Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A Level

1212/01

S17-1212-01

GEOLOGY – GL2a
Investigative Geology

WEDNESDAY, 26 APRIL 2017 – MORNING

1 hour 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**11**	
3.	**10**	
4.	**4**	
5.	**6**	
6.	**13**	
7.	**5**	
8.	**5**	
Total	**60**	

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ADDITIONAL MATERIALS

In addition to this examination paper, you will need:
- the Resource Sheet;
- Specimens **A**, **B**, **C**, and **H**;
- geological equipment for testing specimens;
- the Mineral Data Sheet.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Answer **all** questions.

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 **5** 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**, **B**, **C**, and **H**, are provided for use.

Specimens **A**, **B**, and **H** 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 1-8**.

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

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

	Tick (✓) only **three** boxes
• *It formed by rapid cooling*	☐
• *It is the product of contact metamorphism*	☐
• *It has a mafic composition*	☐
• *It has a porphyritic texture*	☐
• *It formed by slow cooling*	☐
• *It contains many phenocrysts*	☐
• *It is the product of intrusion*	☐
• *It was formed by weathering at the Earth's surface*	☐
• *It is the product of a lava flow*	☐

Examiner only

(b) Compare the **textures** of Specimen **A** and Specimen **B**. You should comment on **three** similarities and/or differences in the textures of the two rocks. [3]

1. .....

.....

2. .....

.....

3. .....

.....

6

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Turn over.

Examiner only

2. **Photograph 1**, on page 4 of the resource sheet, is a photomicrograph of a sample of Rock Unit **C** collected from within the area of **Map 1**.

(a) (i) Complete **Table 2** to describe the texture of the sample of Rock Unit **C** in **Photograph 1**. [2]

Grain Size	0.1 mm – 3.5 mm
Grain Shape	•
Sorting	•

Table 2

(ii) With reference to the shape of the grains in **Photograph 1**, draw a conclusion regarding the distance of transport of the grains before they were deposited to form this sample of Rock Unit **C**. Give a reason for your answer. [2]

.....

.....

.....

(iii) Select the most likely name of the rock forming part of Rock Unit **C** shown in **Photograph 1**. [1]

Greywacke	Arkose	Orthoquartzite	Breccia	Conglomerate	
☐	☐	☐	☐	☐	Tick (✓) only **one** box

Examiner only

(b) **Figure 2** is a graphic log (sedimentary log) recorded across a horizontal exposure within Rock Unit **C**. It records the sedimentary features of beds **C1 – C4** which make up part of Rock Unit **C** within **Box A** on **Map 1**.

Photograph 2, on page 4 of the resource sheet, shows a sedimentary structure found in the rocks recorded within the graphic log in **Figure 2**.

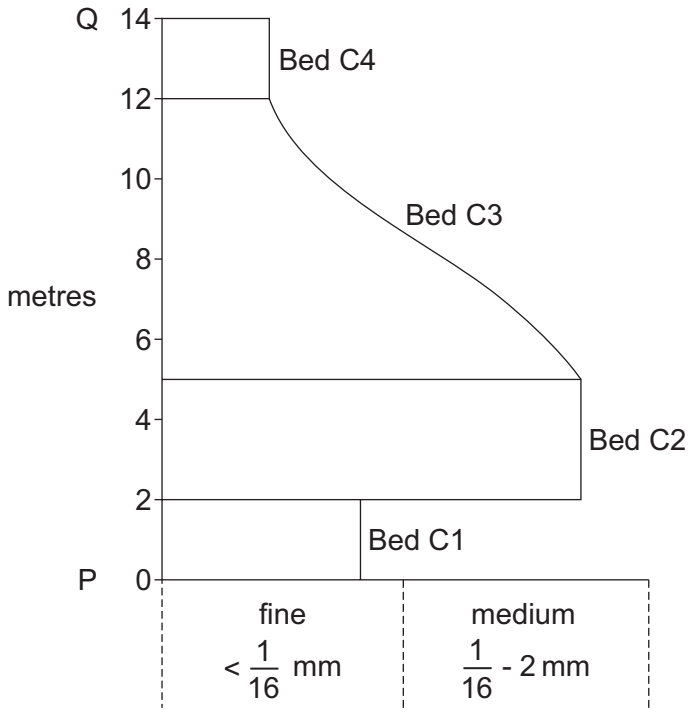

Figure 2

(i) State the thickness of bed **C2** in **Figure 2**. [1]

..... m

(ii) Indicate on **Figure 2**, with an arrow labelled **W** (**W**→), the most likely location within the graphic log where the sedimentary structure shown in **Photograph 2** was recorded. [1]

(iii) A student has correctly suggested that the beds in the location of the graphic log are "the right way up". With reference to **Photograph 2** only, explain the evidence which supports this suggestion. [3]

.....

.....

.....

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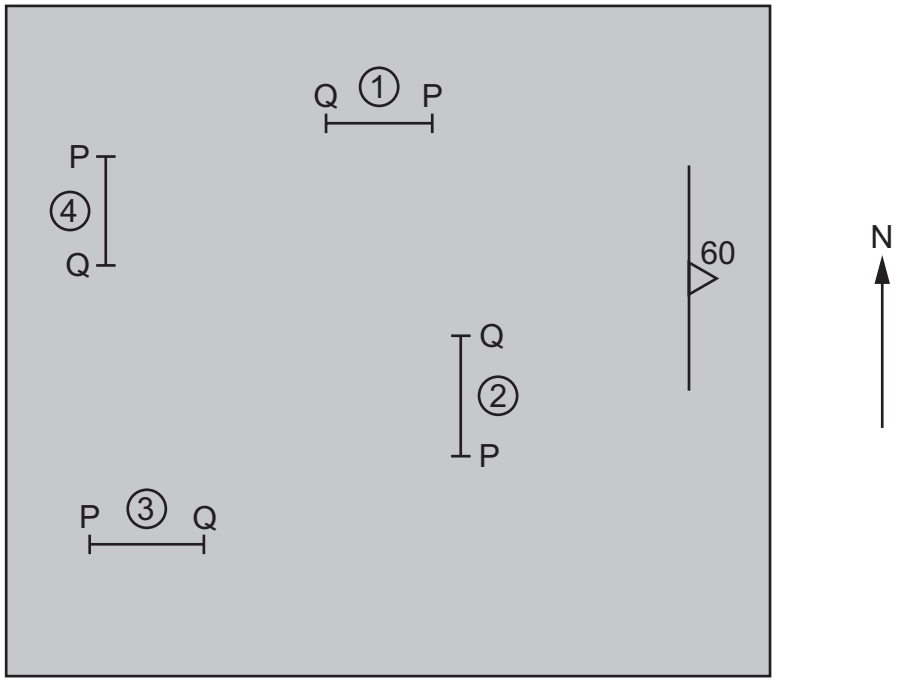
(c) **Map 2** below shows the geology in **Box A** on **Map 1**. It shows **four** possible locations (1-4) where the graphic log in **Figure 2** may have been recorded. (**P** and **Q** represent the base and top of the log as seen in **Figure 2**). The key for the Rock Units is the same as for **Map 1**.



Map 2

With reference to **Figure 2** and **Map 2**, state at which one of the locations 1-4, the graphic log was most likely to have been recorded. [1]

Locality

11

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3. Specimen **C** is a plaster cast of a fossil collected from Rock Unit **C** within the area of **Map 1**.

(a) (i) Complete **Figure 3** by drawing Specimen **C** using the scale provided. [4]

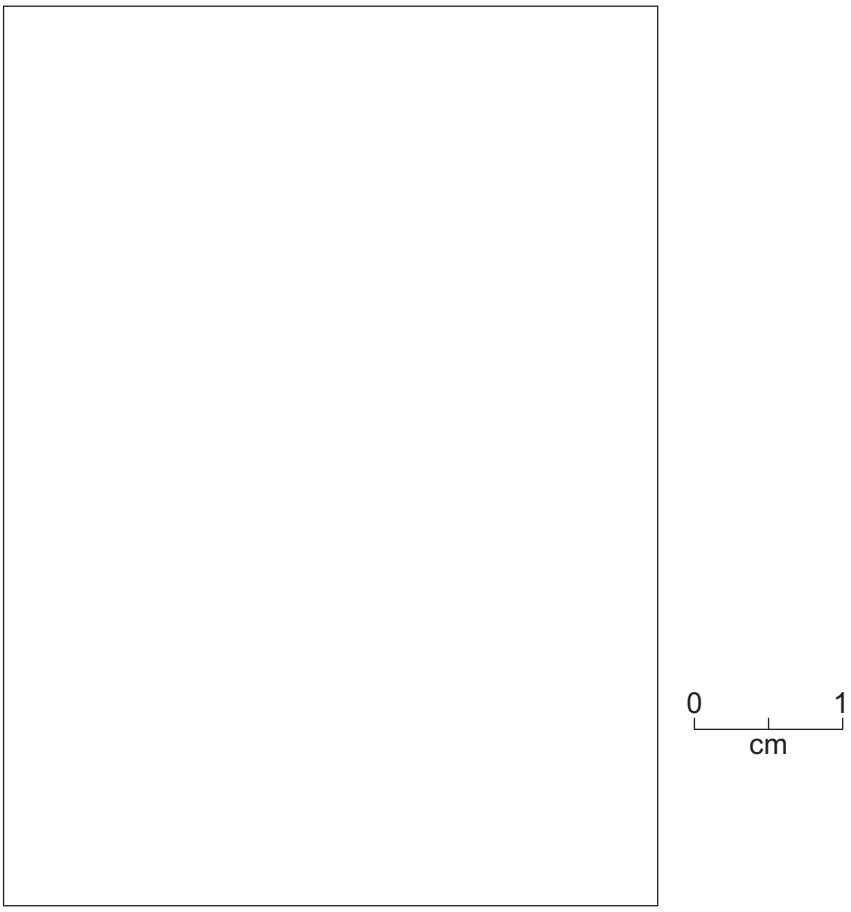

Figure 3

(ii) Clearly label on your drawing in **Figure 3**, with a labelled arrow, the position of the glabella. [1]

(b) **Photograph 3** on page 4 of the resource sheet shows a well preserved fossil collected within the area of **Map 1**.

(i) Select the most likely fossil group represented by the fossil in **Photograph 3**. [1]

Goniatite	Bivalve	Brachiopod	Coral	
☐	☐	☐	☐	Tick (✓) only **one** box

Examiner only

(ii) With reference to **Map 1**, explain **two** pieces of evidence which indicate that Rock Unit **B** is older than Rock Unit **C**. [2]

Evidence 1 .....

.....

Evidence 2 .....

.....

(iii) Rock Unit **D** on **Map 1** is shale. State from which **one** of the two Rock Units **B** or **D**, the well-preserved fossil shown in **Photograph 3**, is most likely to have been collected. Give reasons for your answer. [2]

Rock unit

Reasons .....

.....

.....

.....

10

Turn over.

Examiner only

4. Specimen **H** is a mineral collected within Rock Unit **H** on **Map 1**.

(a) Complete **Table 4** by:
- stating the result of the test or observation described
- describing **one** *other* test/observation which confirms the identity of the mineral forming Specimen **H** and stating the result

You may wish to refer to the **mineral data sheet**. [3]

Description of test/observation	Result of test/observation described
Observe the colour of light reflected by the surface	White
Reaction with dilute hydrochloric acid	No reaction
Observe the lustre, the appearance of the surface in reflected light	•
•	•

(b) Identify Specimen **H**. [1]

Name of mineral forming Specimen **H** .....

4

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5. Refer to **Map 1**. There are two faults labelled **F1** and **F2** in the area shown on **Map 1**. **F1**, which crops out twice in the area, dips at 18° to the East. **F2** dips at 75° to the West.

(a) **Fault F2** is the only fault to have displaced Rock Unit **H**. With reference to Rock Unit **H** on **Map 1**, calculate the throw of **Fault F2**. You must show your working. [2]

..... metres

(b) Complete **Table 5** below to show the characteristics of **Faults F1** and **F2**. [4]

	Fault F1	Fault F2
Dip angle and direction of the fault plane	18° to the East	75° to the West
The downthrow side of the fault (West or East)	•	•
Side of the fault which is the footwall block (West or East)	•	•
Type of fault (Normal, Reverse, Thrust, or Strike-slip)	•	•

Table 5

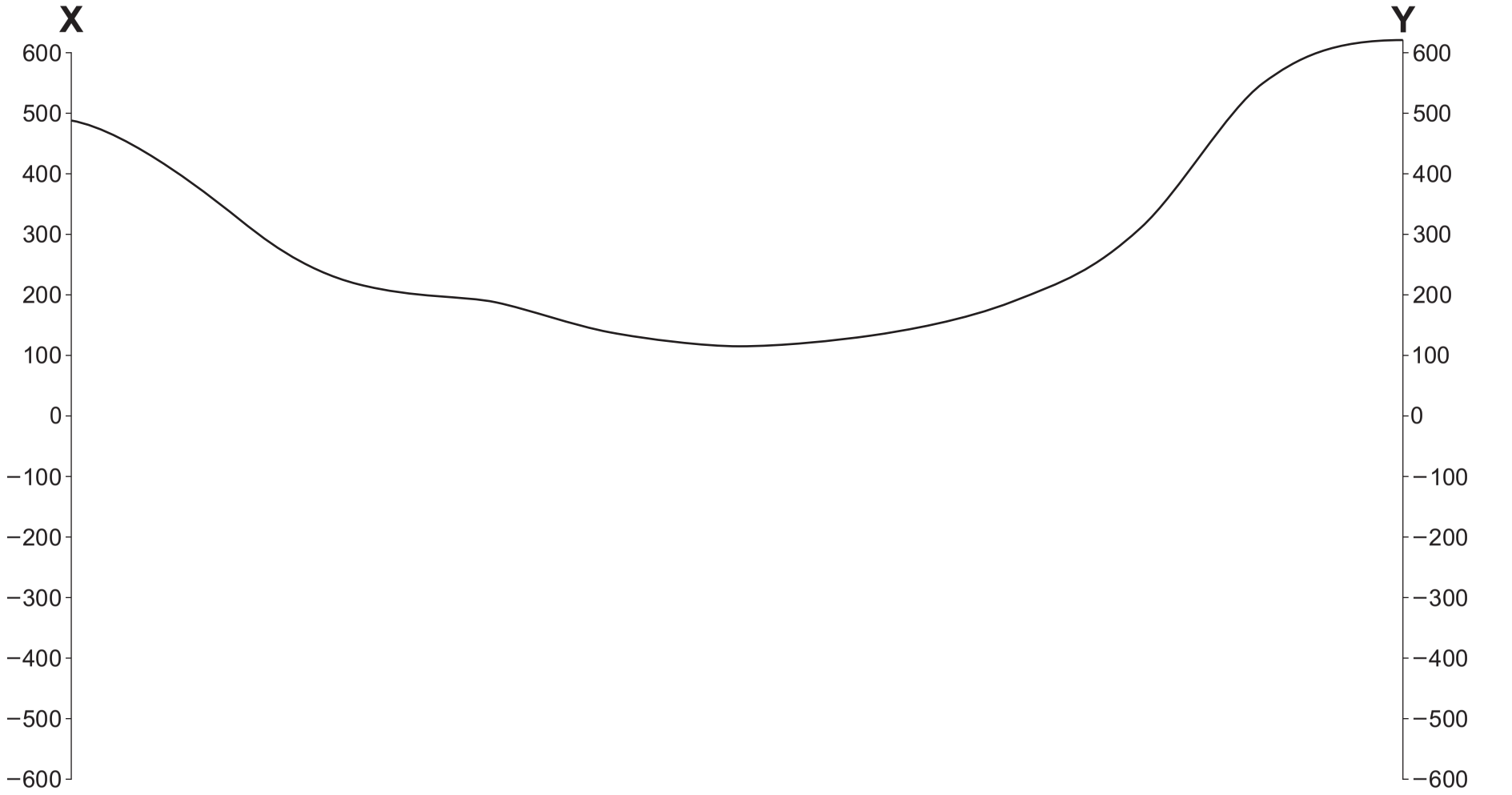
6

Turn over.

6. 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**.

- Draw the **rock units**. Use similar ornament, or letters, for these as on **Map 1**.
- Draw and label any **fold axes**.
- Draw and label faults **F1** and **F2**
- Project the **rock units** and structures above the ground surface to illustrate any cross-cutting relationships with the unconformity. [13]



Examiner only

7. Refer to **Map 1**. The partially completed sequence shown below represents the geological events for the time **after** the deposition of Rock Unit **E** in the area of **Map 1**. Complete the sequence of geological events by clearly inserting with labelled arrows (e.g. ◄——— F2) the position of the following:

- Fault F1
- Fault F2
- An episode of folding
- Intrusion of Rock Unit G
- An unconformity [5]

YOUNGEST

A

H

E

OLDEST

5

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8. Igneous bodies include plutons, dykes, sills and lava flows. These can be distinguished from one another by their features.

With reference to your fieldwork or **Photograph 4** or **Photograph 5**:

- Choose **one** type of igneous body.
- Describe the features of your chosen type of igneous body that enable it to be distinguished from others correctly.

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

- Your fieldwork observations of **one** location ☐
- **Photograph 4** (on page 4 of the Resource Sheet) taken looking towards the North-East at **Locality I** on **Map 1** ☐
- **Photograph 5** (on page 4 of the Resource Sheet) taken looking towards the North-East at **Locality II** on **Map 1** ☐

An annotated diagram(s) may be used in your answer. [5]

Chosen igneous body

Examiner only

END OF PAPER

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