

Candidate Name	Centre Number	Candidate Number
		2



GCE AS/A level

1212/01

GEOLOGY - GL2α INVESTIGATIVE GEOLOGY

A.M. WEDNESDAY, 4 May 2011

1½ hours

		Examiner only
1.	9	
2.	13	
3.	13	
4.	6	
5.	13	
6.	6	
Total	60	

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- the Resource Sheet;
- Specimens **A**, **C**, **E** and **M**;
- geological equipment for testing specimens;
- the Mineral Data Sheet.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Answer **all** questions. Questions 1-4 may be completed in any order.

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

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The geology is **not** designed to represent any particular area.

The Mineral Data Sheet and **Map 1** and **Photographs 1** to **4** are provided on separate resource sheets.

These are **not** required by the Examiner.

Strips of plain paper may be obtained from the Supervisor on request.

The strips are **not** required by the examiner.

Four specimens, **A**, **C**, **E** and **M**, are provided for use.

All, except **M**, may be tested with the equipment specified by the Supervisor.

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

Marking will take into account the quality of communication used in your answers.

Answer **ALL** the questions in the spaces provided.

Study **Map 1** on the Resource Sheet carefully before answering **Questions 1-6**.

1. (a) A student investigated **Rock Unit A** on **Map 1** and concluded that the unit
- “is a mafic rock which contains a dark mineral which is **not** biotite mica”.
 - “formed as a pluton”.
- (i) Study **Specimen A** which was collected from **Rock Unit A** at **Locality I** on **Map 1**. Using any of the equipment specified by the Supervisor, and the Mineral Data Sheet, complete **Table 1** to confirm that the student’s conclusion about the *dark mineral* is correct by
- briefly describing how you would test for hardness,
 - recording the results of your test.

[2]

Physical property	Description of test	Results of test
• Hardness	•	•

Table 1

- (ii) Complete **Table 2**, indicating in the evaluation column whether the student’s conclusion that it is a *pluton* is true or false. Describe and explain the evidence in the table for your evaluation.

[4]

Evidence	Evaluation (true/false)	Description of evidence	Explanation of evidence
Texture of Specimen A collected from Rock Unit A at Locality I on Map 1		•	•
The contact of Rock Unit A with the country rock between Localities II and III on Map 1		•	•

Table 2

(b) **Figure 1** is a field sketch drawn by the student of the contact of **Rock Unit A** with **Rock Unit B** at **Locality IV** on **Map 1**.

Field sketch of the contact at Locality VI looking North

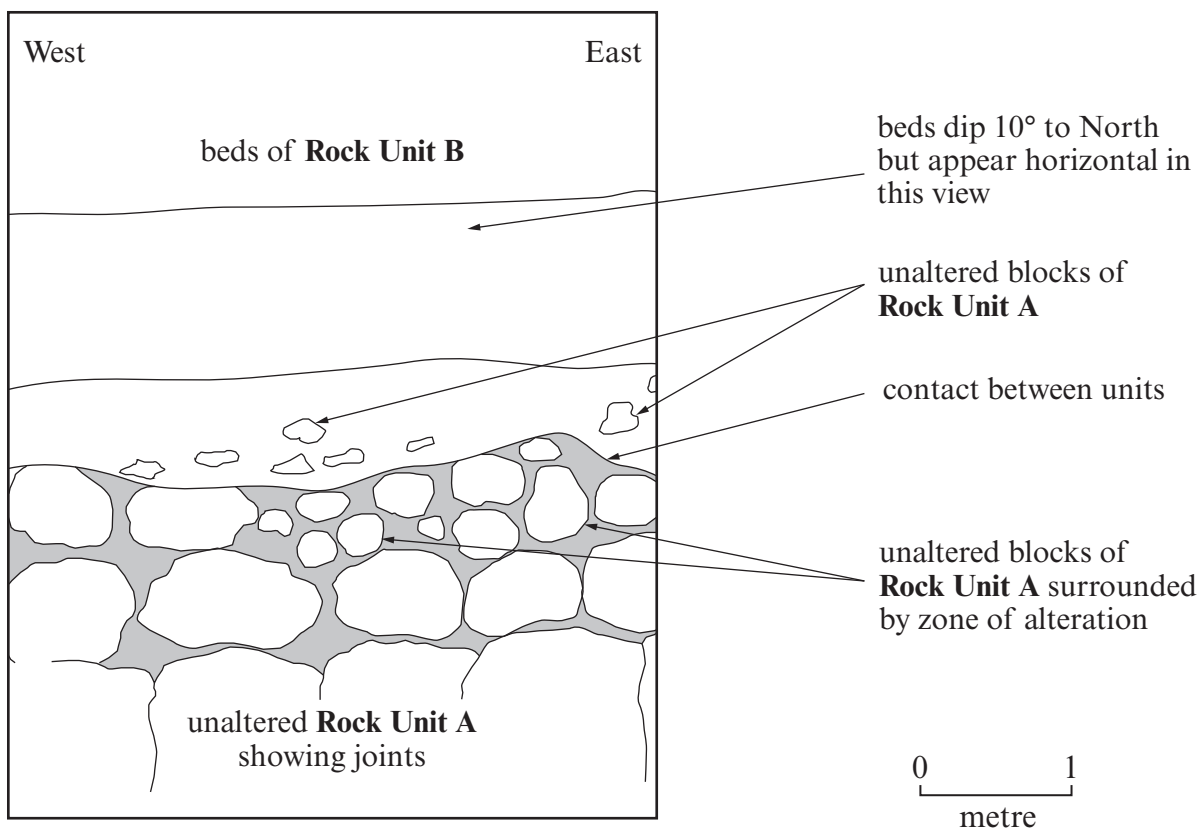


Figure 1

With reference to **Figure 1** only, suggest a name for the contact between **Rock Unit A** and **Rock Unit B**. Give **two** reasons for your answer. [3]

Name of contact

Reason 1

Reason 2

Total 9 marks

2. (a) **Specimen C** was collected from an exposure of **Rock Unit C** on **Map 1**.

(i) Study **Specimen C** with a hand lens.

The list below contains statements about the texture of **Specimen C**.

Tick, in the boxes below, the **three** statements which best apply to **Specimen C**. [3]

• *It is fine-grained (<1/16 mm)*

• *It is dominated by angular crystals*

• *It is dominated by fossil material*

• *It is coarse-grained (>2mm)*

• *It is cemented*

• *It is dominated by rounded grains*

• *It is medium-grained*

• *It is laminated*

• *It is dominated by a matrix*

Tick only
three boxes

(ii) Using any of the equipment specified by the Supervisor, and the Mineral Data Sheet, describe the result of a useful test/observation which is used to name **Specimen C**. [2]

Test/observation

.....

.....

Name of Specimen C

(b) **Specimen M** is a plaster cast of a fossil collected from **Rock Unit C** on **Map 1**.

(i) Draw to scale, in **Figure 2**, a diagram of part of the fossil. [4]

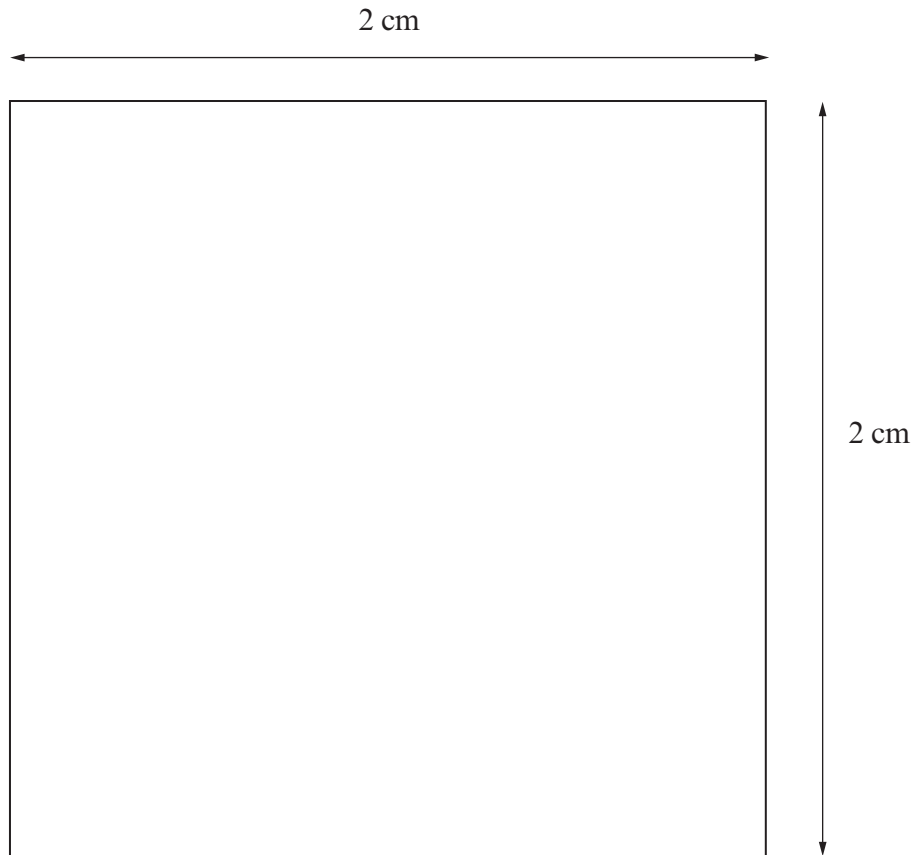


Figure 2

(ii) Label, using an arrow (←) on **Figure 2**, a name of a hard part which is typical of this fossil. [1]

(iii) The fossil from which **Specimen M** was reproduced was composed of quartz. Explain **one** process by which the original fossil may have been preserved. [3]

.....

.....

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.....

.....

Total 13 marks

Turn over.

3. **Rock Unit D** on **Map 1** contains evidence of deep marine current (turbidity current) activity. Details from a sedimentary log of **Rock Unit D** are shown in **Table 3**. **Photographs 1** and **2** (on page 4 of the Resource Sheet) show sedimentary features within the log.

	Bed thickness in cm	Rock type	Description
Bed 7	100	Shale	Black, fine-grained rock
Bed 6	250	Greywacke	Coarse sand with irregular base, passing upwards into medium, then fine, sand
Bed 5	50	Greywacke	Coarse sand with irregular base Photograph 1 taken at base of the bed
Bed 4	100	Shale	Black, fine-grained rock
Bed 3	100	Greywacke	Medium to fine sand
Bed 2	150	Greywacke	Coarse sand with irregular base Photograph 2 taken within bed
Bed 1	150	Shale	Black, fine-grained rock

Table 3

- (a) Complete **Figure 3** (a simplified sedimentary log) using the data in **Table 3**. [4]

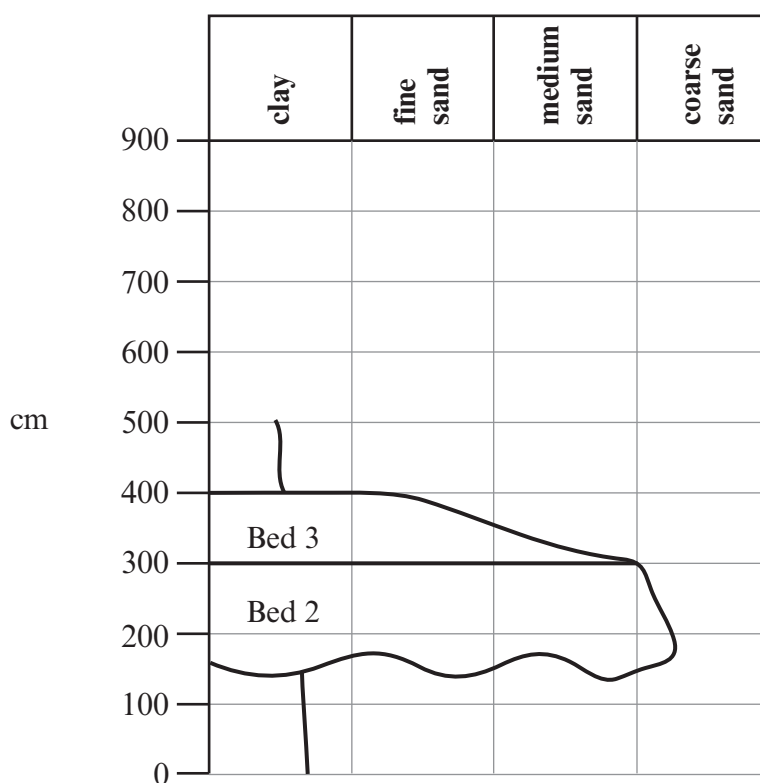


Figure 3

- (b) Study **Figure 4**, which is a graph showing how the velocity of a turbidity current at this locality may have varied with time. The possible conditions of formation of the sedimentary features seen in **Photograph 1** and **2** are indicated.

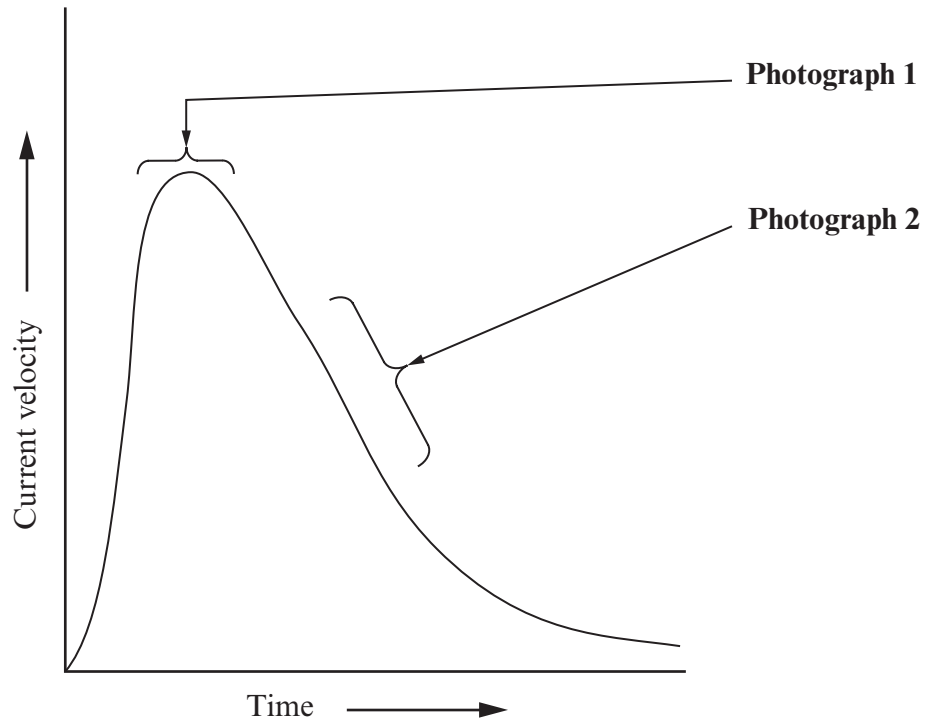


Figure 4

Complete **Table 4** by

- naming each sedimentary feature,
- suggesting why they formed at these conditions.

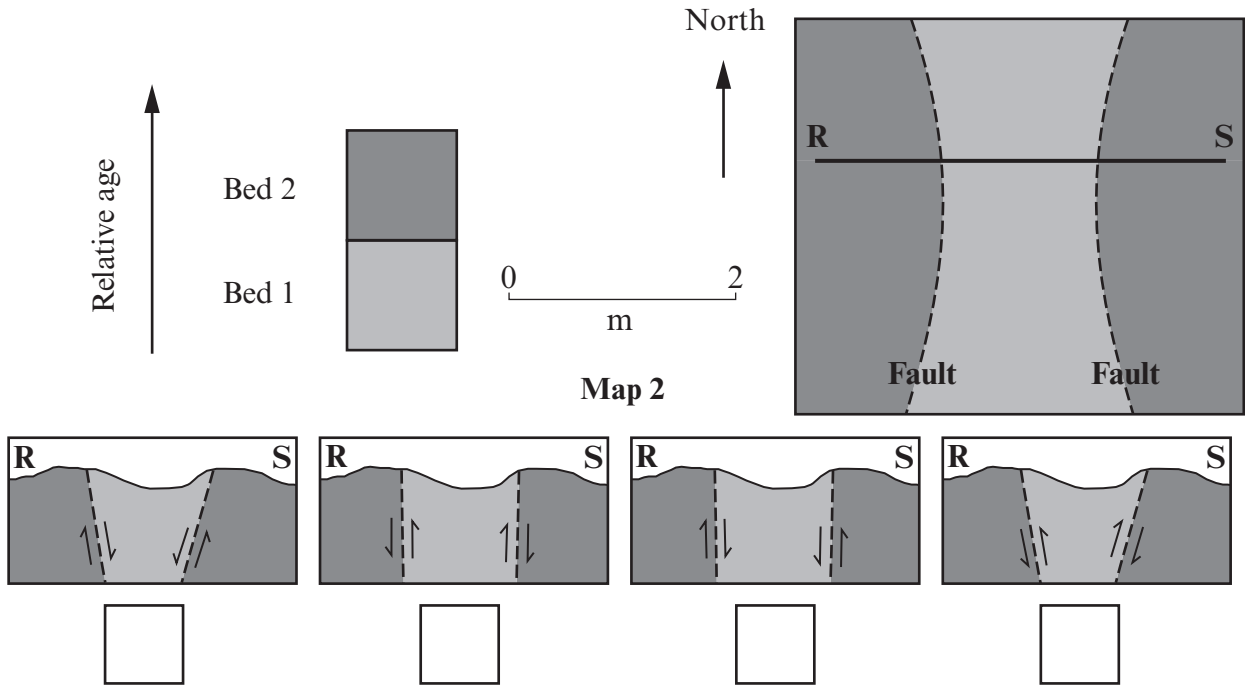
[5]

Photograph	Name of feature	Formation
Photograph 1	•	• •
Photograph 2	•	•

Table 4

(c) **Rock Unit D** on **Map 1** contains many small scale folds and faults. **Maps 2** and **3** were used by a student during a field investigation of the effects of these structures on the outcrop of Beds 1-3.

(i) Study **Map 2** which shows two small dip-slip faults. The relief of the area is not flat.



Tick only **one** box

The student gave four interpretations of the cross-section along **R-S**.

Use the evidence on **Map 2** to tick **one** box to indicate which is the most likely interpretation. Give **two** reasons for your answer. [2]

Reason 1

.....

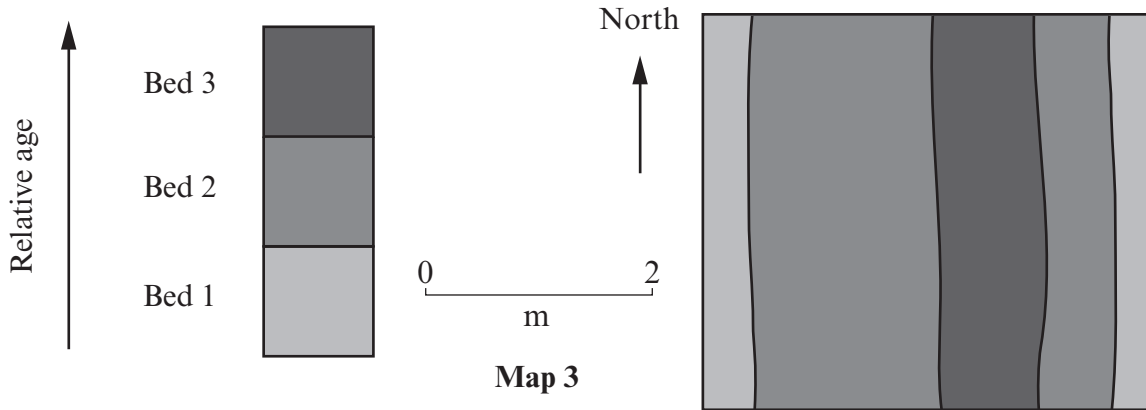
.....

Reason 2

.....

.....

(ii) Study **Map 3** which shows the effects of a small fold on Beds 1-3. The relief of the area is flat.



The student described the fold as

- an anticline with the axial plane trace (APT) trending North to South,
- having limbs dipping at different angles.

Complete **Table 6**, indicating in the evaluation column whether each of the statements relating to this fold is true or false, by discussing **one** piece of evidence from **Map 3**. [2]

	Evaluation (true/false)	Evidence
<i>“an anticline”</i>		•
<i>“limbs dipping at different angles”</i>		•

Table 6

Total 13 marks

4. **Rock Unit E** was a sedimentary rock, probably a shale, which has been completely altered by regional metamorphism into two different rock types.

- (a) Give **one** piece of evidence **only** from **Map 1** which indicates that these are regionally metamorphosed rocks. [1]

Evidence

.....

- (b) Study **Specimen E** and **Photograph 3** (on page 4 of the Resource Sheet) which represent the two rock types.

Using your observations and the Mineral Data Sheet, complete **Table 7** to contrast these. [5]

	Specimen E	Photograph 3
Texture	<ul style="list-style-type: none"> • Too fine to be identified in hand specimen 	<ul style="list-style-type: none"> •
Mineral content	<ul style="list-style-type: none"> • Too small to be identified in hand specimen 	<ul style="list-style-type: none"> • • Mica, feldspar, quartz
Other diagnostic feature	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> •
Name	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Schist

Table 7

Total 6 marks

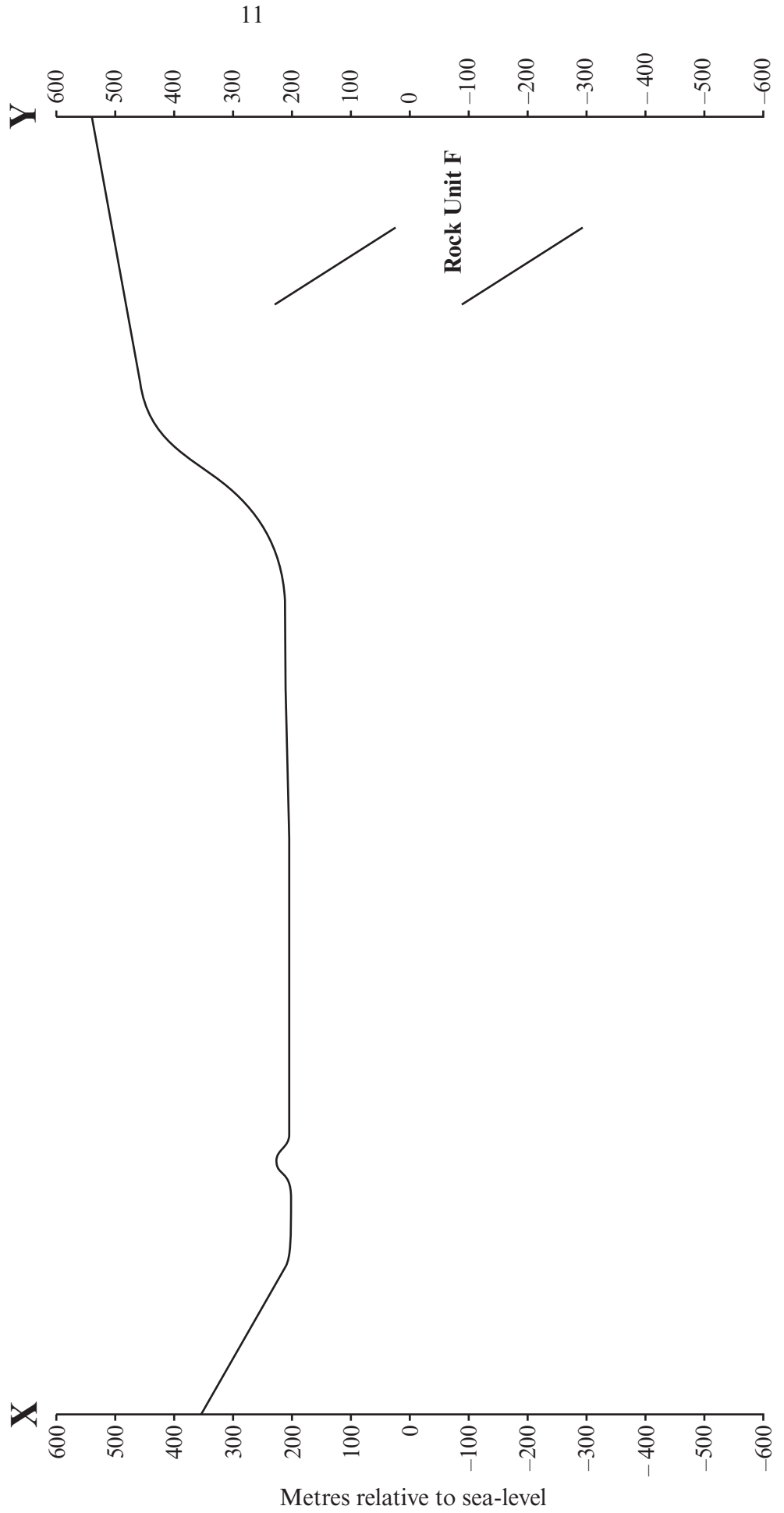
5. The topographic profile below was taken along line X–Y on Map 1. Part of **Rock Unit F** has been inserted.

(1212-01)

Complete the sketch of the geological cross-section along this line using Map 1.

- Draw the **Rock Units**. Use similar ornament, or letters, for these as on Map 1.
- Draw and label **faults**, using the letters on Map 1, **drawing arrows to show movement**.
- Draw and label any **fold axes**.
- Project the **Rock Units** and structures above the ground surface to illustrate any cross-cutting relationships.

[13]



Total 13 marks
Turn over.

6. Fossils can provide evidence of the sedimentary environment of the rock in which they occur.

Explain how a fossil, or an assemblage of fossils, can provide such evidence.

Your answer should refer to any of the following:

- Your fieldwork observations;
- **Specimen M** which is a plaster cast of a fossil collected from **Rock Unit C** on **Map 1**;
- **Photograph 4** (on page 4 of the Resource Sheet) which is taken from **Rock Unit G** on **Map 1**.

You may use annotated diagrams.

[6]

Total 6 marks

Ruled area for examiner's use with horizontal dotted lines.

Photograph 1

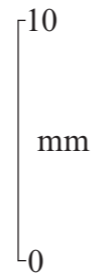
For use in Question 3



Length of hammer is 25 cm

Photograph 2

For use in Question 3



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Photograph 3

For use in Question 4

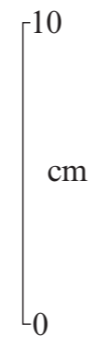
- no cleavage
- will not scratch with steel pin

Scale × 2



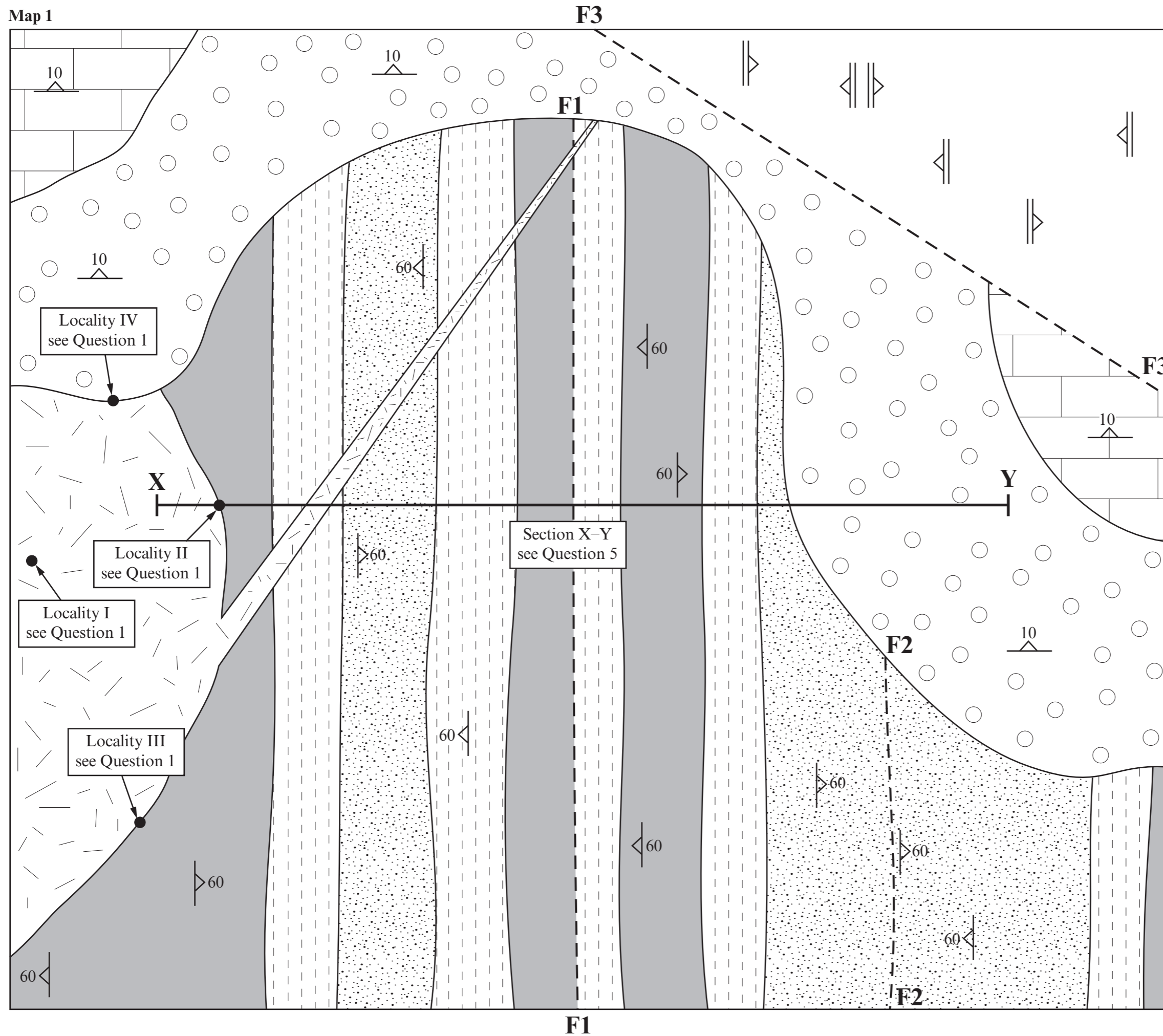
Photograph 4

For use in Question 6














This sheet is **not** required by the examiner.

Map 1



The rock units are not in order of age. Their ornament is not necessarily representative of rock type.

-  Rock Unit A (Specimen A)
-  Rock Unit B
-  Rock Unit C (Specimens C and M)
-  Rock Unit D (Photographs 1 and 2)
-  Rock Unit E (Specimen E, Photograph 3)
-  Rock Unit F
-  Rock Unit G - shelly limestone (Photograph 4)
-  Fault
-  Dip of bed
-  Dip of foliation
-  Locality numbers

