Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1212/01

GEOLOGY – GL2a
Investigative Geology

A.M. WEDNESDAY, 30 April 2014

1 hour 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**7**	
2.	**5**	
3.	**13**	
4.	**10**	
5.	**5**	
6.	**16**	
7.	**4**	
Total	**60**	

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ADDITIONAL MATERIALS

In addition to this examination paper, you will need:
- the Resource Sheet;
- Specimens **A**, **C** and **R**;
- 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.

Three specimens, **A**, **C** and **R**, are provided for use.

Specimens **A** and **C** 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.

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

Study **Map 1** on the Resource Sheet carefully before answering **Questions 1-7**.

1. **Specimen A** is representative of **Rock Unit A** on **Map 1**.

(a) The list below contains statements about the texture of **Specimen A**. Select the **three** statements which best apply to **Specimen A**. [3]

	Tick (✓) only **three** boxes
• *It shows porphyritic texture*	☐
• *It is medium grained*	☐
• *It is equigranular*	☐
• *It is dominated by crystals > 5 mm*	☐
• *It is dominated by a matrix*	☐
• *It is dominated by grains*	☐
• *It is cemented*	☐
• *It is fine grained*	☐
• *It is dominated by crystals*	☐

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(b) **Rock Unit B** is a pluton composed of granite. Using evidence from **Map 1** and the **composition** of **Specimen A** evaluate the statement:

"***Rock Unit A*** *is a dyke intruded at the same time and crystallised from the same magma as* ***Rock Unit B***".

Complete **Table 1** with your evaluation and state your evidence. [3]

Statement	Evaluation (true / false)	Evidence from **Map 1**
"***Rock Unit A*** *is a dyke*"	•	•
"***Rock Unit A*** *intruded at the same time as* ***Rock Unit B***"	•	•
Statement	Evaluation (true / false)	Evidence from the composition of **Specimen A**
"***Rock Unit A*** *crystallised from the same magma as* ***Rock Unit B***"	•	•

Table 1

(c) Name the rock represented by **Specimen A**. [1]

Name of rock .....

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7

Turn over.

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2. **Map 1** shows two faults, **F1** and **F2**.

(a) Complete **Table 2** with your evaluation of two statements about **Fault F1** and state your evidence from **Map 1**. [2]

Statement	Evaluation (true / false)	Evidence from **Map 1**
Fault F1 shows strike-slip displacement	•	•
Fault F1 dips at a lower angle than **Fault F2**	•	•

Table 2

(b) **Fault F2** has dip-slip displacement and **dips steeply to the west**.

Complete the description of **Fault F2** on **Map 1** by ticking (✓) **one** box for **each** statement below. [3]

- The rock unit to the west of the fault is

older	younger	
☐	☐	Tick (✓) only **one** box

- The footwall is to the

west of the fault	east of the fault	
☐	☐	Tick (✓) only **one** box

- The fault shows a

normal movement	reverse movement	
☐	☐	Tick (✓) only **one** box

5

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3. **Specimen C** is representative of **Rock Unit C** on **Map 1**.

(a) (i) Complete **Figure 3a** by drawing, to the scale provided, the texture of **Specimen C**. [4]

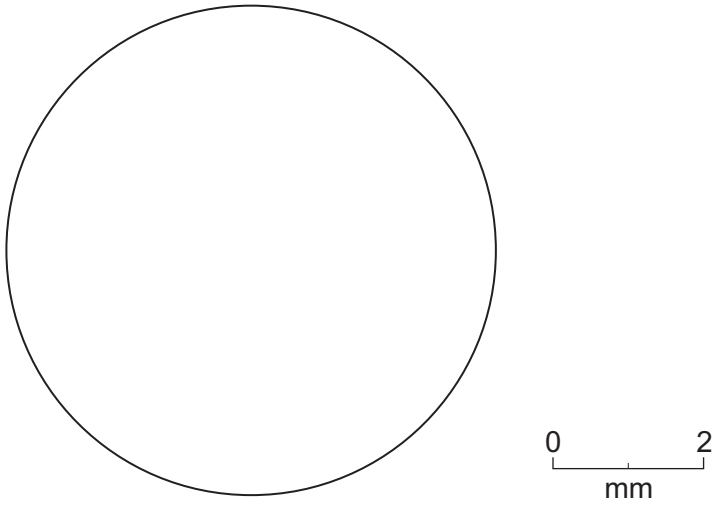

Figure 3a

(ii) The majority of the grains of **Specimen C** are composed of one mineral. Complete **Table 3**.

- Describe and state the result of a test or observation which allows you to identify this mineral. You may use the equipment provided by the supervisor.
- State the name of the mineral forming the majority of the grains in **Specimen C**.

You may wish to refer to the Mineral Data Sheet. [2]

Description and result of test or observation	Name of mineral
•	•

Table 3

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(b) **Map 1** shows the location of a borehole.

Place a tick (✓) in **one** of the boxes in **Figure 3b** to indicate the most likely sequence of rock units down the borehole. The key for the rock units is the same as that for **Map 1**. [1]

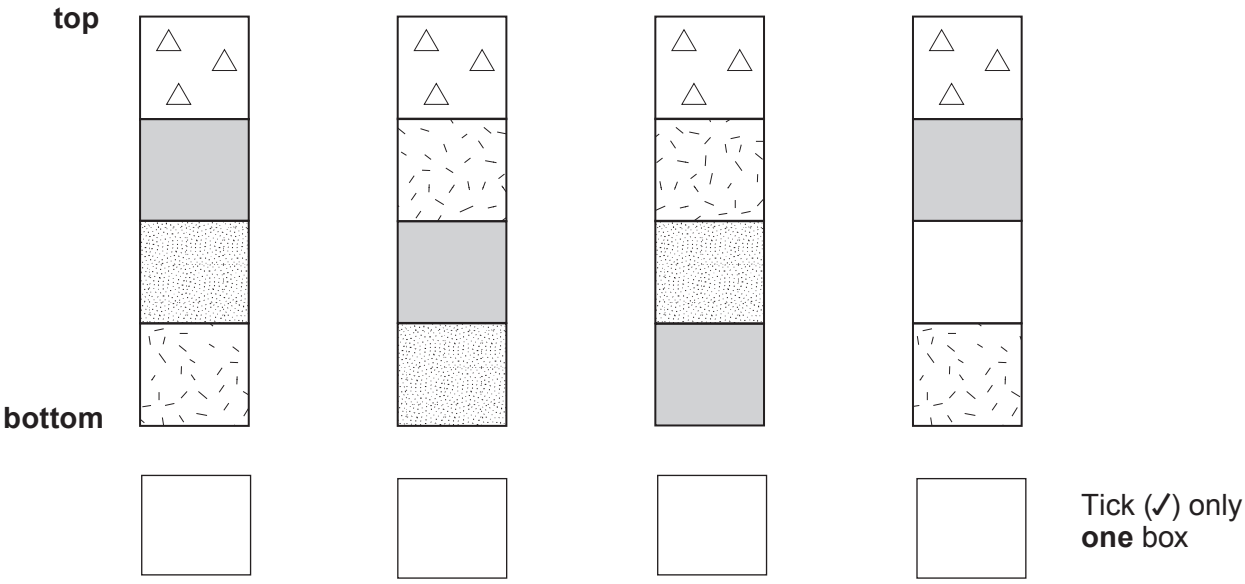

Figure 3b

(c) **Photograph 1**, on page 4 of the Resource Sheet, is a photomicrograph of **Rock C1** collected from **Rock Unit C** down the borehole.

Rock C1 is a metamorphic rock derived from rocks more typical of **Rock Unit C**.

(i) State the evidence in **Photograph 1** which supports the statement "**Rock C1** is a metamorphic rock". [1]

Evidence .....

.....

(ii) State the name of **Rock C1**. Give a reason for your answer. [2]

Name of rock .....

Reason .....

.....

(iii) Explain how **Rock C1** has been derived from rocks more typical of **Rock Unit C**. [3]

.....

.....

.....

.....

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Turn over.

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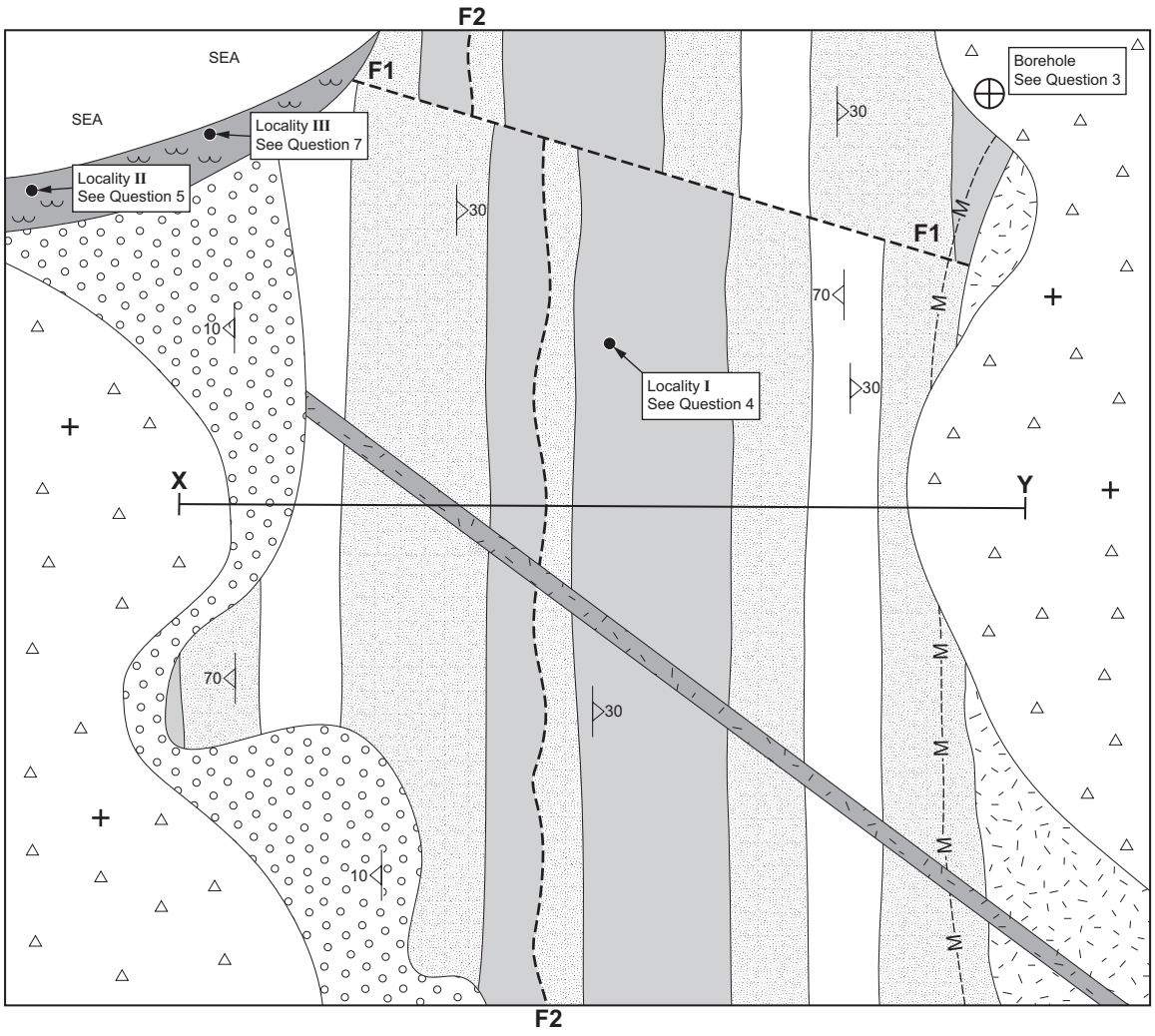
4. **Map 2** below is a reduction of **Map 1**. The key for the rock units is the same as that for **Map 1**.



Map 2

(a) (i) Label on **Map 2** above, using the symbol **U (U ⟶)**, the outcrop of an unconformity. [1]

(ii) State **two** pieces of evidence from **Map 2** which confirm the presence of an unconformity. [2]

Evidence 1 .....

.....

Evidence 2 .....

.....

(b) Clearly draw and label on **Map 2** the axial plane trace (APT) of a **synform** to the **south** of **Fault F1**. Label it with the following symbol. [1]

 synform

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(c) **Figure 4** is a student's field sketch showing a cross-section of small-scale folds within **Rock Unit D** at **Locality I** on **Map 1**.

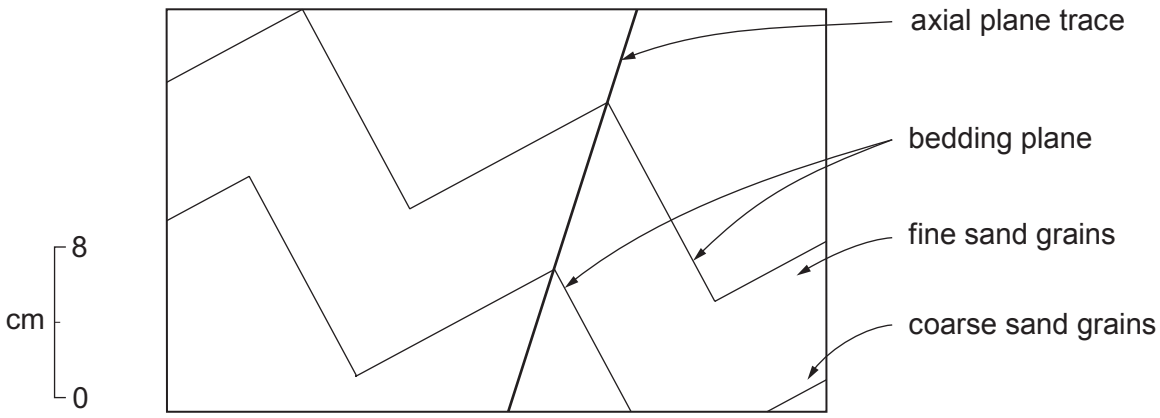

Figure 4

(i) Suggest what the information shown in **Figure 4** indicates about the 'way-up' of the rocks at **Locality I**. Give a reason for your answer. [2]

'Way-up' of the rocks .....

Reason .....

.....

(ii) Select from the list below the **three** terms which best describe the fold for which the axial plane trace has been drawn on **Figure 4**. [3]

	Tick (✓) only **three** boxes
Symmetrical (limbs equal length)	☐
Anticline	☐
Synform	☐
Asymmetrical (limbs different lengths)	☐
Syncline	☐
Antiform	☐

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(iii) The small-scale folds and the large-scale folds within the area of **Map 1** were formed by tectonic stresses from the same directions. Indicate the direction towards which the field sketch **Figure 4** was drawn. [1]

South	East	West	
☐	☐	☐	Tick (✓) only **one** box

10

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5. **Specimen R** has been collected from **Locality II** on **Map 1**. **Photograph 2** on page 4 of the Resource Sheet shows **Locality II**.

(a)
- Draw in **Figure 5** the internal view of **Specimen R** using the scale provided. [4]
- Label teeth and sockets on your drawing in **Figure 5**.

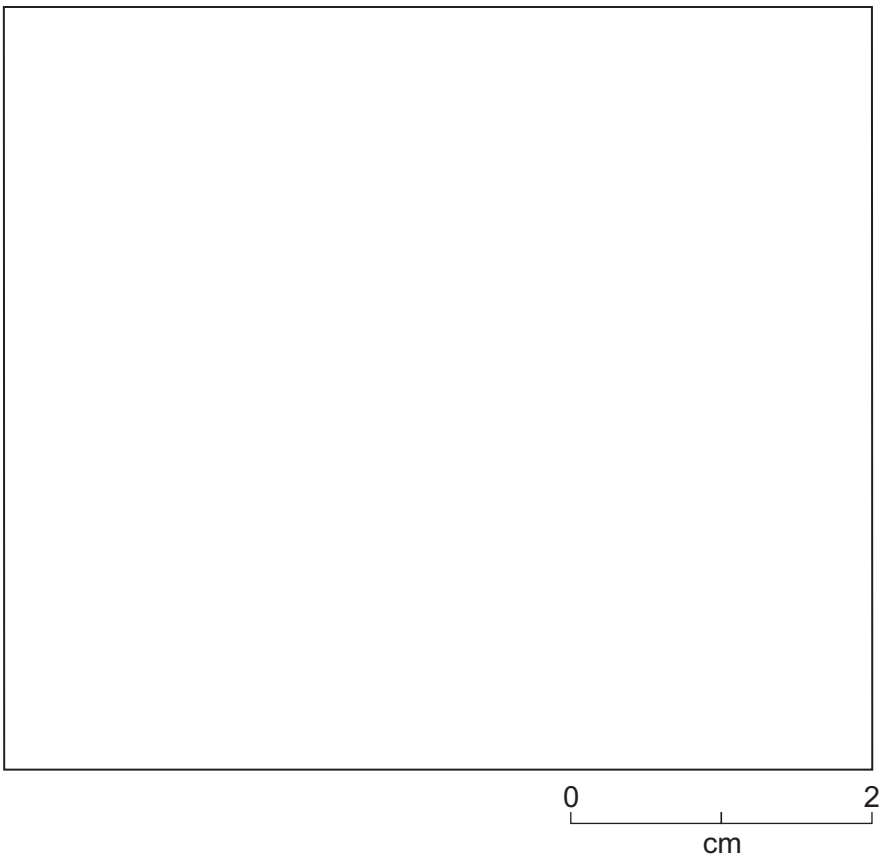


Figure 5

(b) Tick (✓) **one** box to indicate whether the deposit of shells in **Photograph 2** on page 4 of the Resource Sheet represents a life assemblage or a death assemblage. Give a reason for your answer. [1]

Life assemblage ☐ Death assemblage ☐ Tick (✓) only **one** box

Reason .....

.....

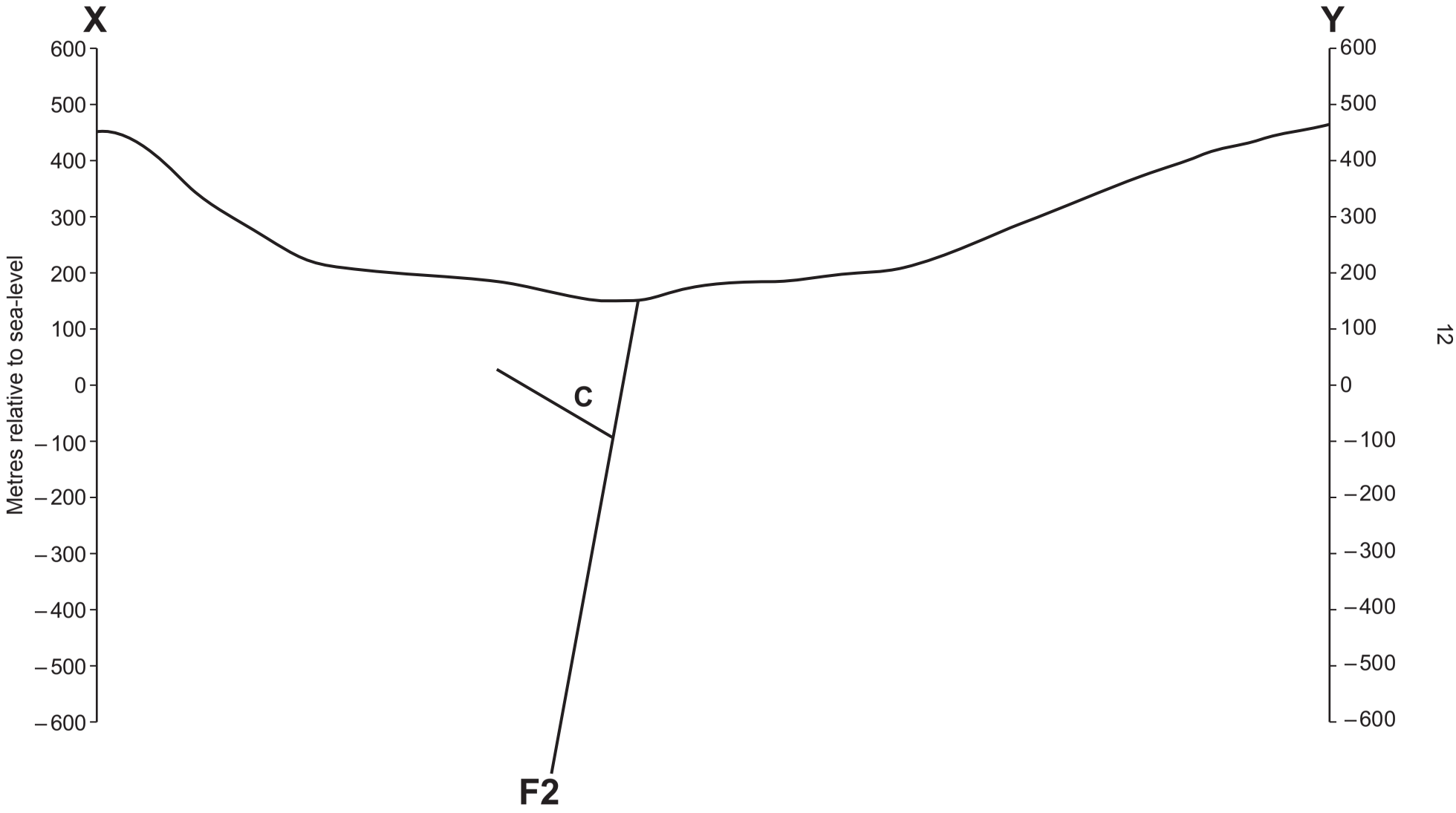
.....

5

6. *(a)* The topographic profile below was taken along the line **X–Y** on **Map 1**.
Part of the base of **Rock Unit C** and **Fault F2** have been inserted.

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 used on **Map 1**.
- Draw and label any **fold axes**.
- Draw arrows alongside **Fault F2** to show movement.
- Project the rock units and structures above the ground surface to illustrate any cross-cutting relationships. [12]



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(b) The table below shows each rock unit in the area of **Map 1** in order of deposition or emplacement with the oldest at the base. Complete the sequence of geological events represented in the area of **Map 1** by clearly marking and labelling the position of the two faults and two episodes of folding.

← **Fault F1**

← **Fault F2**

← an episode of folding

← an episode of folding [4]

YOUNGEST

F
G
H
A
B
D
C
E

OLDEST

16

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7. Sedimentary structures can be used to indicate that some sedimentary rocks were deposited under the influence of currents.

Using an annotated diagram(s):

- Name **one** sedimentary structure which can be used to indicate the direction(s) of current flow.
- Show **how** your chosen sedimentary structure can be used to determine the direction(s) of current flow.
- **Explain** the origin of your chosen sedimentary structure.

Credit will only be awarded for answers which relate to **one** of the following. Tick (✓) **one** box to indicate your choice.

- Your fieldwork observation of **one** rock exposure ☐
- **Photograph 3** (on page 4 of the Resource Sheet) which is representative of **Superficial Deposit Unit F** at **Locality III** on **Map 1** ☐
- **Photograph 4** (on page 4 of the Resource Sheet) which is representative of **Rock Unit D** on **Map 1** ☐

An annotated diagram(s) **must** be used in your answer. [4]

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END OF PAPER

4

Acknowledgements for Resource Sheet

Photograph 1 © Earth Science Education Unit: http//www.earthscienceeducation.com

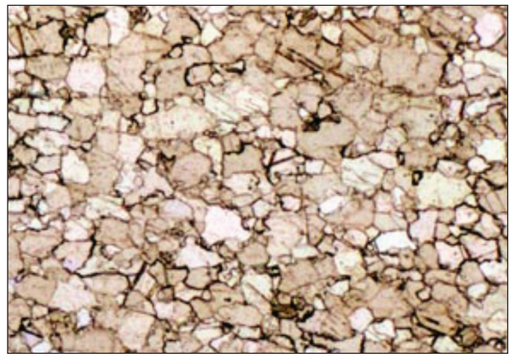
Photograph 2 © Wikimedia Commons

Photograph 3 © www.brynmawr.edu

Photograph 4 © Ashley Dace/www.geograph.org.uk

Photograph 1

For use in Question 3



Photograph 2

For use in Question 5

Photograph 3

For use in Question 7

Photograph 4

For use in Question 7

GCE AS/A level

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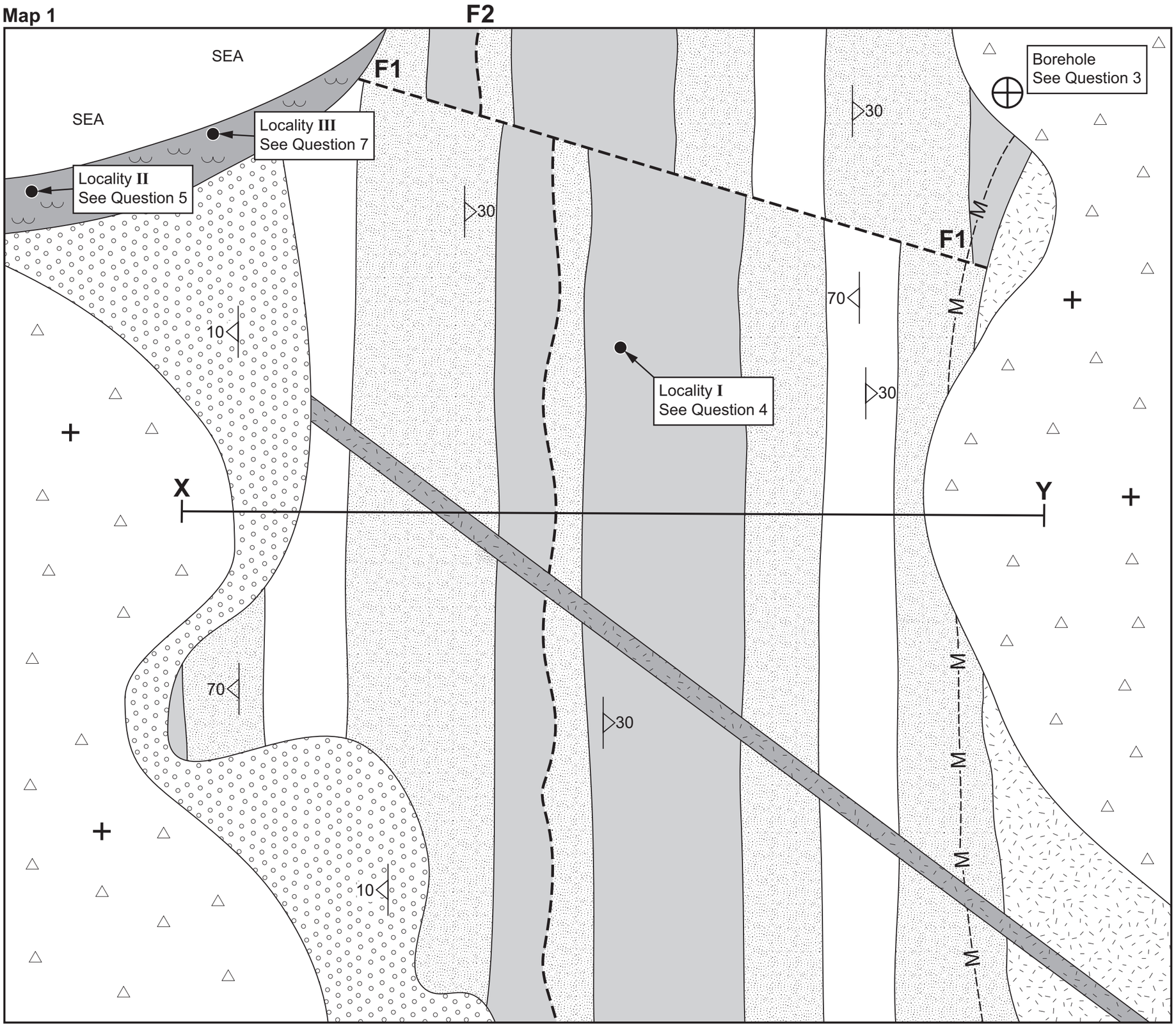
GEOLOGY – GL2a
Investigative Geology

A.M. WEDNESDAY, 30 April 2014

Resource Sheet

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 (Specimen C, Photograph 1)
- Rock Unit D (Photograph 4)
- Rock Unit E
- Superficial Deposit Unit F (Photographs 2 and 3)
- Rock Unit G
- Rock Unit H
- Fault
- Dip of bed
- Horizontal bed
- Limit of metamorphic aureole
- Location of borehole
- Locality numbers

N

0 500 metres

Turn over.