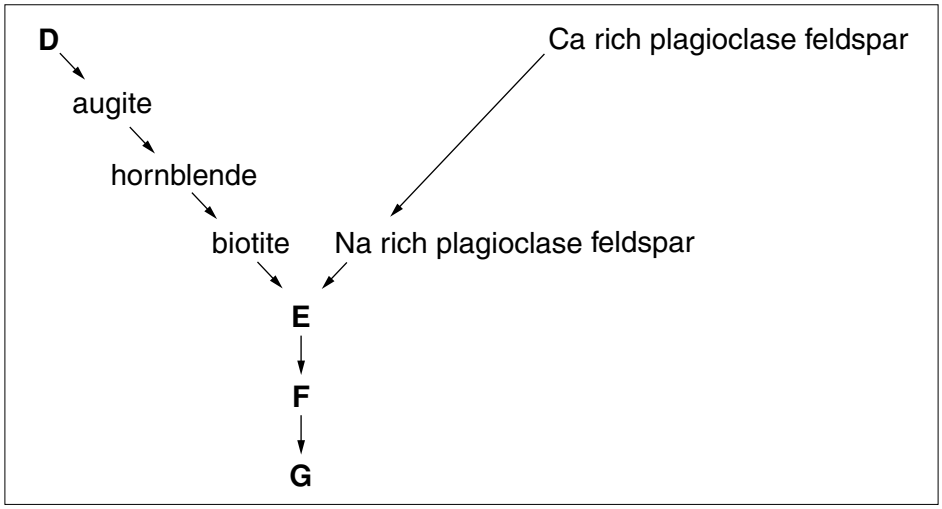
2. .....

..... [2]

(c) Plagioclase feldspar, augite and hornblende are all part of Bowen's Reaction Series. They have been entered on to the reaction series diagram below.



(i) Name the minerals **D**, **E**, **F** and **G** from Bowen's Reaction Series.

D .....

E .....

F .....

G ..... [3]

(ii) Explain the relationship of Bowen's Reaction Series to temperature.

.....

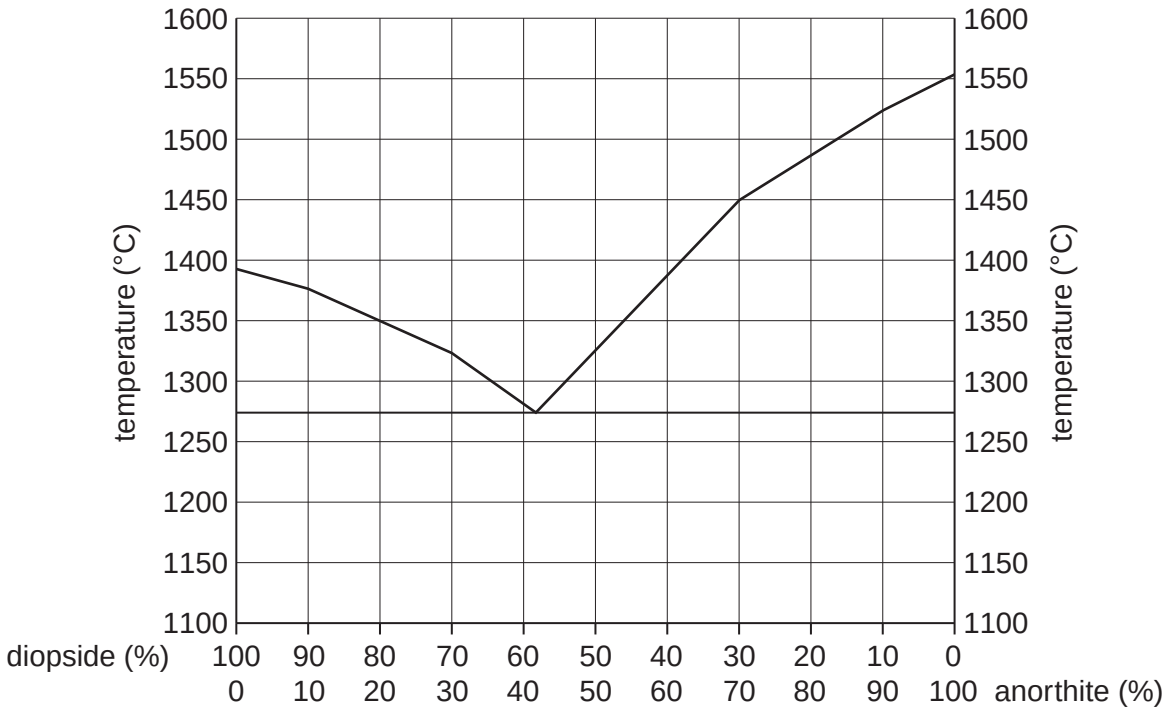
.....

.....

..... [2]

(iii) Put a ring around the **discontinuous** part of Bowen's Reaction Series on the diagram. [1]

(d) The phase diagram for a two component system comprising the minerals diopside and anorthite is shown below.



If the composition of the original magma is 80% anorthite

(i) What will be the composition of the first formed crystals?

.....[1]

(ii) At what temperature will crystallisation of this magma begin?

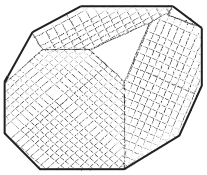
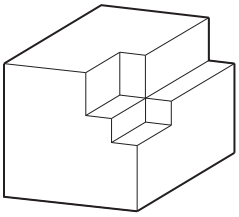
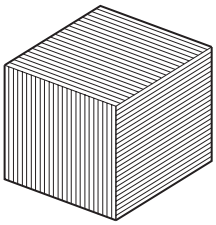
.....[1]

(iii) At what temperature will crystallisation of this magma be complete?

.....[1]

[Total: 20]

2 The table below shows three minerals and their diagnostic properties.

		
H hardness 4 purple colour	**J** hardness 2.5 silver grey colour	**K** hardness 5.5 brassy yellow colour

(a) (i) Name the crystal shape of all three minerals shown.

..... [1]

(ii) Identify the three minerals.

H .....

J .....

K ..... [3]

(b) (i) One of the three minerals may occur as porphyroblasts in slate.

Identify this mineral **and** define the term *porphyroblast*.

mineral .....

definition .....

..... [2]

(ii) One of the three minerals is an important ore mineral.

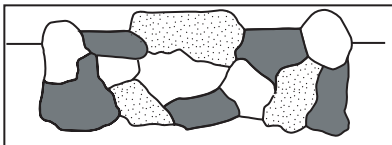
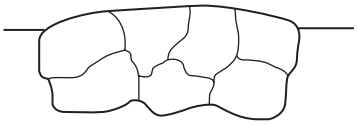
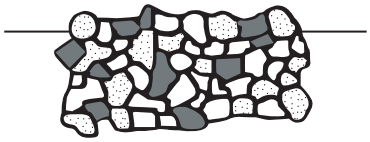
Identify this mineral **and** define the term *ore mineral*.

mineral .....

definition .....

..... [2]

(c) The diagrams below show three igneous rocks that are being considered for use as a roadstone. The road surface needs to be both skid resistant and strong.

 x1	 x1	 x5
L made of several different minerals mineral hardness 5 – 6 crystal size >5 mm	**M** made of only one mineral mineral hardness 7 crystal size >5 mm	**N** made of several different minerals mineral hardness 5 – 6 crystal size ≤1 mm

(i) Which of the rocks shown will be the best choice for a roadstone used to surface a motorway? Explain your answer.

.....

.....

.....

..... [2]

(ii) Suggest the name of a suitable rock that could be used for **these** roadstone chippings.

..... [1]

(d) Aggregate is crushed rock or naturally occurring gravels, used for foundations of roads and for concrete production.

Describe the characteristics of rocks that would be suitable for aggregate.

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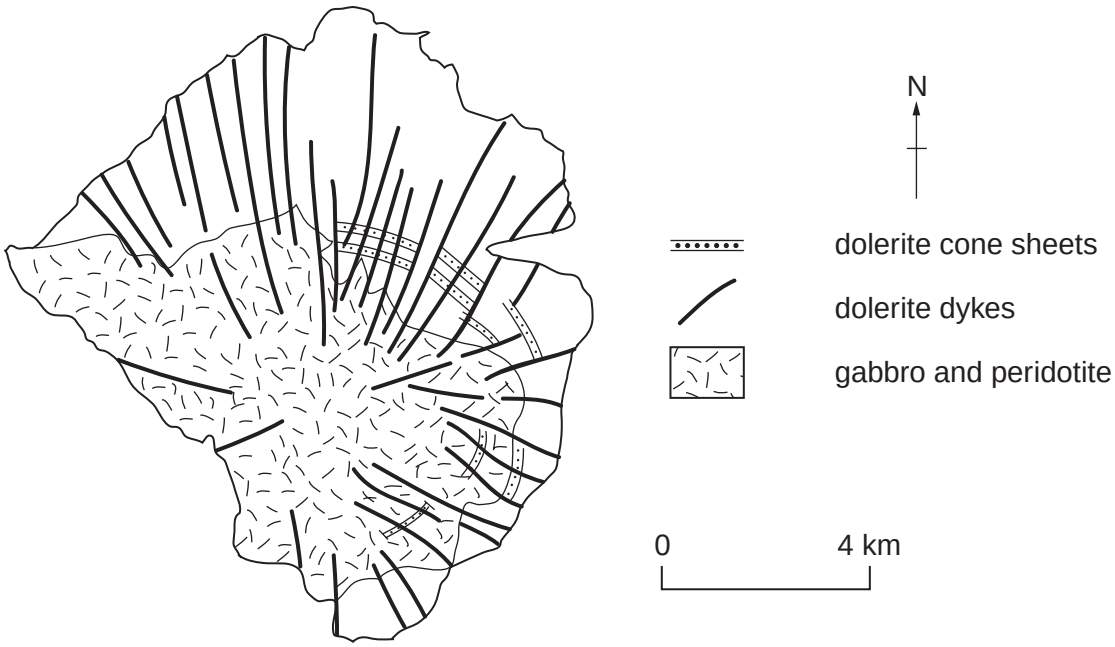
.....[2]

[Total: 13]

3 The sketch map below is of the island of Rhum, off the west coast of Scotland. The map shows a number of igneous intrusions. The island was once covered by basalt which has now been eroded away.



(a) (i) Describe **and** explain the pattern of dykes and cone sheets shown on the map.

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..... [2]

(ii) Describe with the aid of a cross section diagram, the relationship of the cone sheets, the gabbro, the peridotite and the eroded basalts to each other.

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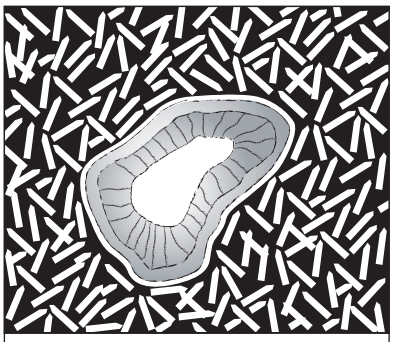
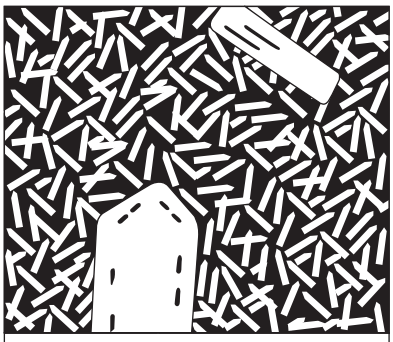
..... [4]

(b) The textures shown in the photomicrographs below are all found in dolerite and basalts. Note that the scales are all different.

x8 rock **P**



x1 rock **Q**



x2 rock **R**

(i) Identify the three **different** textures shown.

P .....

Q .....

R ..... [3]

(ii) State the maximum length seen of the largest crystal in rock **R**.

R ..... [1]

(iii) Describe how the texture in rock **Q** formed.

.....

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.....[2]

(iv) Describe how the texture in rock **R** formed.

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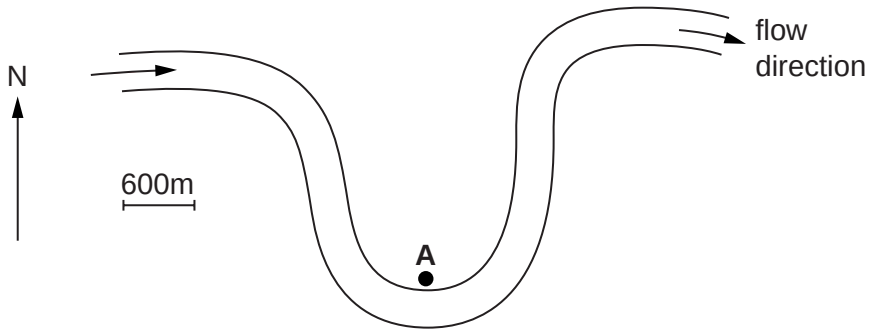
.....[2]

[Total: 14]

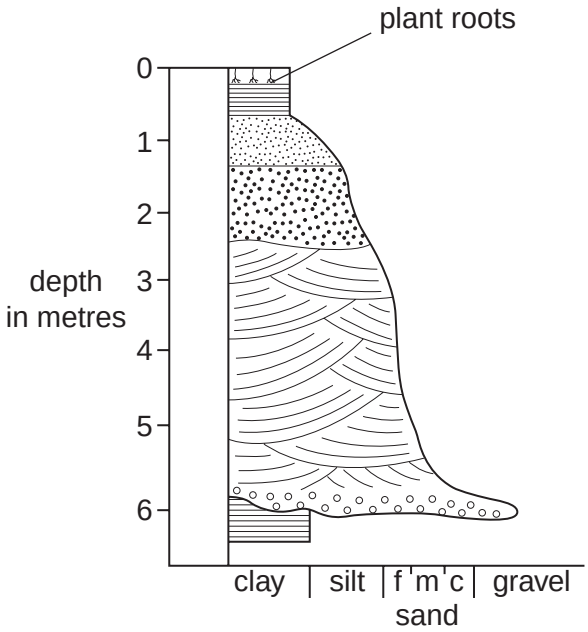
4 The map below shows part of a meandering river.



(a) Mark and label clearly on the map

- an area where erosion occurs.
- an area where deposition occurs [2]

(b) Data from a borehole at **A** is shown as a graphic log.



(i) Use the graphic log to identify the sedimentary sequence.

.....[1]

(ii) Describe the environment in which the clays and plant roots were deposited.

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.....[2]

(iii) Describe the environment in which the gravel and sands were deposited.

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.....[2]

(c) Describe **and** explain the changes in energy recorded in the graphic log.

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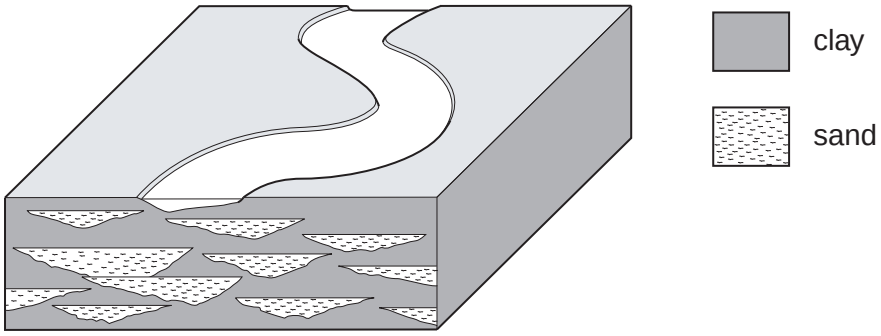
.....[2]

(d) The block diagram below shows a meandering river and its deposits over time.



Describe **and** explain the pattern of sand and clay shown on the cross sectional view.

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.....[2]

(e) A river is flowing under normal flow conditions.

(i) Name the method of transport which moves sand grains.

.....[1]

(ii) Name the grain size which is transported as the suspended load.

.....[1]

(iii) Name the method of transport which moves gravel.

.....[1]

(f) **(i)** Name **one** sedimentary structure found in deposits left by meandering rivers **and** explain how it forms in this environment.

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.....[2]

(ii) Explain why fossil plant roots can be preserved in deposits formed by a meandering river, but not the leaves or stem. Why have no other fossils been found in these deposits?

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.....[2]

[Total: 18]

5 In this question, two marks are available for the quality of written communication. You may use diagrams to illustrate your answer.

Answer **both** parts of the question.

(a) Describe how grain size, grain shape, mineral composition and fossil content can be used to classify clastic and non-clastic sedimentary rocks.

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(b) Describe the sequence of metamorphic rocks produced by the regional metamorphism of shales.

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Quality of Written Communication [2]

[Total: 25]

END OF QUESTION PAPER

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