



**ADVANCED GCE**  
**GEOLOGY**  
 Geological Skills

**2836/01**

Candidates answer on the question paper

**OCR Supplied Materials:**

- Insert (inserted)

**Other Materials Required:**

- Protractor
- Ruler (cm/mm)

**Friday 12 June 2009**  
**Morning**

**Duration: 1 hour 15 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**

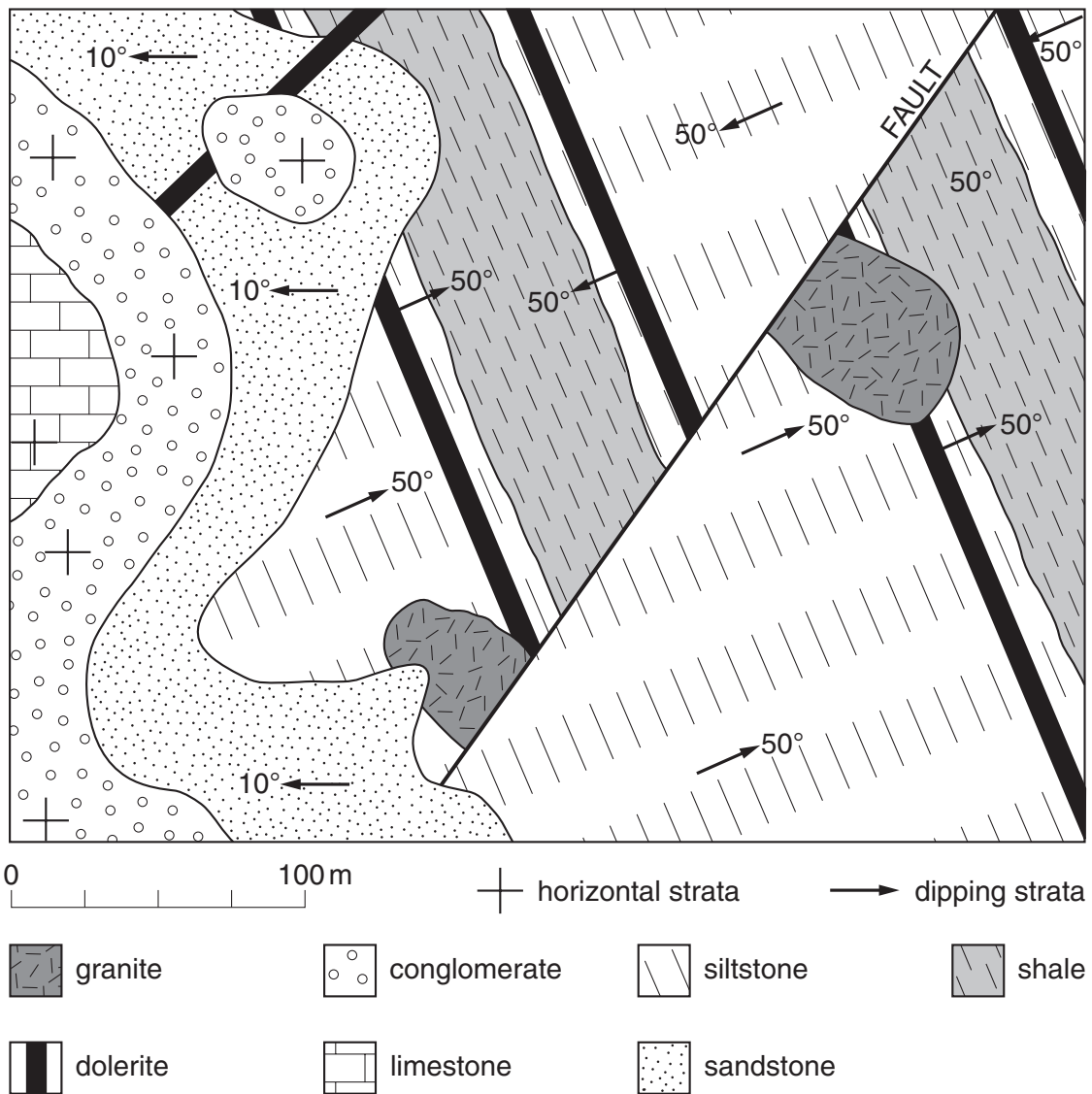
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- This document consists of **16** pages. Any blank pages are indicated.

**FOR EXAMINER'S USE**

Qu.	Max	Mark
1	13	
2	18	
3	12	
4	10	
5	7	
<b>TOTAL</b>	<b>60</b>	

Answer **all** the questions.

- 1 A sequence of sedimentary and igneous rocks is shown on the map below.



- (a) (i) Determine the displacement along the fault on the map. .... m [1]

- (ii) Use technical terms and directions to describe fully and identify the fault. Give a reason for your identification of the fault type.

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..... [3]

In this question, one mark is available for the quality of written communication.

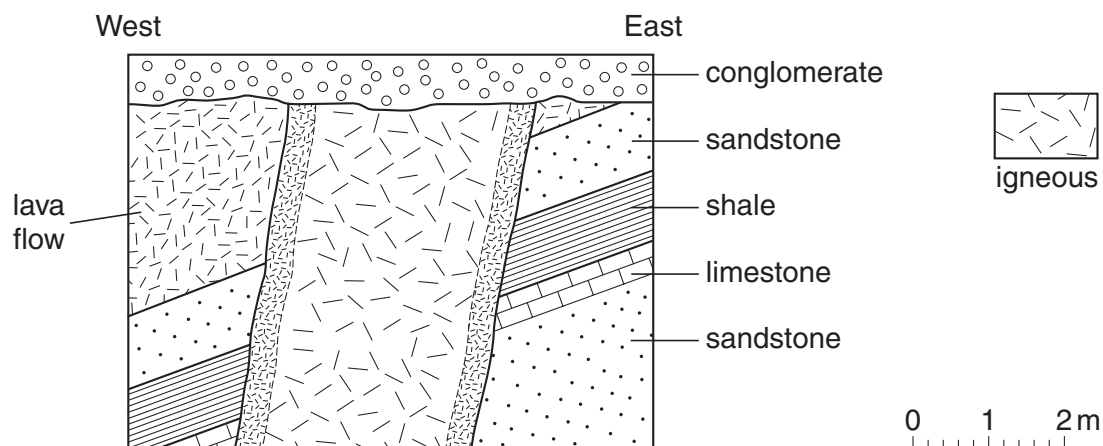
**(b)** Describe the sequence of events that produced the geology shown on the map. Start with the earliest events and describe fully using technical terms.

[8]

Quality of Written Communication [1]

**[Total: 13]**

2 The diagram below is a cross section of an igneous intrusion.



(a) (i) On the diagram above shade and label baked margins. [1]

(ii) Determine the width of the chilled margins.

width ..... cm [1]

(iii) Label the downthrow side of the fault. [1]

(b) (i) The rock of the igneous intrusion has been dated at  $167 \pm 10$  Ma using  $^{40}\text{K}$ – $^{40}\text{Ar}$ . Explain why the date is given with a 10 Ma error margin.

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

(ii) Why are  $^{40}\text{K}$ – $^{40}\text{Ar}$  dates often inaccurate?

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

- (iii) Use the date of the igneous intrusion to give relative dates for the fault and the sedimentary rocks.

.....

.....

.....

.....

..... [2]

- (c) The photograph in **Fig. 1** on the insert shows an igneous rock from the top of a lava flow. Identify the rock and explain how it formed.

.....

.....

.....

.....

.....

..... [3]

- (d) (i) The shale in the cross section contains belemnites and ammonites. The ammonites have complex suture lines, ribs, a sharp keel and have been pyritised.

Suggest a time period in which these rocks were laid down.

..... [1]

- (ii) Draw a belemnite guard.

[1]

- (iii) In this question, one mark is available for the quality of written communication.

The same pyritised ammonites were also found in the conglomerate. Describe the process of pyritisation and explain why these fossils occur in the conglomerate.

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..... [4]

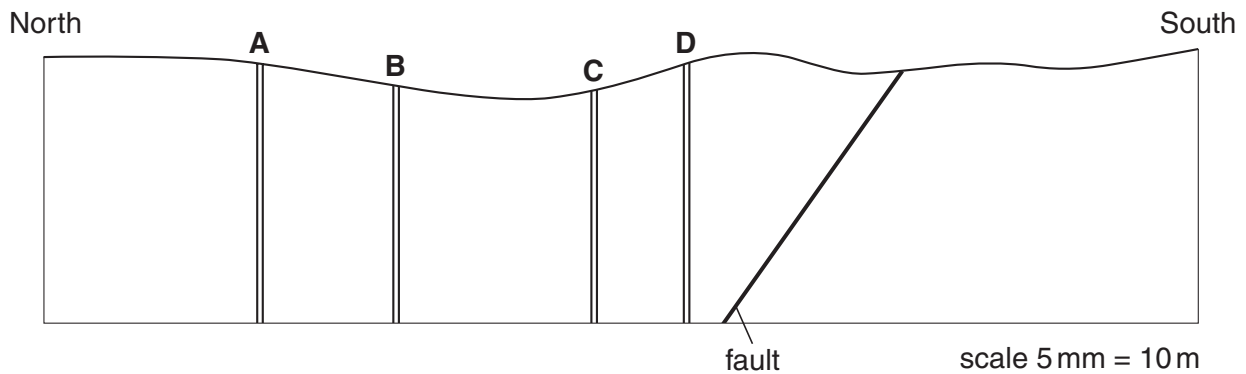
Quality of Written Communication [1]

[Total: 18]

**7**  
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- 3 A mineral vein is encountered at varying depths in a series of boreholes **A**, **B**, **C** and **D** shown on the cross section below.



borehole	depth below surface to mineral vein/m
<b>A</b>	25
<b>B</b>	28
<b>C</b>	38
<b>D</b>	50

- (a) (i) Draw the mineral vein on the cross section using the borehole data. [2]
- (ii) Measure the dip of the mineral vein.  
 ..... [1]
- (iii) The fault has a downthrow of 40m to the north. Using this data continue the mineral vein on the south side of the fault. [2]



- (b) (i) In order to make open cast mining economic the maximum thickness of overburden that can be removed is 30m. Shade on the **north** side of the fault the area that could be mined by opencast methods. [1]

- (ii) The metallic mineral to be mined is galena. Much of the vein is made of fluorite and calcite. Explain how you could use specific gravity to separate the metallic mineral galena from the other minerals.

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

- (iii) Describe the potential environmental consequences of mining **galena**.

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

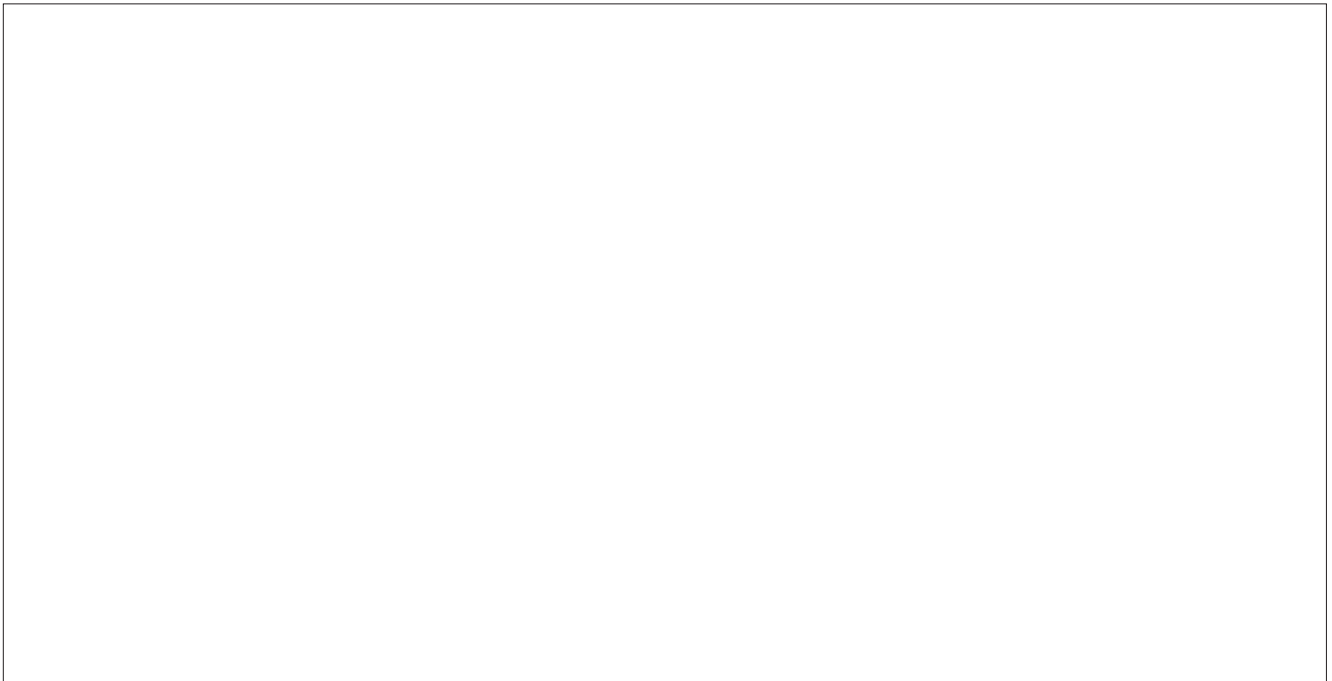
- (c) State **one** diagnostic physical characteristic that would identify each of the minerals:

calcite .....  
 .....  
 fluorite .....  
 ..... [2]

[Total: 12]

4 The photograph **Fig. 2** on the insert shows several geological features on part of a cliff face.

- (a) Draw a **fully labelled** sketch with appropriate dip measurements to show the geological structures on the photograph.

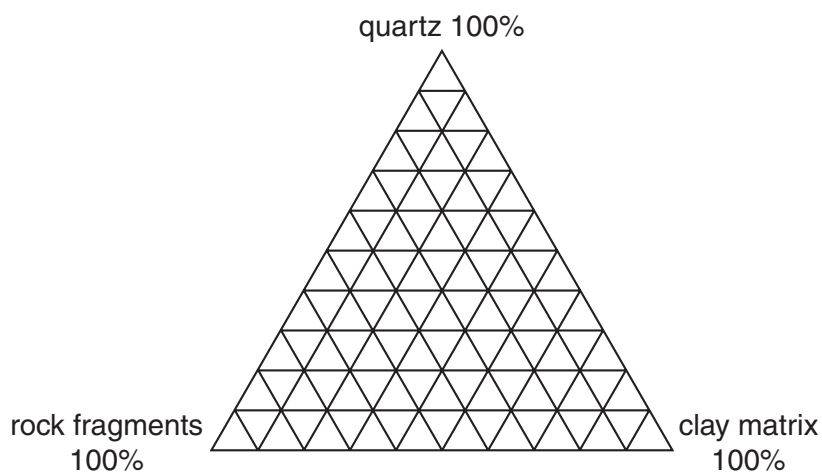


[4]

- (b) The thick beds shown in the photograph are greywacke with a composition of:

- quartz 65%
- rock fragments 20%
- clay matrix 15%

Plot this data on the triangular diagram below.



[1]

- (c) (i) Identify the geological feature in the sandstone shown in the photograph **Fig. 3** on the insert.

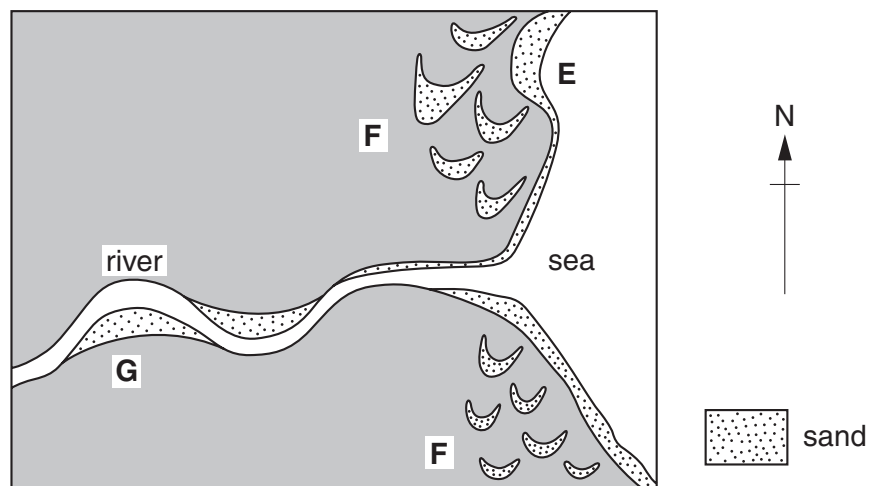
..... [1]

- (ii) The sandstone in **Fig. 3** formed at locality **F** shown on the map below. Explain how this feature formed.

.....  
 .....  
 .....

..... [2]

Map of sand deposits in three environments of deposition.



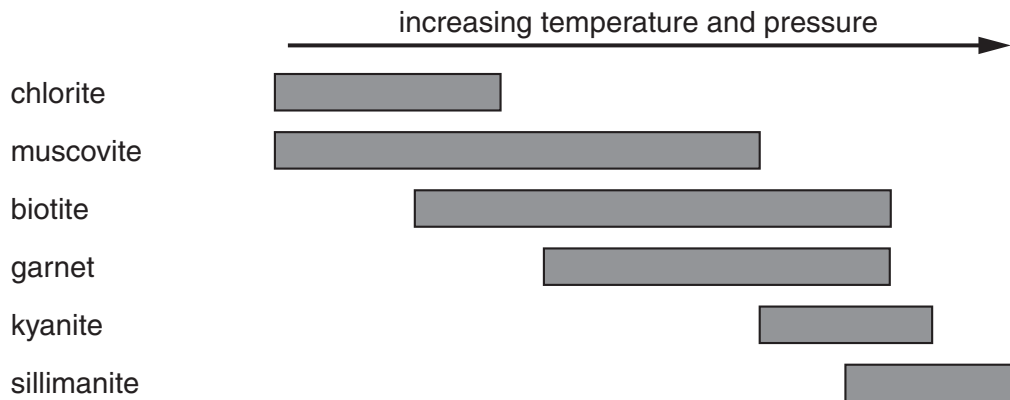
- (iii) Match each of the sands to an environment of deposition **E**, **F** or **G** shown on the map above.

sand	description	environment E, F or G
1	sub rounded, coarse, medium and fine sand sized quartz grains, with some muscovite mica and rock fragments	
2	rounded, medium size sand grains with a composition of 95% quartz with some calcite cement	
3	fine, well sorted and well rounded sand with a composition of 95% quartz with a few rock fragments	

[2]

[Total: 10]

- 5 The diagram below shows the index minerals that are found in metamorphic rocks at a range of temperatures and pressures.



- (a) (i) What type of metamorphism produces this range of minerals?

..... [1]

- (ii) Draw on the diagram above **two** vertical lines to show the limits of medium grade metamorphism. [1]

- (iii) Identify the rocks that are typical of low, medium and high grade metamorphism.

grade	rock name
low	
medium	
high	

[3]

- (b) Explain how kyanite and sillimanite are related.

.....

.....

.....

..... [2]

[Total: 7]

END OF QUESTION PAPER

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