Candidate Name	Centre Number	Candidate Number
		2

GCE AS/A level

451/01

GEOLOGY - GL1

Foundation Unit

P.M. THURSDAY, 8 January 2009

1 hour

	Examiner only
Question 1	
Question 2	
Question 3	
Question 4	
Total	/60

ADDITIONAL MATERIALS

In addition to this examination paper, you will need a copy of the **Mineral Data Sheet.**

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that marking will take into account the use of examples and the quality of communication used in your answers.

Examiner only

GL1. FOUNDATION GEOLOGY

Answer **all** *questions.*

1. **Figure 1a** shows a fossil bivalve and a graptolite. **Figure 1b** shows a sedimentary structure preserved on a bedding plane of a sandstone.

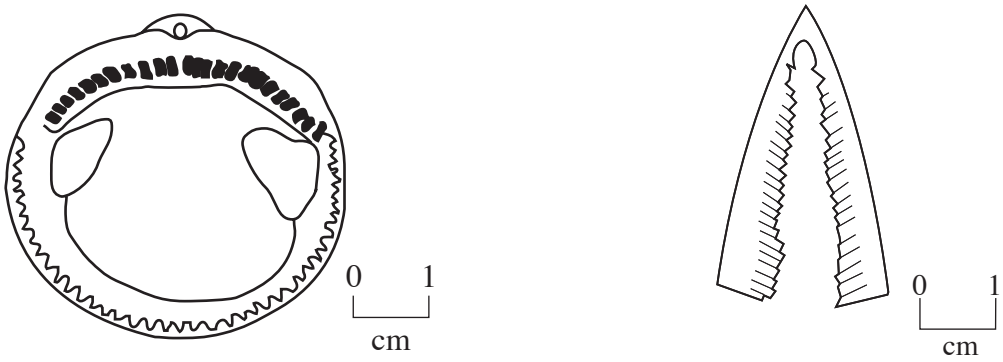

Figure 1a

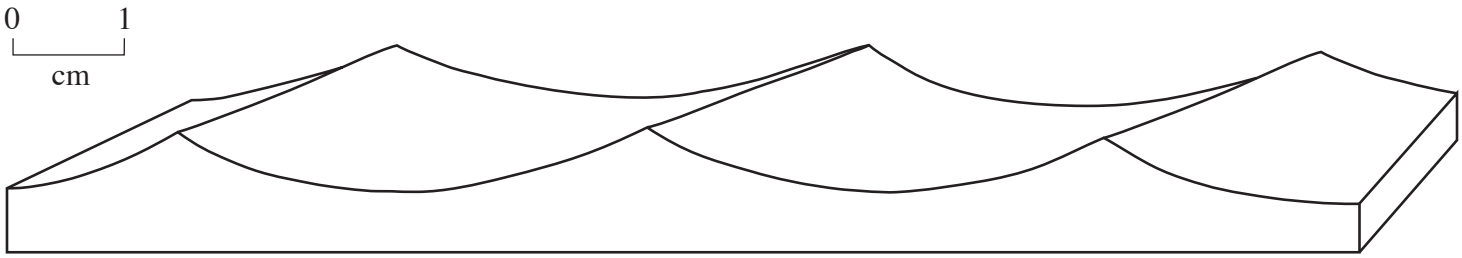

Figure 1b

(a) Label **Figure 1a**, to show the position of [2]

- a pallial line,
- teeth.

(b) Refer to **Figure 1b**.

(i) Name the sedimentary structure shown in **Figure 1b**. [1]

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(ii) Describe the most likely process and environment in which the sedimentary structure shown in **Figure 1b** formed. [3]

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(iii) Explain why the bivalve rather than the graptolite is more likely to have been preserved in the sandstone. Give reasons for your answer. [3]

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Figure 1c shows a sedimentary structure on a bedding plane. This structure originally formed in a hot desert environment.

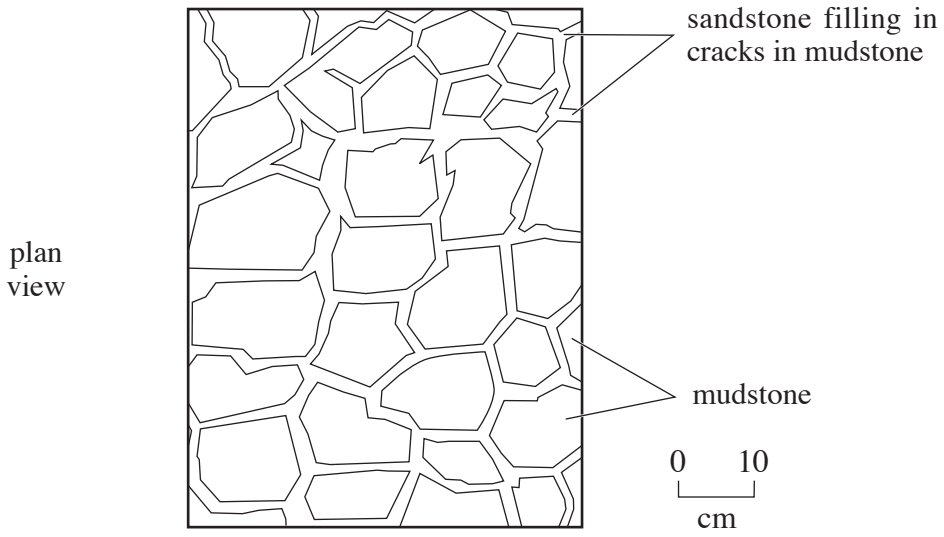

Figure 1c

(c) (i) Name the sedimentary structure shown in **Figure 1c**. [1]

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(ii) Explain how this sedimentary structure formed. [3]

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(d) For **one** sedimentary structure other than those shown in **Figure 1b** and **Figure 1c**,

1. describe its appearance and
2. explain how it formed. [5]

You may wish to make specific reference to your fieldwork (or other examples you have studied) and illustrate your answer with a labelled diagram(s).

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[Total 18 marks]

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Turn over.

2. **Figure 2a** is a graph showing the travel time curves for S-waves and surface waves.
Figure 2b shows the path taken by S-waves to seismic recorders **A** and **B**. The distances from the epicentre to seismic recorders **A** and **B** are shown in **Figure 2a**.
Figure 2c shows the seismogram of the same earthquake received at a third seismic recorder, **C** (not shown in **Figure 2b**). **Figure 2d** shows the seismogram of the same earthquake received at seismic recorder **D** shown in **Figure 2b**.

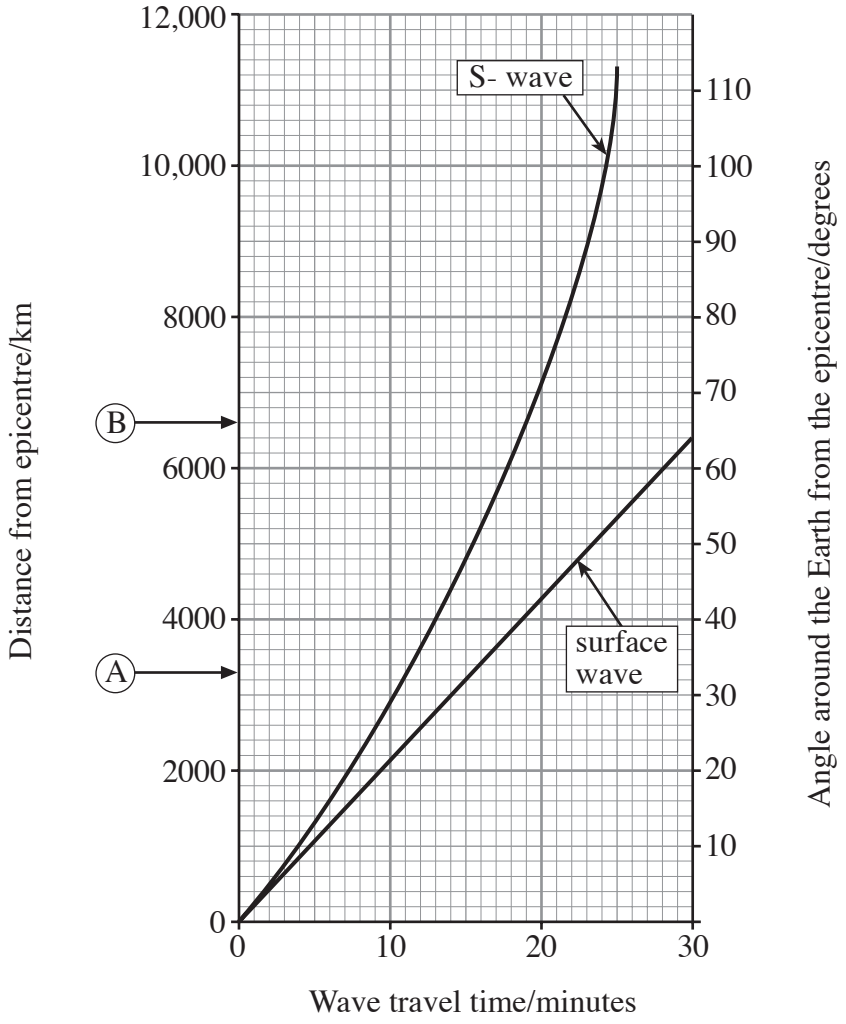

Figure 2a

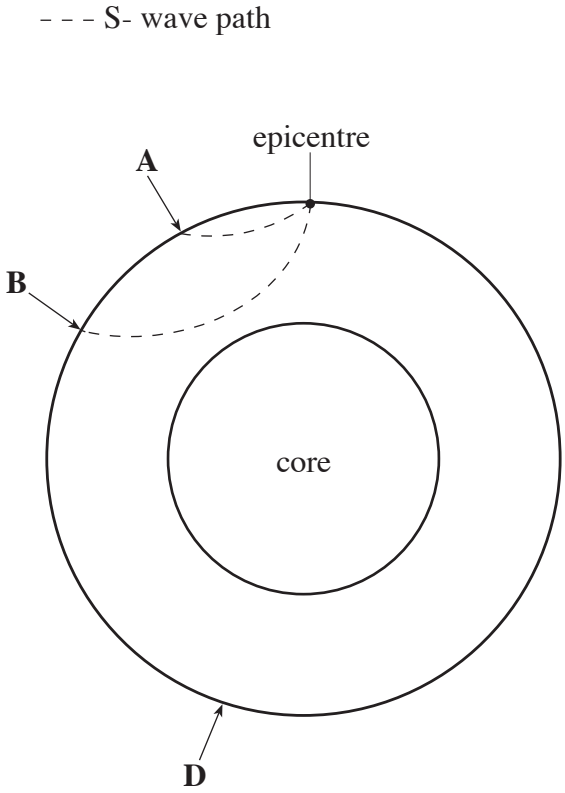

Figure 2b

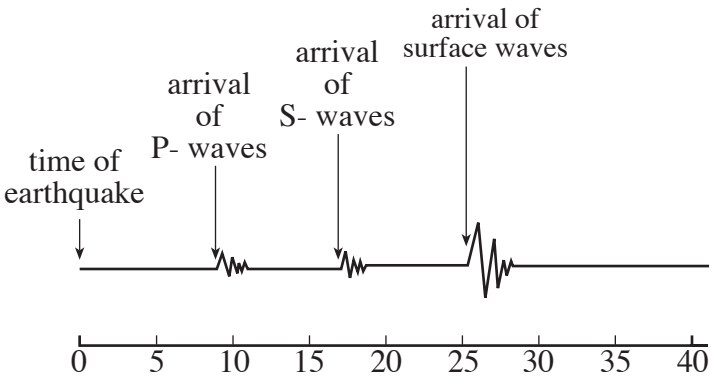

Figure 2c

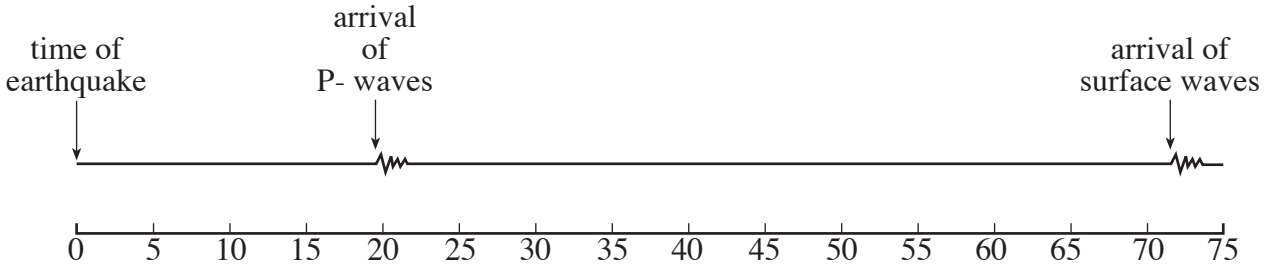

Figure 2d

(a) (i) With reference to **Figure 2a**, complete **Table 2** by:
- recording the arrival time of the **surface** wave at seismic recorder **A**;
- calculating the velocity of the **surface** waves between the epicentre and seismic recorder **A**. Show your working. [3]

Distance to seismic recorder **A** from the epicentre/km	Arrival time of surface waves at seismic recorder **A**/minutes	Velocity of the surface waves/km min^{-1}
3300		

Table 2

(ii) With reference to **Figure 2b** and your knowledge, explain why the S-waves arriving at seismic recorder **B** have a higher mean velocity than the S-waves arriving at seismic recorder **A**. [2]

.....

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(b) (i) Using **Figure 2a**, and the arrival time for the S-wave shown in **Figure 2c**, determine the distance of seismic recorder **C** from the epicentre. Show your working. [2]

Distance ..... km

(ii) With reference to the seismogram shown in **Figure 2c**, draw in **Figure 2a** a travel time curve for **P-waves**. [3]

(c) Seismic recorder **D**, shown on **Figure 2b**, is 160° from the epicentre.

(i) Describe **three** differences between the seismogram for seismic recorder **C** (**Figure 2c**) and the seismogram for seismic recorder **D** (**Figure 2d**). [3]

Difference 1 .....

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Difference 2 .....

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Difference 3 .....

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(ii) Using your knowledge, explain the differences between the two seismograms, **Figure 2c** and **Figure 2d**. [4]

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[Total 17 marks]

3. **Figure 3a** is a cross-section through a sequence of sedimentary and volcanic rocks.

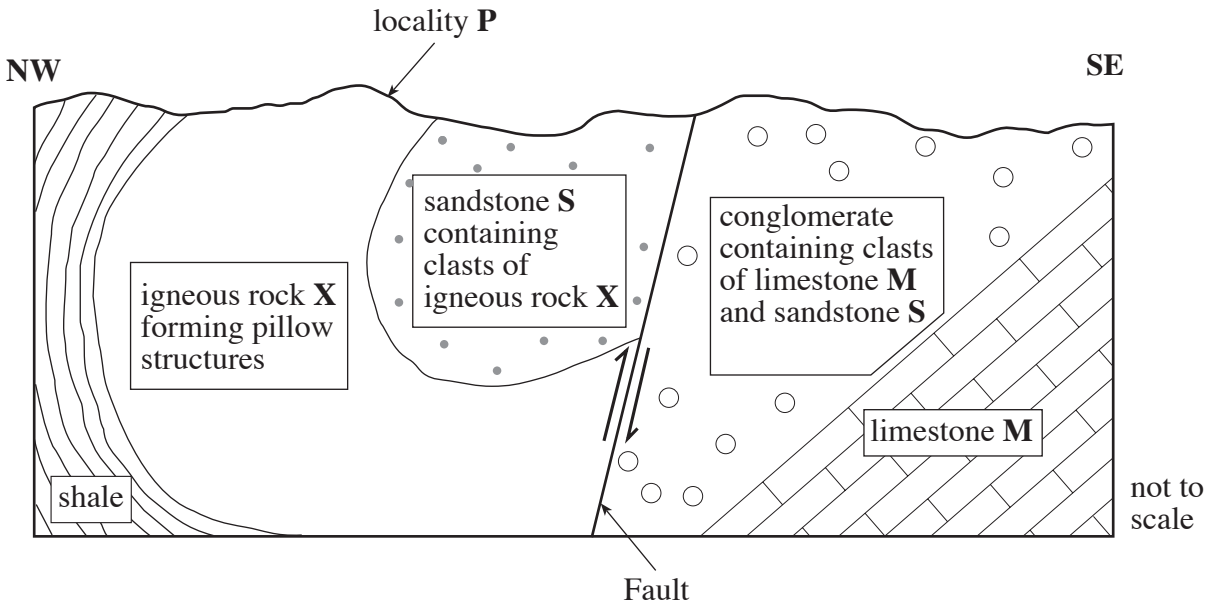

Figure 3a

(a) Refer to **Figure 3a**.

(i) Select, from the list below, the type of fault which best represents that shown in **Figure 3a**. Give a reason for your answer. [2]

Normal **Reverse** **Thrust** **Strike-Slip**

Type of fault .....

Reason .....

.....

.....

(ii) State the name of the youngest rock on **Figure 3a**. Give reasons for your answer. [3]

Youngest rock .....

Reasons .....

.....

.....

Figure 3b is a diagram showing the pillow structures in cross-section at locality **P** in **Figure 3a**.

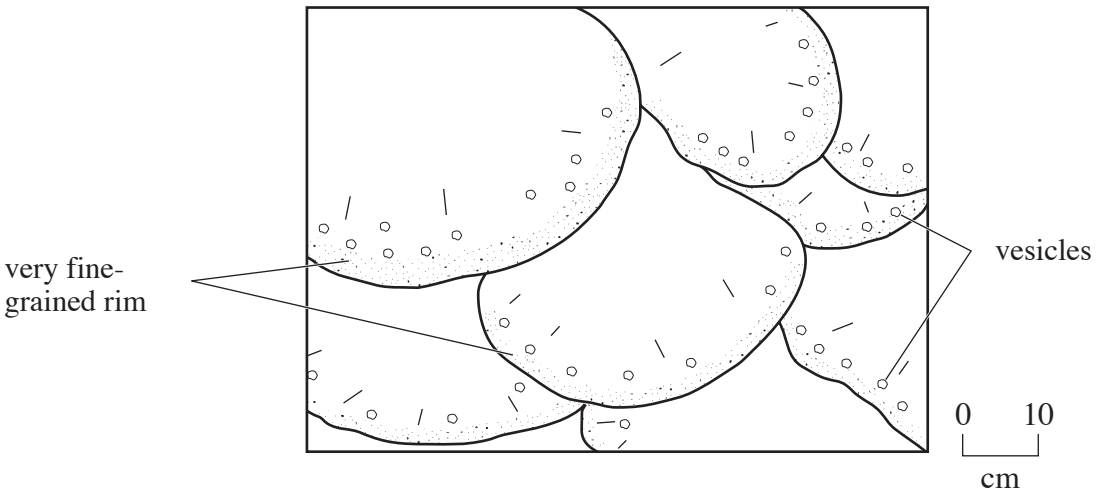

Figure 3b

(b) Refer to **Figure 3b**.

(i) Name the most common igneous rock in which such pillow structures occur. [1]

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(ii) Explain why each of the pillow structures has a very fine-grained rim. [2]

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(c) Refer to **Figures 3a** and **3b**.

(i) Explain the most likely origin of the vesicles in the pillow structures. [2]

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(ii) Describe and explain the distribution of the vesicles within the pillow structures seen in **Figure 3b**. [4]

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[Total 14 marks]

4. **Figure 4a** is a diagram of metamorphic rock **P**.

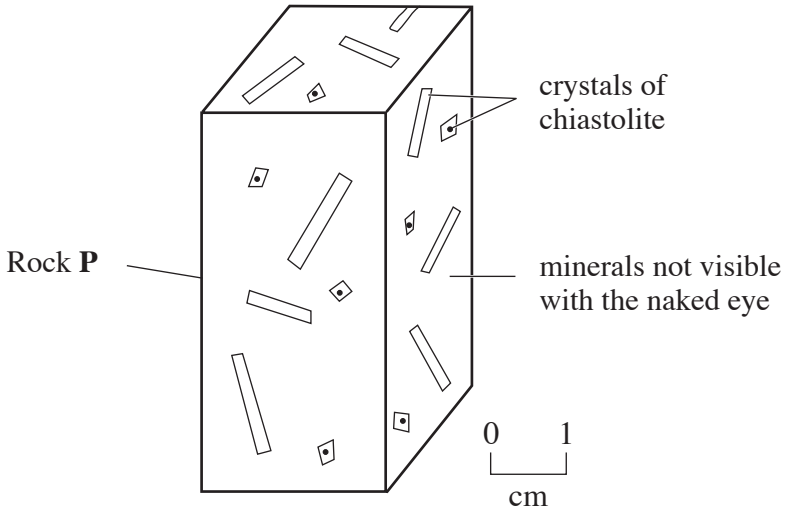

Figure 4

(a) Describe the texture of the crystalline rock **P** shown in **Figure 4**. [3]

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(b) Explain the processes by which metamorphism has formed rock **P**. [3]

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(c) Schist can form under the same temperature conditions as rock **P** and from the same original rock but has a very different mineralogy and texture.

(i) Name one common mineral in schist. [1]

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(ii) State **two** differences between the texture of rock **P** and the texture of schist. [2]

Difference 1 .....

.....

Difference 2 .....

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(iii) Explain why rock **P** and schist have different textures. [2]

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[Total 11 marks]

Examiner only