Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1212/01

S15-1212-01

GEOLOGY – GL2a
Investigative Geology

A.M. WEDNESDAY, 29 April 2015

1 hour 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**9**	
3.	**6**	
4.	**9**	
5.	**4**	
6.	**4**	
7.	**6**	
8.	**13**	
9.	**4**	
Total	**60**	

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010001

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:
- the Resource Sheet;
- Specimens **C**, **G**, **H** and **J**;
- 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 **3** 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, **C**, **G**, **H** and **J**, are provided for use.

Specimens **C**, **G** and **J** may be tested with the equipment specified by the supervisor.

The number of marks is given in brackets at the end of each question or 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 1-9**.

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

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

	Tick only **three** boxes
• *It is dominated by grains*	☐
• *It formed by the extrusion of igneous rock*	☐
• *It formed by the intrusion of igneous rock*	☐
• *It is the product of contact metamorphism*	☐
• *It is dominated by a matrix*	☐
• *It is the product of regional metamorphism*	☐
• *It formed under the influence of low pressure*	☐
• *It formed under the influence of high temperature and pressure*	☐
• *It is dominated by crystals*	☐

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(b) **Photograph 1** on page 4 of the Resource Sheet shows a sample of **Rock Unit F** on **Map 1**.

Describe **two** differences in the textures of **Specimen G** and **Rock Unit F** in **Photograph 1**. [2]

Difference 1 .....

.....

.....

Difference 2 .....

.....

.....

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2. **Figure 2a** is a partially completed graphic log (sedimentary log) recorded within **Rock Unit B** at **Locality I** on **Map 1.**

Table 2 describes the sedimentary characteristics of the rocks within beds **1-4** of the graphic log.

(a) Complete **Figure 2a** by adding beds **1, 2** and **3** using the descriptions in **Table 2**. [4]

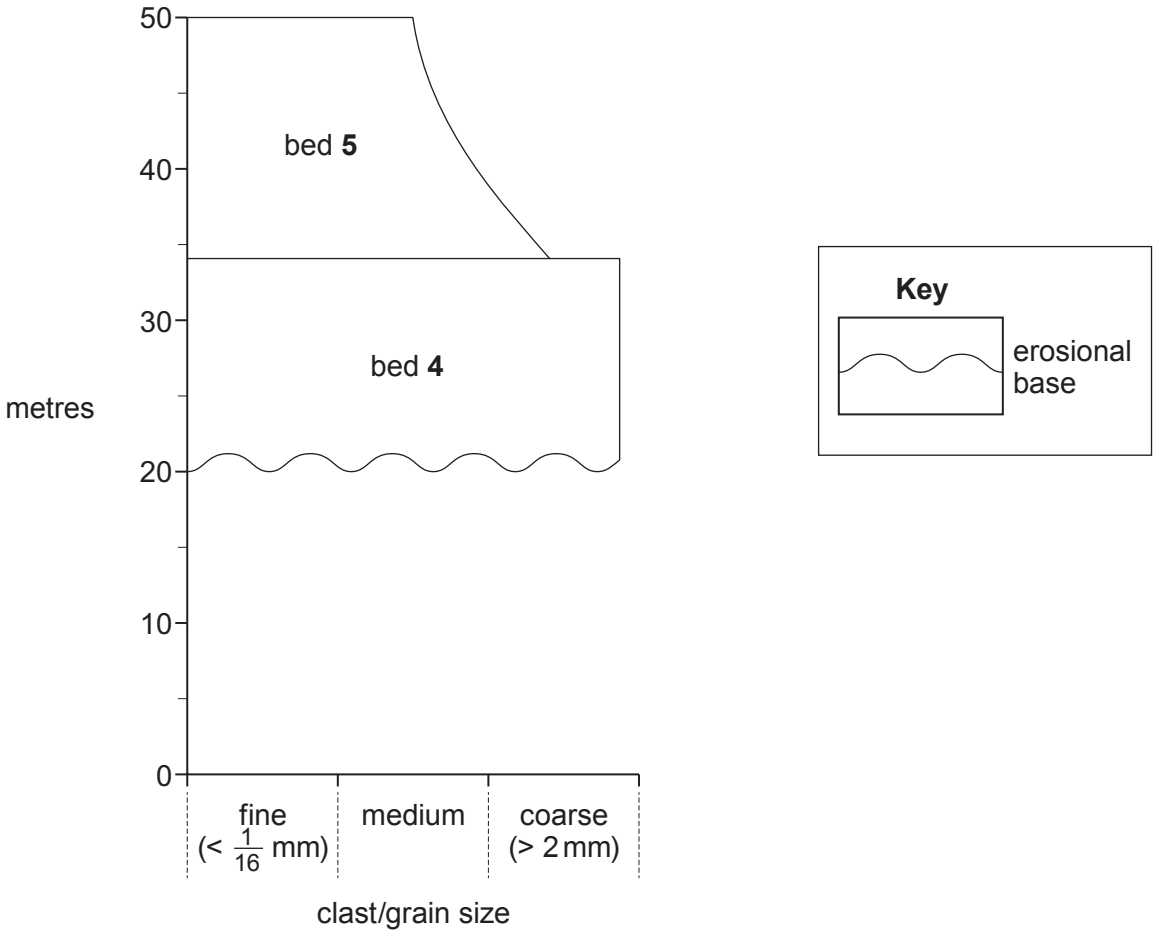

Figure 2a

Bed	Description
4	14 m thick bed with an erosional base; the rock is composed of poorly sorted, angular clasts with a mean grain size of 5 cm
3	5 m thick bed of shale
2	7 m thick bed of conglomerate
1	8 m thick bed which has a medium grain size at the base, grading into fine at the top

Table 2

Examiner only

(b) Refer to **Figure 2a**. Draw a line on **Figure 2b**, to show the most likely change in current velocity over the time in which bed **5** was deposited. [1]

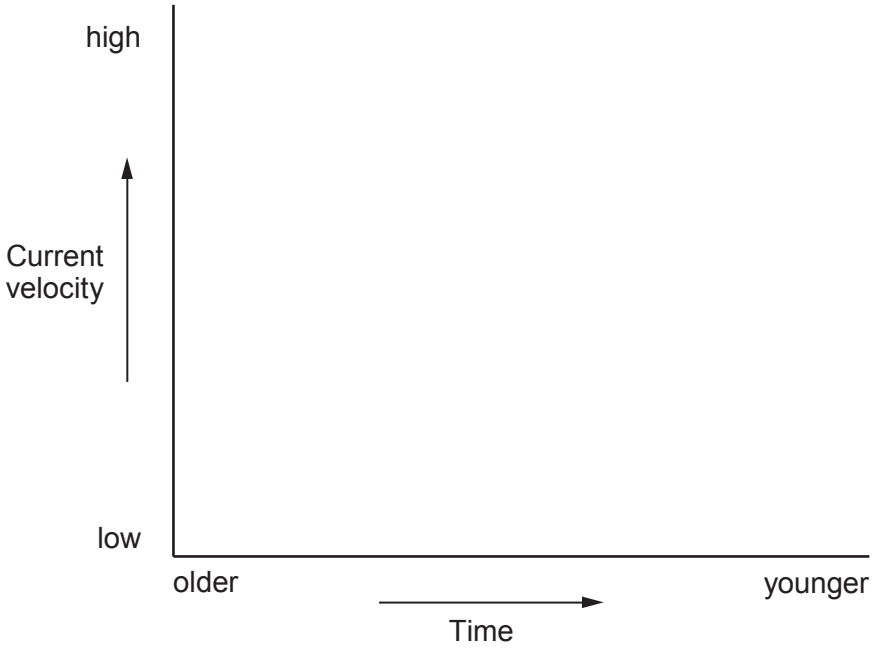

Figure 2b

(c) (i) Refer to **Table 2**. Draw in **Figure 2c** the texture of a rock specimen from bed **4**, to the scale provided. [3]

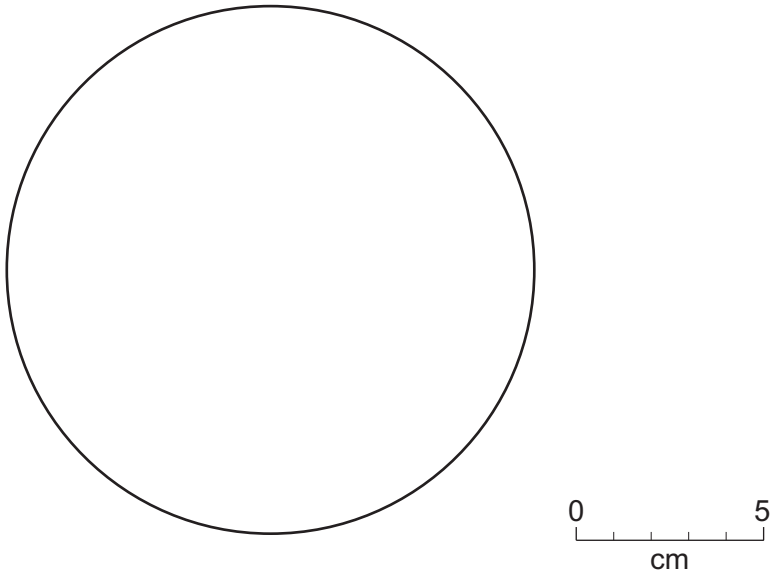

Figure 2c

(ii) Select the most likely name of the rock forming bed **4**, described in **Table 2**. [1]

Conglomerate	Breccia	Gabbro	Gneiss	
☐	☐	☐	☐	Tick only **one** box

Examiner only

3. **Specimen J** is a mineral associated with **Fault F2**, collected from **Locality II** on **Map 1**.

(a) Complete **Table 3** which refers to diagnostic tests **most useful** for identifying **Specimen J**. You may refer to diagnostic tests which use the equipment provided by the supervisor.

You may wish to refer to the Mineral Data Sheet. [5]

Diagnostic test	Description of diagnostic test	Result of diagnostic test
lustre	the appearance of reflected light	metallic-dull
hardness	•	•
•	•	•

Table 3

(b) State the name of **Specimen J**. [1]

Name .....

6

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4. **Specimen C** was collected from the margin of **Rock Unit C** at **Locality III** on **Map 1**.

(a) With reference to features of **Specimen C only** state, giving **two** reasons, the name of **Specimen C**. [3]

Reason 1 .....

.....

Reason 2 .....

.....

Name .....

Figure 4a is a student's field sketch taken at **Locality III** on **Map 1**, looking to the north.

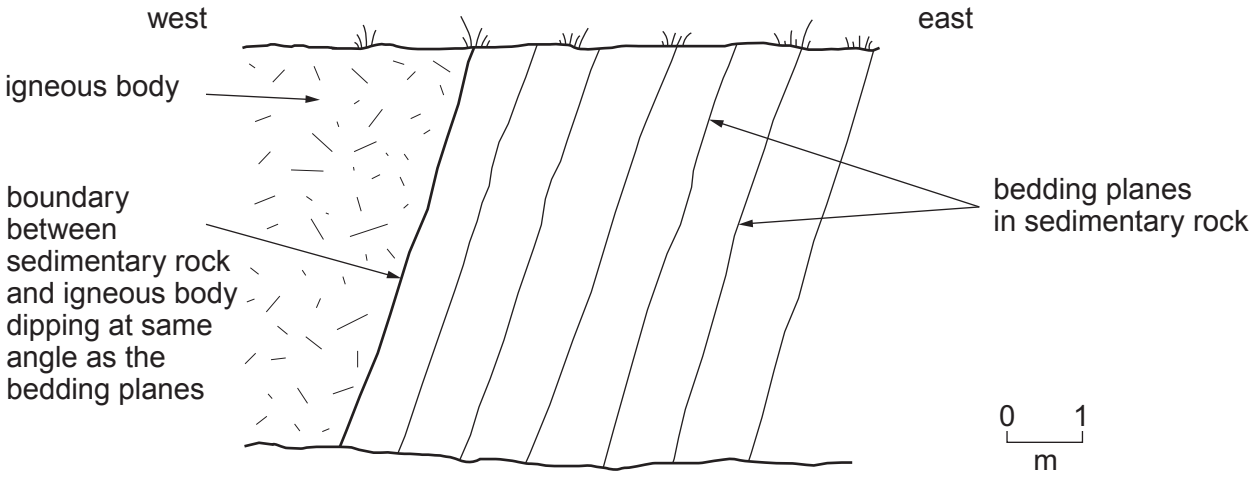

Figure 4a

(b) With reference to the evidence in **Figure 4a only**, indicate which possible type(s) of igneous body could be represented by the igneous body in **Figure 4a**. [1]

Dyke	Sill	Lava Flow
☐	☐	☐

Tick **one** or **more** boxes

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(c) **Figure 4b** is a field sketch showing **Rock Unit C** drawn at another location within the area shown on **Map 1**.

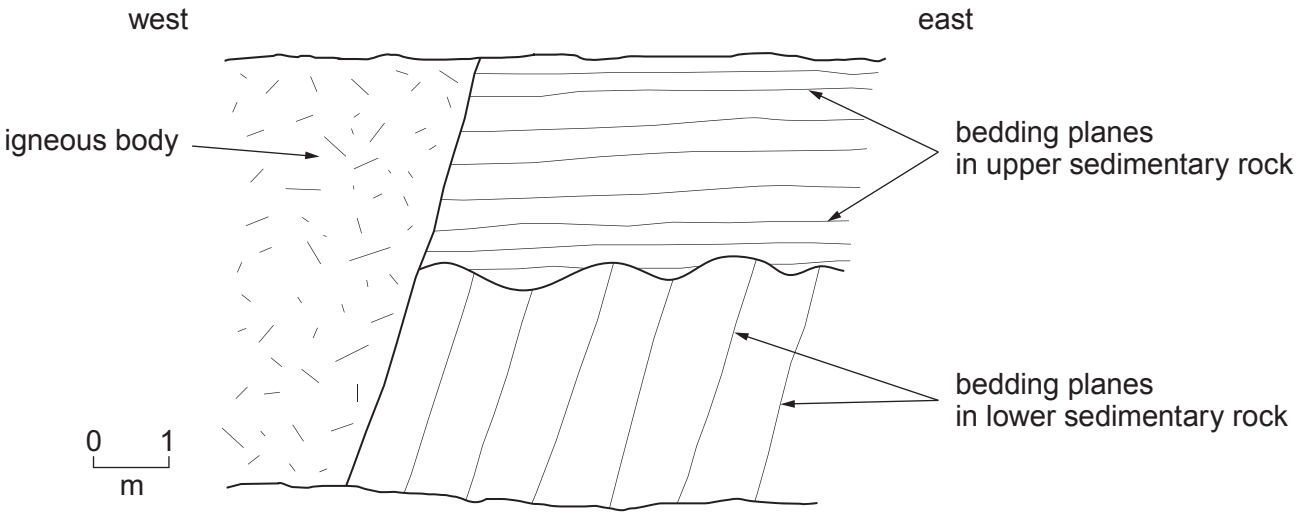
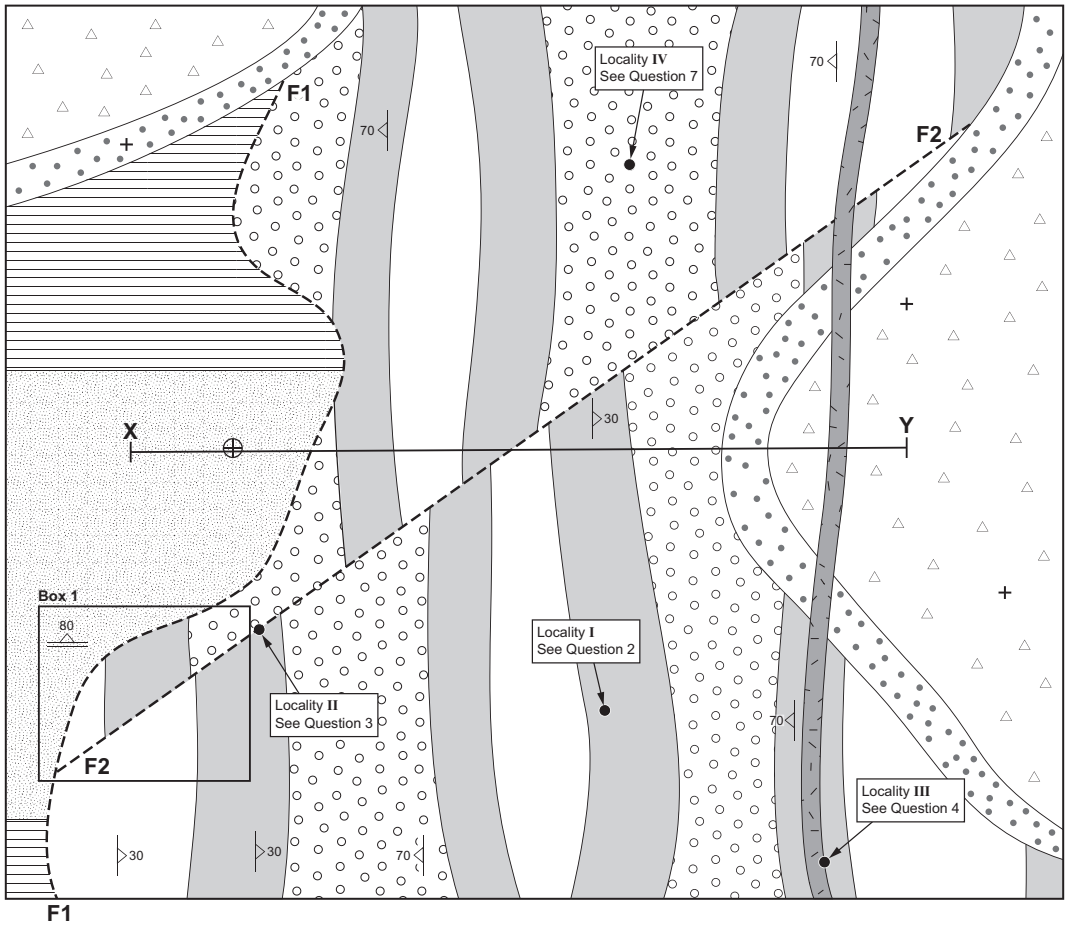


Figure 4b

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



Map 2

Examiner only

(i) Indicate on **Map 2** with an arrow labelled **K (K →)** a locality at which the field sketch shown in **Figure 4b** might have been drawn. Give a reason for your answer. [2]

Reason .....

.....

(ii) A student concluded that *"***Rock Unit C** *is a sill"*. Evaluate this statement with reference to **Figure 4b** and **Map 2**. [3]

.....

.....

.....

.....

9

Turn over.

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

Complete **Table 5** to describe the features of faults **F1** and **F2** on **Map 1**. [4]

Feature of the fault	**Fault F1**	**Fault F2**
Outcrop pattern	sinuous	straight
Angle/direction of dip of fault plane	low angle of dip to the west	•
Direction of movement	vertical downthrow to the east	horizontal •
Type of fault (normal, reverse, thrust, strike-slip)	•	•

Table 5

4

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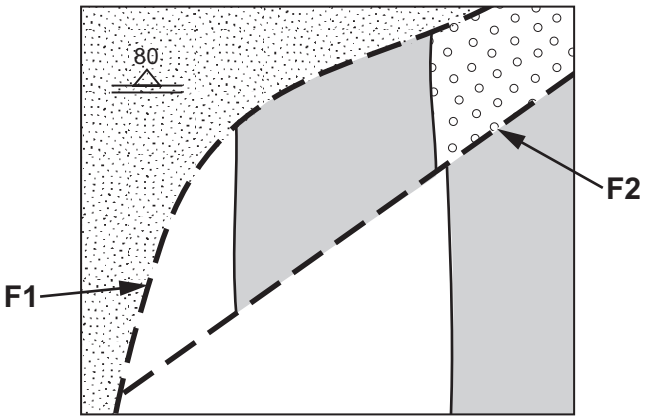
6. **Map 3** shows the area within **Box 1** on **Map 1**. The key is the same as that for **Map 1**.



Map 3

Refer to **Map 1** and **Map 3**.

Complete the sequence of geological events represented in the area of **Map 3** by clearly inserting

- the rock unit letters in the blank boxes below in order of age, with the oldest at the base
- the positions of **Fault F1** and **Fault F2** with labelled arrows (e.g. ⟵ **F1**). [4]

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OLDEST

4

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7. **Specimen H** is a fossil of the same age as **Rock Unit H** found at **Locality IV** on **Map 1.**

(a) (i) Draw on **Figure 7 one** suture line as it appears on **Specimen H**. [2]

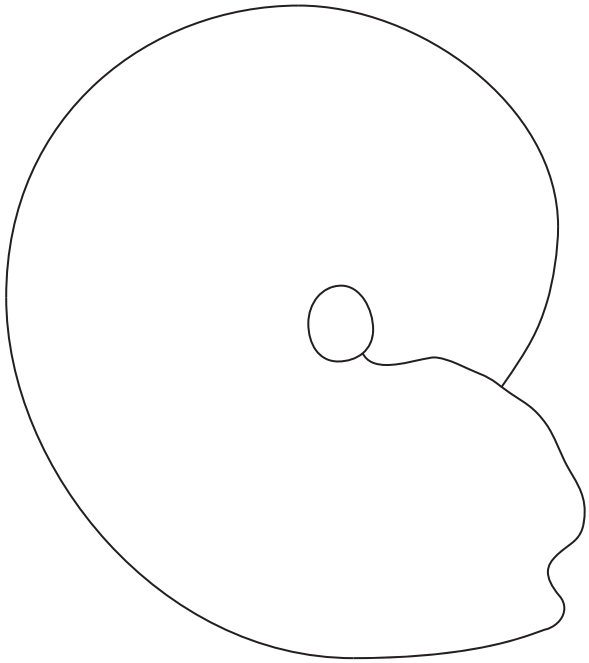


Figure 7

(ii) Select the most likely fossil group represented by **Specimen H**. [1]

Ceratite	Ammonite	Graptolite	Goniatite	
☐	☐	☐	☐	Tick only **one** box

(b) **Photograph 2** on page 4 of the Resource Sheet shows a fossil collected from the area shown on **Map 1**.

State, by inserting a letter into the blank box below, a rock unit on **Map 1** from which the fossil in **Photograph 2** was most likely to have been collected. Give reasons for your answer. [3]

Rock Unit ☐

Reasons .....

.....

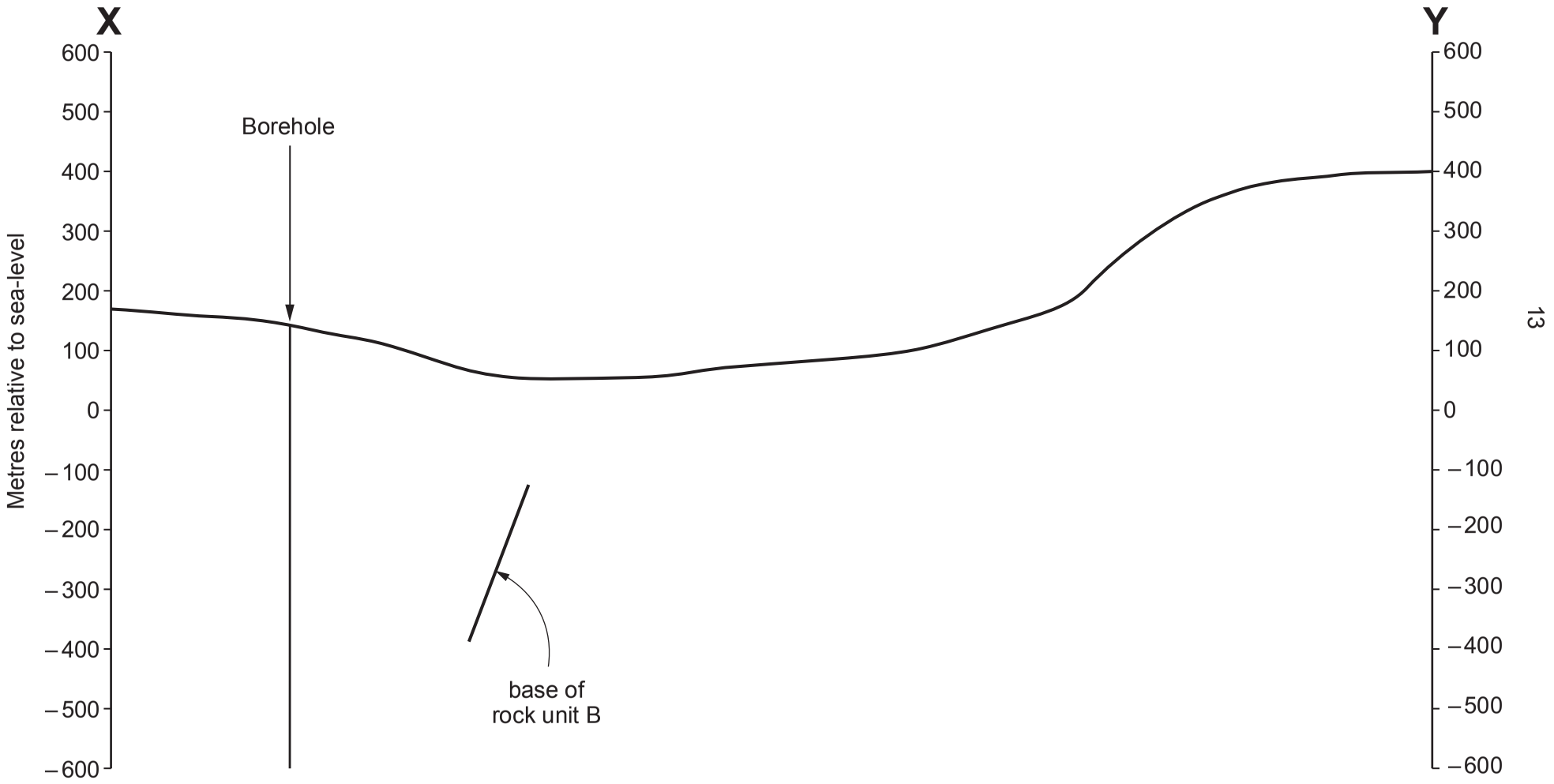
.....

6

8. The topographic profile below was taken along the line **X–Y** on **Map 1**.

Complete the sketch of the geological cross-section along this line using **Map 1** and the borehole data found in the key.

- Draw the rock units. Use similar ornament or letters for these as used on **Map 1**.
- Draw and label any **fold axes**.
- Label faults **F1** and **F2**. Draw arrows alongside **Fault F1** to show movement.
- Project the rock units and structures above the ground surface to illustrate any cross-cutting relationships. [13]



Examiner only

9. Fossils and how they are preserved can be used to provide evidence of the environment of deposition of the sedimentary rock in which they occur.

- Name **one** fossil group which can be used to provide evidence of the environment of deposition.
- Explain **how** your chosen fossil and/or its preservation can be used to determine the environment of deposition.

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** fossil group at **one** rock exposure ☐
- **Photograph 2** (on page 4 of the Resource Sheet) which is a fossil collected from the area shown on **Map 1** ☐
- **Photograph 3** (on page 4 of the Resource Sheet) which is a fossil collected from the area shown on **Map 1** ☐

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

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END OF PAPER

4

Acknowledgements for Resource Sheet

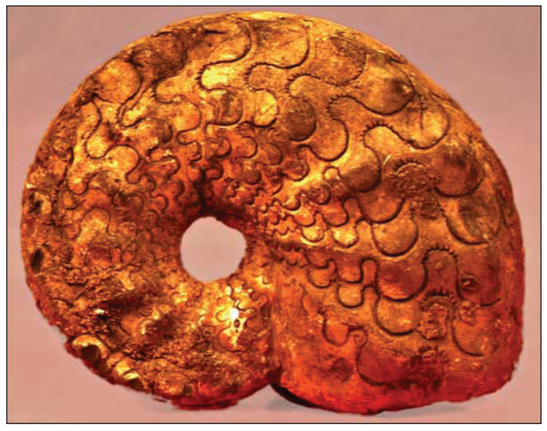
Photograph 1 University of Pittsburg: http:/www.pitt.edu

Photograph 2 Dossier sage science-evolution: http://www.cnrs.fr/cw/dossiers

Photograph 3 http://www.sciencedreams.com

Photograph 1 For use in Question 1

Photograph 2 For use in Questions 7 and 9



Photograph 3 For use in Question 9

GCE AS/A level

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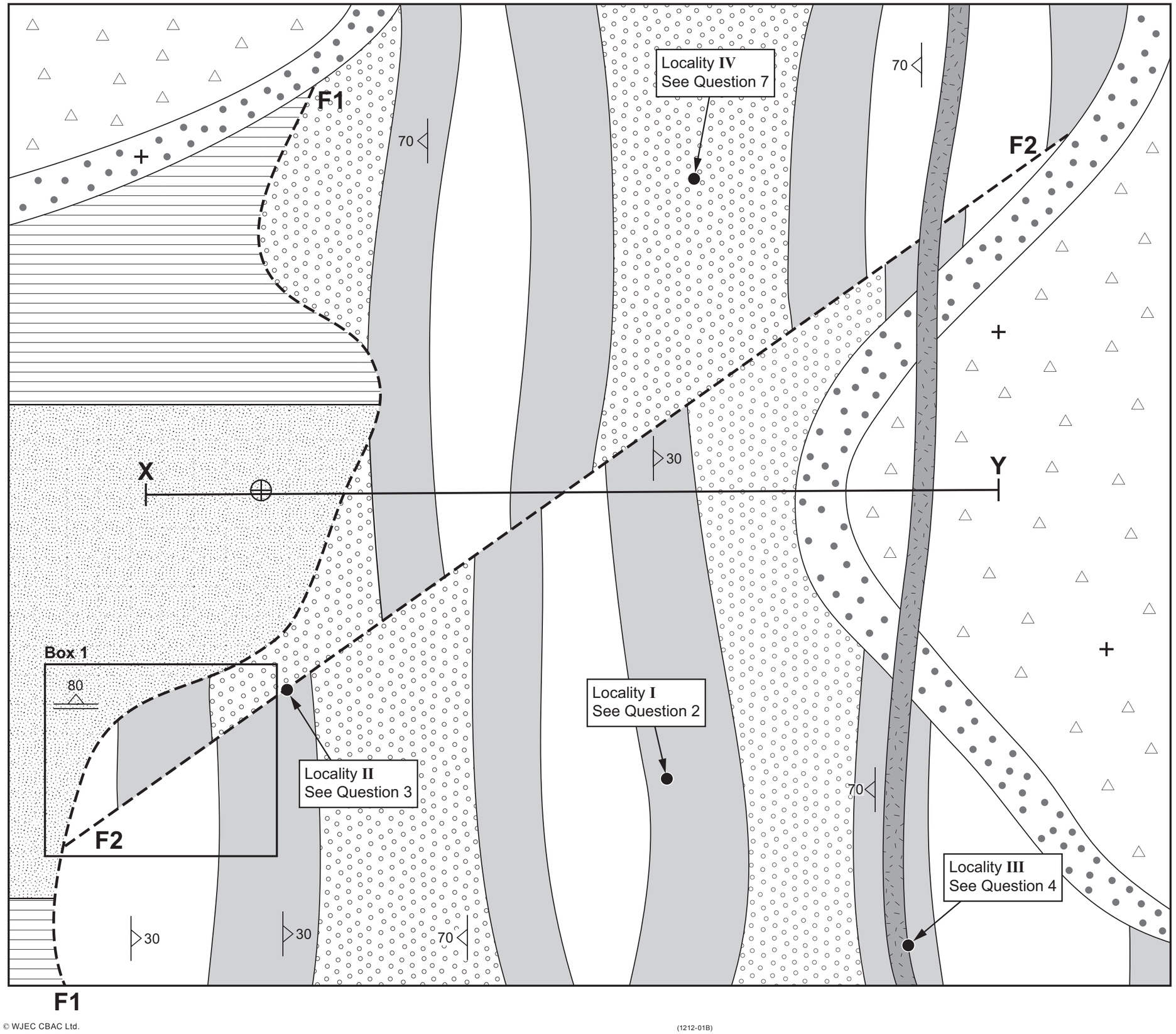
GEOLOGY – GL2a
Investigative Geology

A.M. WEDNESDAY, 29 April 2015

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
- Rock Unit B
- Rock Unit C (Specimen C)
- Rock Unit D
- Rock Unit E
- Rock Unit F (Photograph 1)
- Rock Unit G (Specimen G)
- Rock Unit H (Specimen H)
- Fault (F)
- Dip of bed (30)
- Dip of foliation (80)
- Horizontal bed (+)
- Locality numbers
- Borehole
  Top is 150 metres above sea level
  Depth down borehole (in metres) to:
  Base of Rock Unit G 100
  Base of Rock Unit H 200
  Base of Rock Unit B 380

N

0 500
metres

Turn over.