

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced GCE

GEOLOGY

2835

Petrology

Tuesday

14 JUNE 2005

Morning

1 hour 30 minutes

Candidates answer on the question paper.

Additional materials:

Electronic calculator

Ruler (cm/mm)

Candidate
Number

Candidate Name

Centre Number

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TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers in the spaces on the question paper.
- Read each question carefully and make sure you know what you have to do before starting your answer.

INFORMATION FOR CANDIDATES

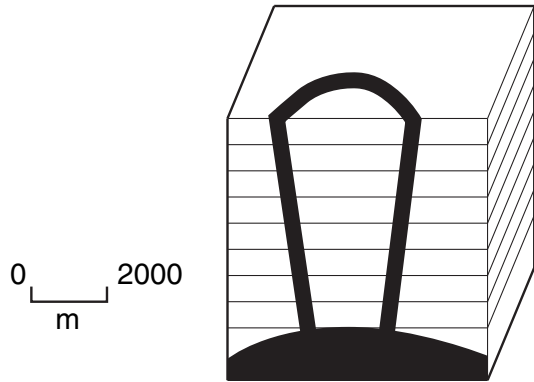
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is 90.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- Some questions in this paper are synoptic in nature. 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.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	20	
2	15	
3	16	
4	14	
5	25	
TOTAL	90	

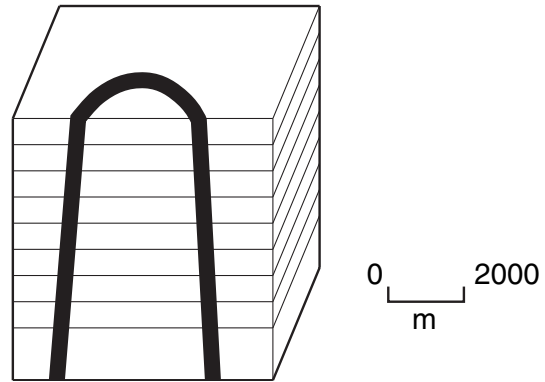
This question paper consists of 15 printed pages and 1 blank page.

Answer **all** the questions.

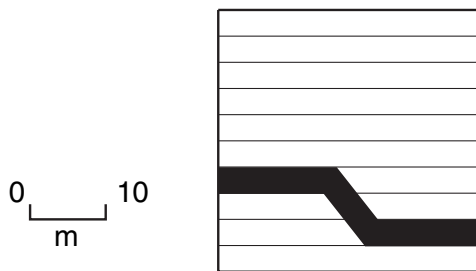
- 1 (a) State the name of the four intrusive igneous masses **A** to **D** shown in the diagrams below.



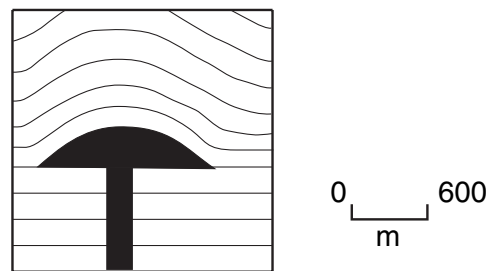
A (block diagram)



B (block diagram)



C (cross section)



D (cross section)

A.....

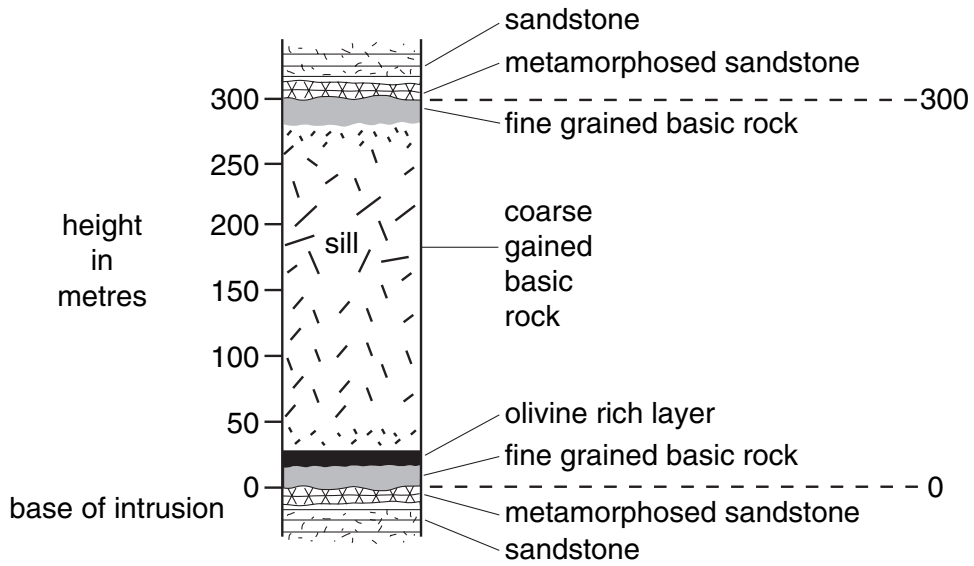
B.....

C.....

D.....

[4]

(b) The diagram below is a simplified cross-section through the Palisades Sill.



(i) State the type of metamorphism that has affected the sandstone.

.....[1]

(ii) Explain the formation of the fine grained basic rock at the top and base of the sill.

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

(iii) Explain the formation of the olivine rich layer at the base of the sill.

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

- (c) Using the information in the table below identify the minerals **E** to **G**. Write your answers in the spaces in the table.

properties	mineral E	mineral F	mineral G
hardness	6–6½	6	6½–7
density (g/cm ³)	2.6–2.8	3.4	3.2–4.4
colour	Usually white or grey	Black or greenish black	Green
lustre	vitreous to pearly	vitreous	vitreous
other features	2 good cleavages at 90° and lamellar twinning	2 good cleavages at 90°	Conchoidal fracture
mineral name			

[3]

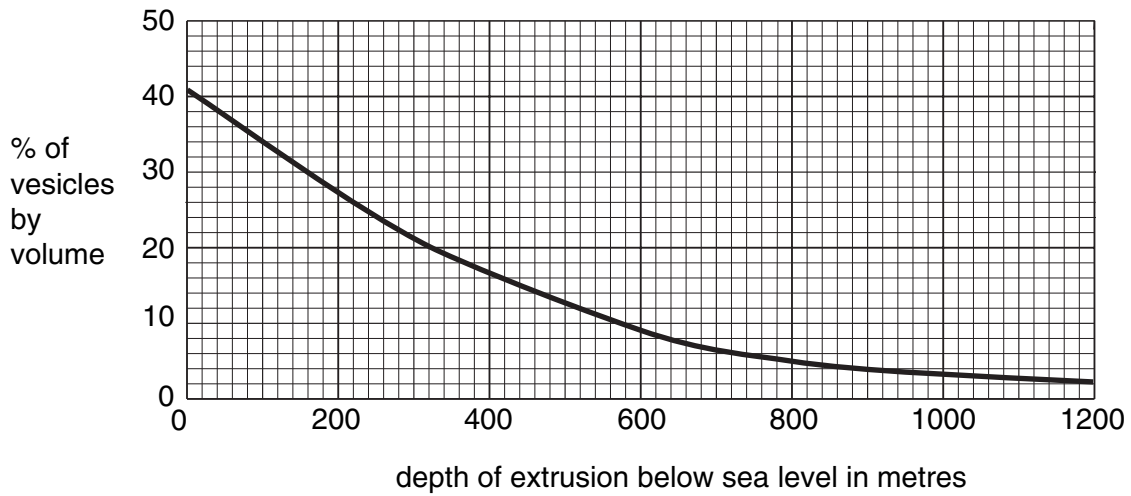
- (d) (i) Identify a rock which is coarse grained and contains minerals **E** and **F** only.

.....[1]

- (ii) Identify a rock which is coarse grained and contains 90% mineral **G** and 10% mineral **E**.

.....[1]

(e) The graph below shows the percentage volume of vesicles plotted against the depth of extrusion of submarine basalts.



(i) Calculate the difference between the percentage volume of vesicles in lava extruded at a depth of 200 metres below sea level and in lava extruded at a depth of 1000 metres below sea level.

.....[1]

(ii) Why does such a difference in percentage volume of vesicles exist?

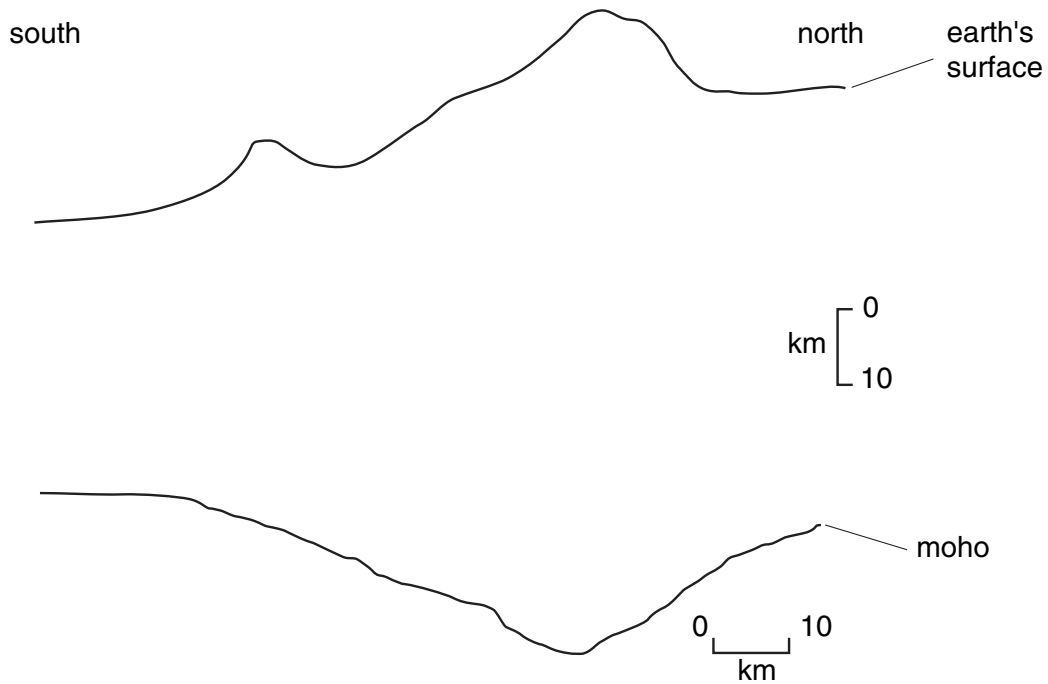
.....
.....
.....
.....[2]

(iii) Describe how a vesicular texture becomes an amygdaloidal texture.

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

[Total: 20]

- 2 (a) The diagram below shows a simplified cross section through the Himalayan orogenic belt.



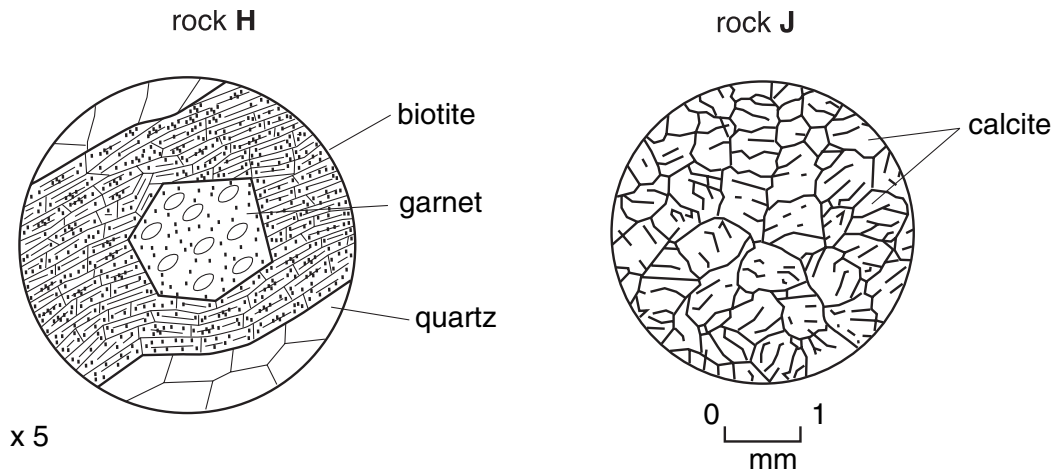
- (i) Add arrows to the diagram to show the direction of plate movement. [1]
- (ii) Measure the maximum thickness of the crust on the diagram.
.....[1]
- (iii) Shade an area on the diagram where crust may be partially melting. [1]
- (iv) Explain why partial melting is taking place in the area that you have shaded.
.....[1]
- (v) Give **two** reasons why the magma produced by the partial melting does **not** reach the surface to form volcanoes.
.....
.....
.....[2]
- (vi) Name a typical igneous rock that forms under such conditions within the crust.
.....[1]

(b) Name **two** geological structures produced by compressive forces that result in crustal thickening and shortening.

Structure 1[1]

Structure 2[1]

(c) The diagrams below show drawings of photomicrographs of metamorphic rocks **H** and **J**.



(i) Name the two rock types.

rock **H**[1]

rock **J**[1]

(ii) For each rock, suggest the likely parent rock and conditions of formation.

rock **H** parent rock:
[1]

likely conditions:
[1]

rock **J** parent rock:
[1]

likely conditions:
[1]

[Total: 15]

- 3 (a) A geologist carrying out fieldwork recorded the data in the table below.

rock	description
K	<ul style="list-style-type: none"> coarse rounded clasts in a finer grained matrix, the rock is poorly sorted average clast size 2 cm clasts are mainly of flint, the matrix is a medium sand with a cream/yellow colour does not react with dilute HCl, no fossils evident
L	<ul style="list-style-type: none"> very fine grained white rock, very well sorted when rubbed with finger a fine white powder comes off reacts with dilute HCl occasional fragments of bivalves and irregular echinoids
M	<ul style="list-style-type: none"> massively bedded, few joints medium grained rock made up of very well rounded and spherical grains well cemented, creamy/white/brown colour very well sorted, average grain size about 1 mm the grains and cement both react with dilute HCl occasional fragments of brachiopods

- (i) State the name of each rock using the information in the table above.

K name[1]

L name[1]

M name[1]

- (ii) Suggest the origin of rock **K**; circle the correct answer from the list below.

biological chemical mechanical

[1]

- (iii) Describe the conditions required for the sediment that formed rock **L** to be deposited.

.....

[2]

(iv) Describe the conditions required for the sediment that formed rock **M** to be deposited.

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

(b) State the main economic use for each rock and a reason why it is suitable for this use.

L use.....
reason.....
.....[2]

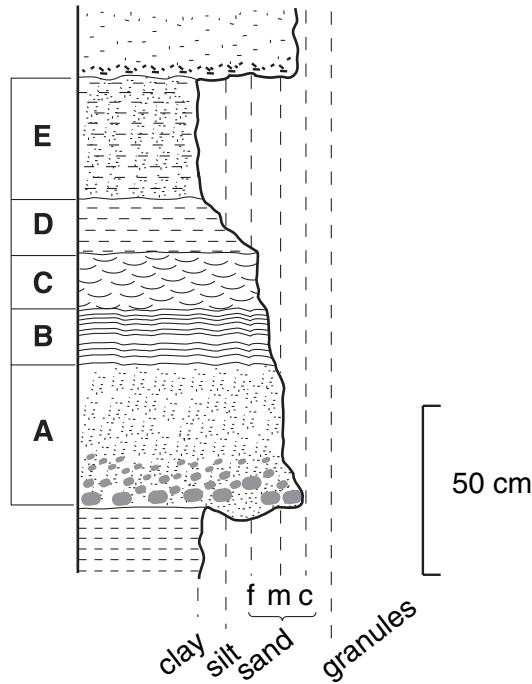
M use.....
reason.....
.....[2]

(c) With the aid of one or more labelled diagrams explain how evaporite **sequences** form in large barred basins.

.....
.....
.....
.....[4]

[Total: 16]

4 (a) The graphic log below shows a commonly found sequence of sedimentary rocks.



(i) Using the graphic log, name and explain the formation of the sedimentary structure shown by the change in grain sizes in bed **A**.

.....

.....

.....

.....

.....

.....

.....

.....[3]

(ii) Flute casts are found at the base of bed **A**. In the space below, draw a labelled diagram of a flute cast. Explain how a flute cast is formed.

.....

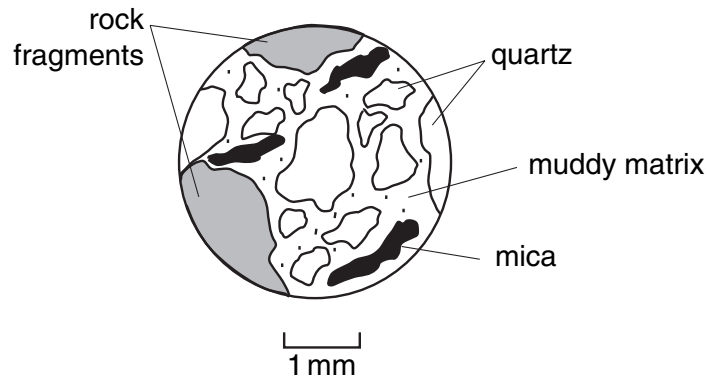
.....

.....[3]

(iii) Load casts are also found at the base of bed **A**. In the space below, draw a labelled diagram of a load cast. Explain how the load cast is formed.

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

(b) The photomicrograph drawing below represents the rock type found in bed **A** in the graphic log.



(i) State, with reasons, the maturity of this rock in terms of composition and texture.

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

(ii) Name the rock type.

.....[1]

(c) Explain the relationship between changes in energy level and the rocks found in the graphic log sequence.

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

[Total: 14]

.....[11]

Quality of Written Communication [2]

[Total: 25]

END OF QUESTION PAPER

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