



ADVANCED SUBSIDIARY GCE
GEOLOGY
 Rocks – Processes and Products

F792

Candidates answer on the question paper

OCR Supplied Materials:
None

Other Materials Required:

- Electronic Calculator
- Ruler (cm/mm)

Wednesday 20 May 2009
Afternoon

Duration: 1 hour 45 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.

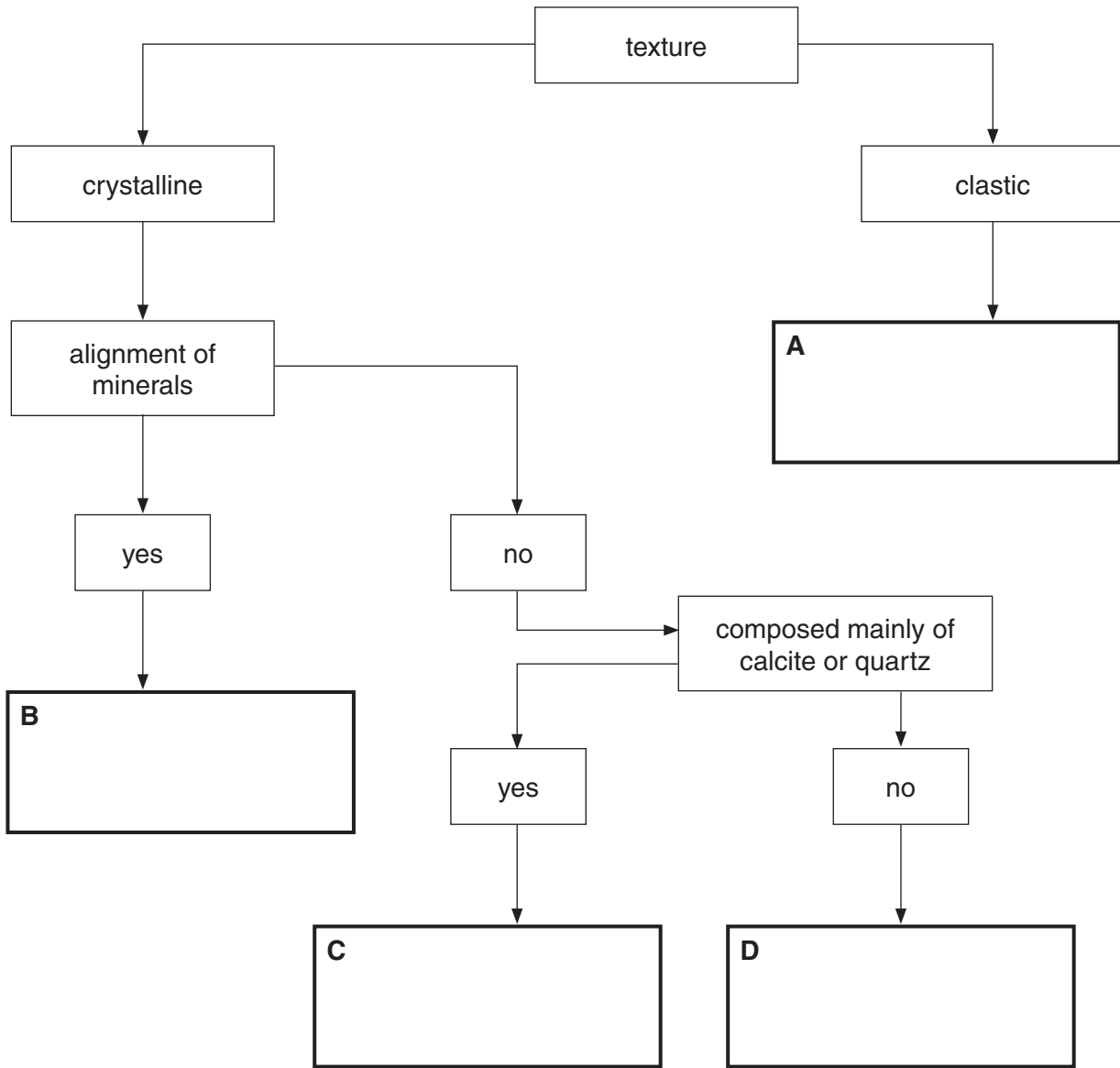
INFORMATION FOR CANDIDATES

- 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 **100**.
- Where you see this icon you will be awarded marks 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.
- This document consists of **20** pages. Any blank pages are indicated.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	14	
2	14	
3	17	
4	19	
5	16	
6	10	
7	10	
TOTAL	100	

Answer **all** the questions.

- 1 (a) Complete the flow diagram below by entering the names of the correct broad rock groups in boxes **A**, **B**, **C** and **D**.



[3]

- (b) (i) Define the terms

clastic

.....

crystalline

..... [2]

- (ii) Define the term *rock*.

.....

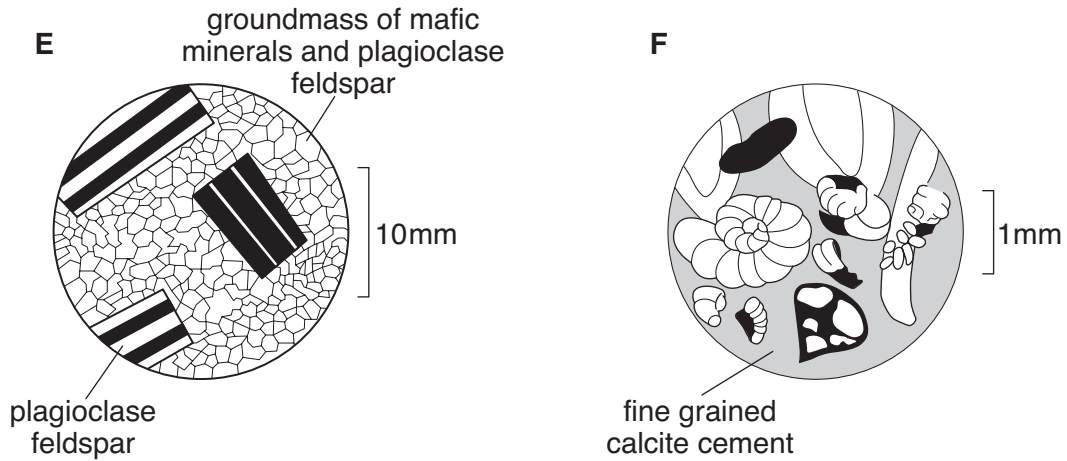
..... [1]

(iii) Explain the processes that cause minerals to be aligned in metamorphic rocks.

.....

 [2]

(c) Below are thin section diagrams of two rocks.



(i) Circle the broad rock group to which each rock belongs.

- | | | | | |
|----------|---------|-------------|-------------|-----|
| E | igneous | metamorphic | sedimentary | |
| F | igneous | metamorphic | sedimentary | [2] |

(ii) Give **two** reasons for your choice for **E**.

1

 2
 [2]

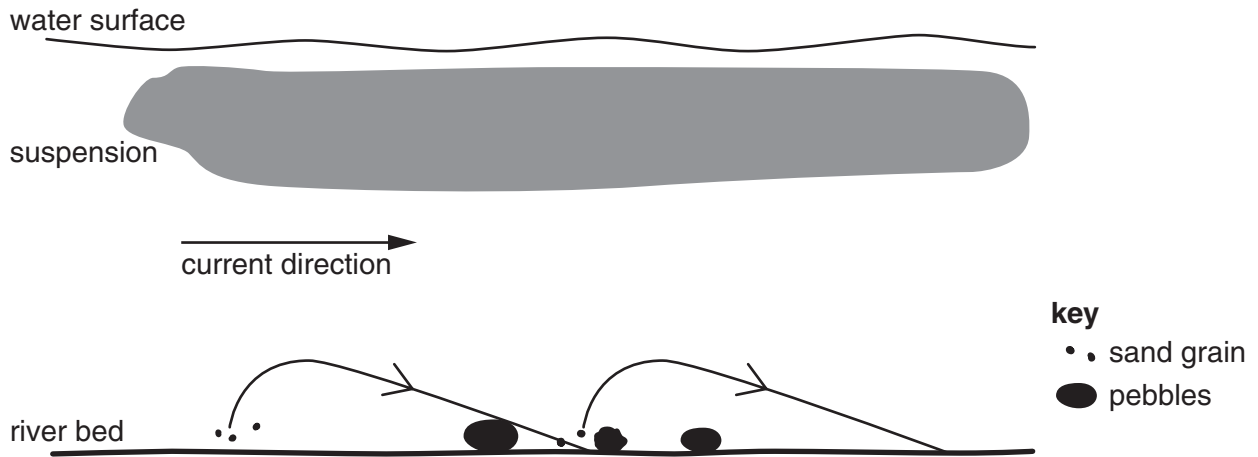
(iii) Give **two** reasons for your choice for **F**.

1

 2
 [2]

[Total: 14]

2 (a) The diagram below shows different types of sediment transport.



(i) Define the term *suspension*.

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

(ii) Explain why the same grain can be transported by suspension and by saltation at different times.

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

(iii) Describe and explain **one** difference between grains transported by ice and by wind.

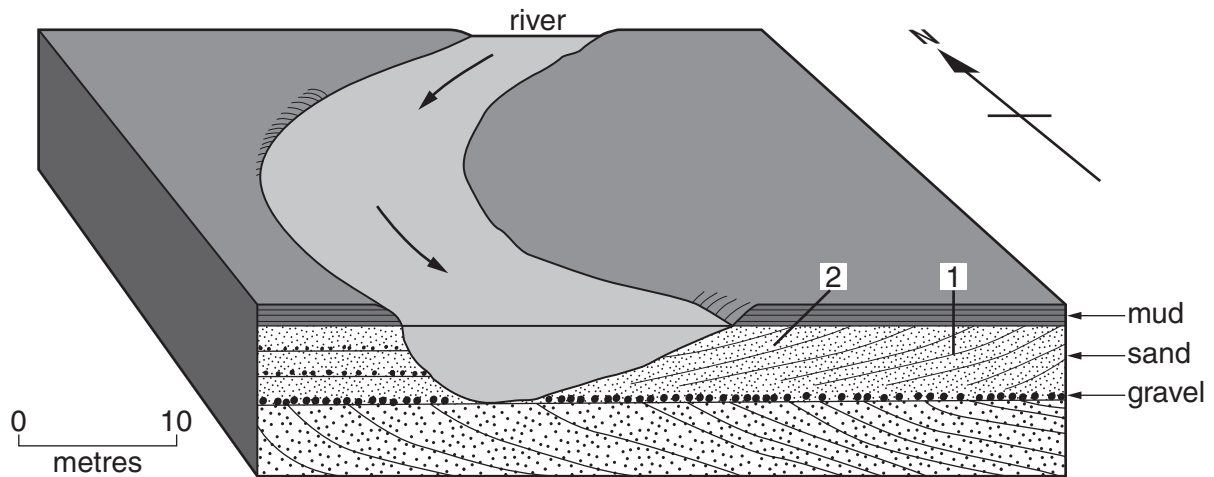
difference

.....

reason

..... [2]

(b) The diagram below shows sediments deposited by a meandering river.



(i) Label on the diagram where sediment is being eroded. [1]

(ii) List **two** sedimentary structures that will be found in the meandering river deposits shown.

.....
 [2]

(iii) Explain why the sediment at **1** is older than the sediment at **2**.

.....

 [2]

(c) The sequence of sediments shown on the diagram is a fining up sequence. Explain how it formed.

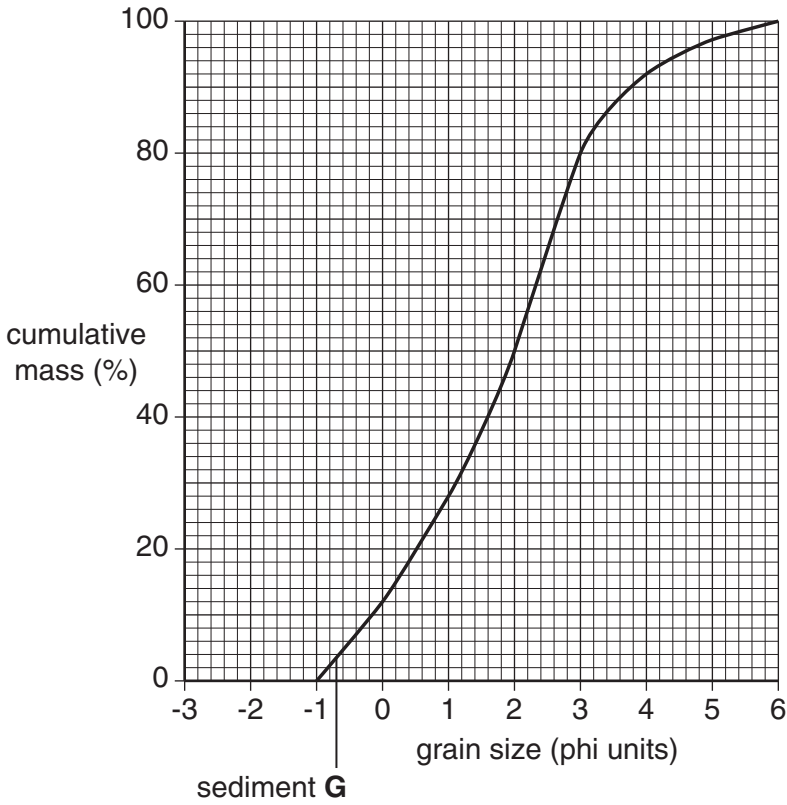
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 [3]

[Total: 14]

Turn over

3 The graph below shows the cumulative frequency curve for sediment **G**. The table shows the grain size distribution for sediment **H**.



grain size (phi ϕ)	mass (%)	cumulative mass (%)
0	0	
1	2	
2	14	
3	78	
4	6	
5	0	
6	0	

sediment **H**

- (a) (i) Using the data
- complete the table to show the cumulative mass % for sediment **H**.
 - plot the data on the graph
 - draw the cumulative frequency curve. [3]

(ii) Define the term *sorting*.

.....

.....

.....

..... [2]

- (iii) Using the cumulative frequency curves and the information below, calculate the coefficient of sorting for sediments **G** and **H**. Show your working.

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

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

coefficient of sorting **G** = coefficient of sorting **H** = [3]

coefficient of sorting	description
<0.50	well sorted
0.50 – 1.00	moderately sorted
>1.00	poorly sorted

- (iv) Describe the difference in sorting between sediment **G** and sediment **H**.

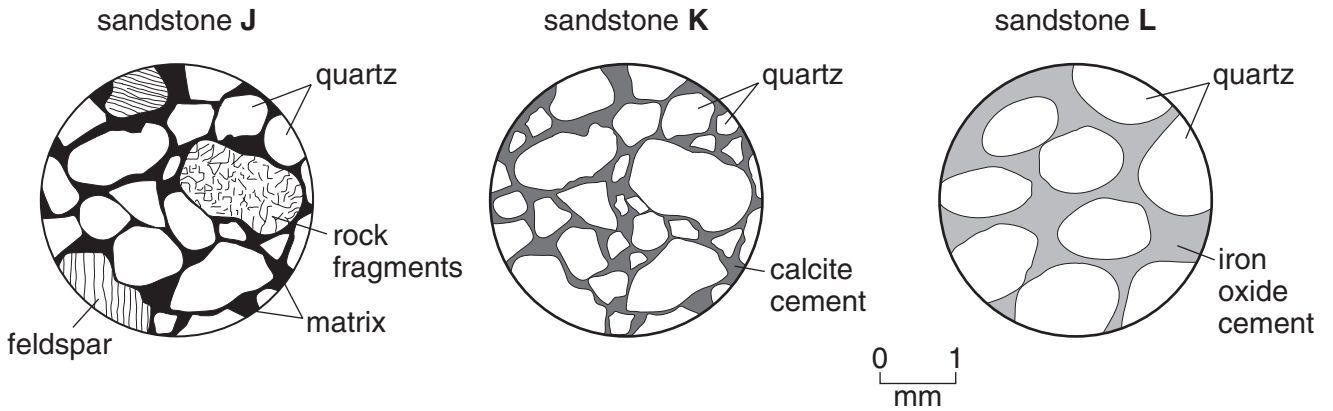
.....
 [1]

- (v) Identify possible environments in which sediments **G** and **H** were formed.

G

H [2]

(b) Sandstones can be classified using composition and grain shape. The thin section diagrams below show three different sandstones.



(i) Identify sandstone **J**. Use the characteristics shown in the diagram to explain the environment in which **J** was deposited.

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

(ii) Use the characteristics shown in the diagram to explain why sandstone **K** was deposited in the sea.

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

(iii) Compare the grain shape of sandstones **K** and **L** and explain how this is used to determine the degree of transport.

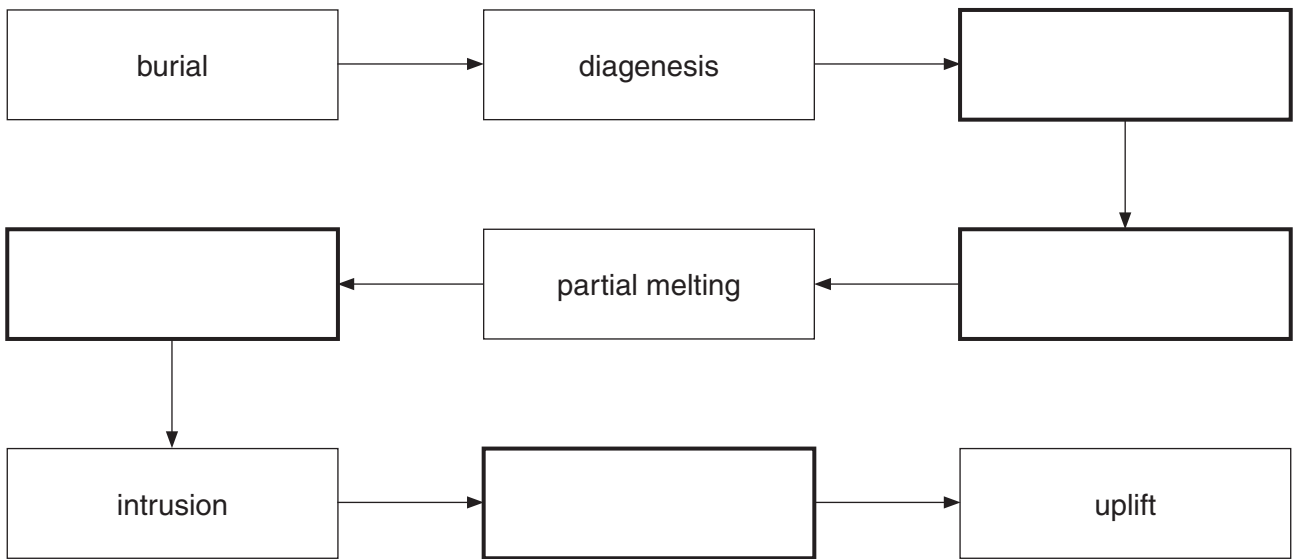
.....
..... [1]

(iv) Analyse the characteristics shown in the diagram to determine the environment of deposition of sandstone **L**.

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

[Total: 17]

4 The diagram below shows a sequence of processes that operate in the rock cycle.



(a) (i) Complete the sequence by entering the name of the correct process in each box above. Choose from the list below.

- crystallisation
- magma accumulation
- metamorphism
- recrystallisation
- transport

[4]

(ii) Describe the process of compaction.

.....

.....

.....

..... [2]

(iii) Describe the process of cementation.

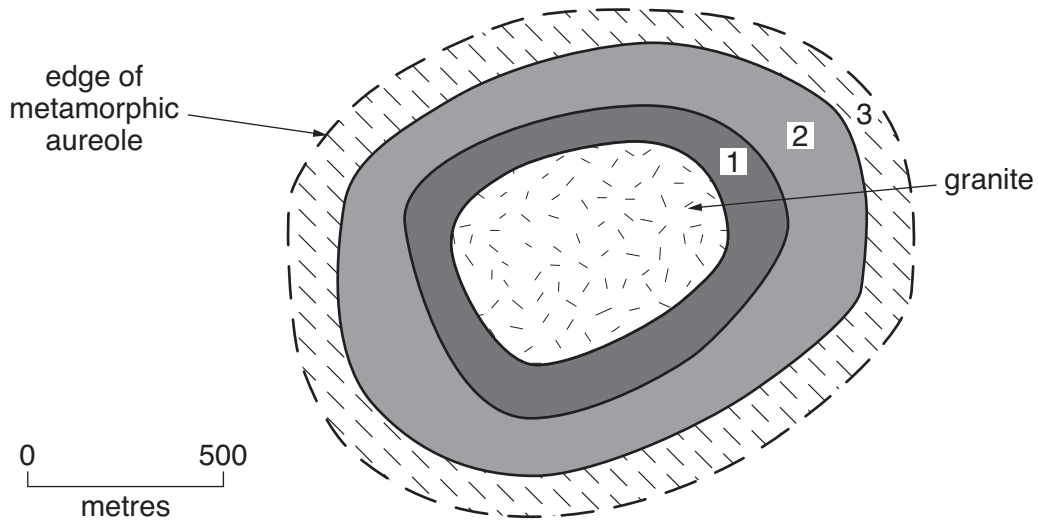
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.....

.....

..... [2]

(b) The diagram below shows zones of metamorphic rocks around a granite intruded into shales.

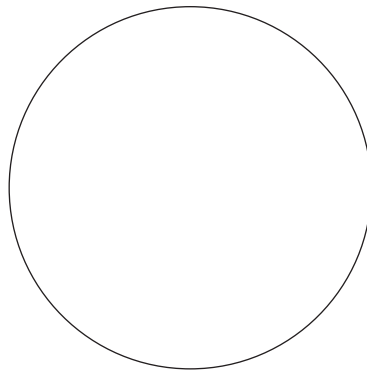


(i) Name and describe the characteristic rocks and index minerals found in each of the three zones.

- 1
-
-
-
- 2
-
-
-
- 3
-
-
-

[6]

- (ii) Draw a labelled diagram and describe the metamorphic rock produced if the parent rock was sandstone.



0 5 mm

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

- (iii) Explain the difference between a metamorphic aureole and a baked margin.

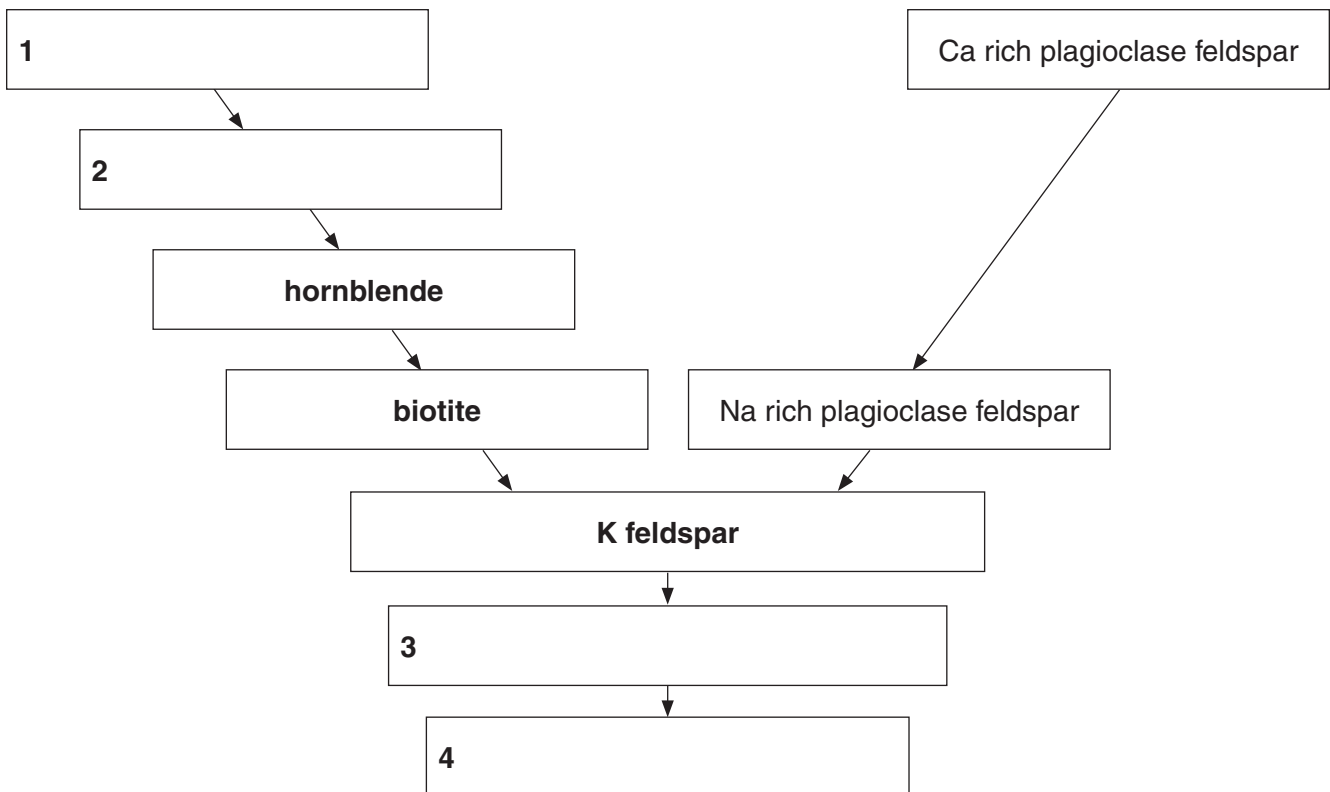
.....
.....
.....
..... [2]

[Total: 19]

5 The diagram below shows part of Bowen's Reaction Series. The table shows some of the characteristic properties of the rock forming minerals.

Specific gravity	Cleavage	Hardness	Composition	Colour	Name
2.7	none	7	silicon dioxide	glassy grey or white	quartz
2.6	two good	6	K rich aluminium silicate	pink or white	K feldspar
2.7	two good	6	Na or Ca rich aluminium silicate	white or grey	plagioclase feldspar
3	one perfect splits into thin elastic sheets	2.5	K, Mg, Fe rich aluminium silicate	dark brown to black	biotite mica
2.8	one perfect splits into thin elastic sheets	2.5	K rich aluminium silicate	pale silvery	muscovite mica
3.2	two good at 120°	5.5	Na or Ca rich aluminium silicate	black or greenish black	hornblende (amphibole)
3.4	two good at 90°	6	Ca, Mg, Fe rich aluminium silicate	black or greenish black	augite (pyroxene)
3.4	none	6.5	Mg, Al silicate	green	olivine

Bowen's Reaction Series



(a) (i) Draw a labelled arrow on the diagram of Bowen's Reaction Series to show increasing temperature. [1]

(ii) Identify the minerals **1 – 4** on Bowen's Reaction Series. Write your answers in the boxes on the previous page. [3]

(iii) Explain how plagioclase feldspar forms a continuous reaction series.
.....
.....
.....
..... [2]

(b) (i) Name **two** of the minerals likely to be found in mafic igneous rocks. Give a reason for each of your answers.

1
.....
2
..... [2]

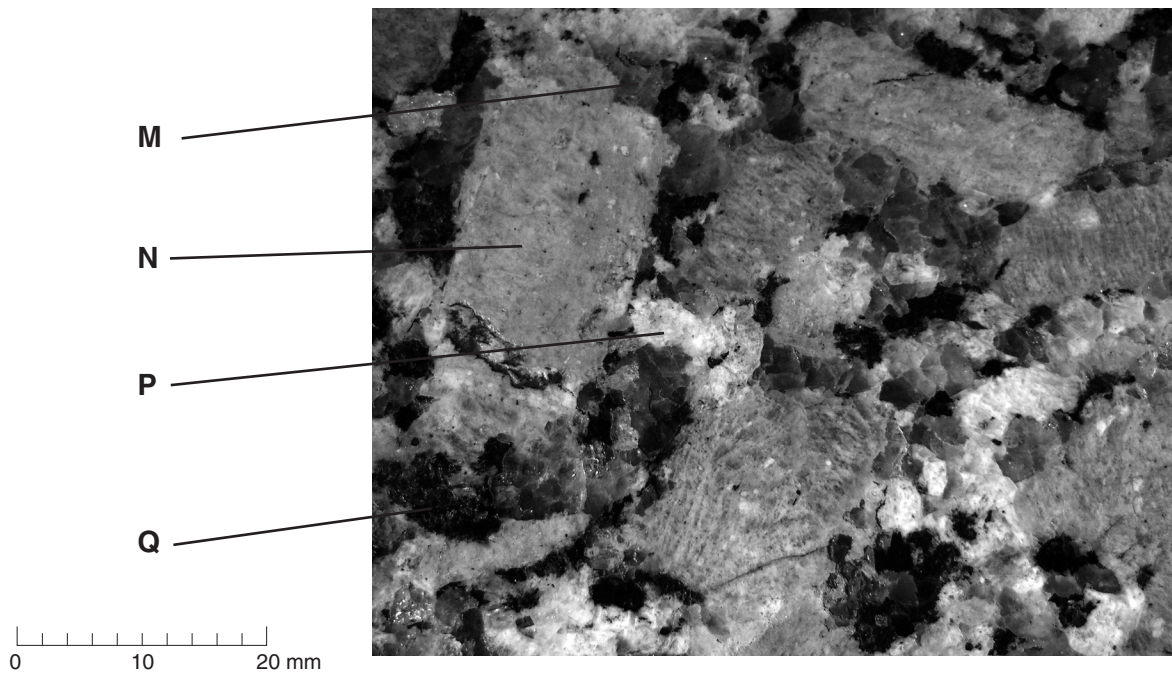
(ii) Using the data provided explain how you would distinguish between the white minerals quartz and plagioclase feldspar.
.....
.....
.....
..... [2]

(c) (i) The photograph below is of a granite. Identify from the photograph the correct minerals from the descriptions below. Put the correct letter in each box.

- black, with perfect cleavage that forms flakes

- pink phenocrysts of hardness 6

[2]



(ii) State **two** other minerals that are present in the granite.

1 2 [1]

(d) Describe how fractional crystallisation and gravity settling allow an intermediate rock to be formed from a mafic magma.

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

[Total: 16]

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