

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Education
Advanced Subsidiary/Advanced



CYD-BWYLLGOR ADDYSG CYMRU
Tystysgrif Addysg Gyffredinol
Uwch Gyfrannol/Uwch

452/01

GEOLOGY GL2a

Investigative Geology

A.M. TUESDAY, 15 May 2007

(1 hour 30 minutes)

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

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

For Examiner's Use Only	
Question 1	13
2	13
3	11
4	8
5	15
Total	60

INSTRUCTIONS TO CANDIDATES

Answer **all** questions. Questions 1-3 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.

Map 1, Photographs 1 to 4 and **Mineral Data** 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**, **B** and **C** are provided for use.

All may be tested with the equipment specified by the Supervisor.

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

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

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

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

Study **Map 1** on the Resource Sheet carefully before answering **Questions 1-5**.

1. (a) Study **Specimen A** which was collected at **Locality I** on **Map 1**. [2]

- (i) Rocks can be igneous, metamorphic or sedimentary in origin.
State **two** textural reasons which might indicate that **Rock Unit A** is igneous.

Reason 1

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.....

Reason 2

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.....

- (ii) Suggest how the texture of **Specimen A** may have formed. [2]

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.....

.....

- (iii) **Specimen A** is dominated by two minerals which have different colour (one grey and one pink/white).

Using any of the equipment specified by the Supervisor and the Mineral Data Sheet, complete **Table 1** by:

- (1) naming a physical property, **other than colour**, which can distinguish between them;
- (2) briefly describing how you would test or observe the **named physical property**;
- (3) recording the results of your tests/observations. [3]

(1) Name of physical property	(2) Description of test/observation	(3) Results of test/observation	
•	•	grey mineral	•
		pink/white mineral	•

(b) Consider this statement:

Rock Unit A is a pluton which forced its way as a melt into cold country rock.

Table 2 contains three pieces of evidence which together can be used to confirm the above statement.

Complete the table by giving:

- a brief description of each piece of evidence;
- an explanation of how it is used to confirm any part of the above statement.

[6]

Evidence	Description	Explanation
Photograph 1 , on page 4 of the Resource Sheet was taken at Locality II on Map 1		
Photograph 2 , on page 4 of the Resource Sheet was taken at Locality III on Map 1		
The dip of the bedding around the outcrop of Rock Unit A on Map 1		

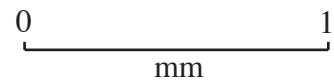
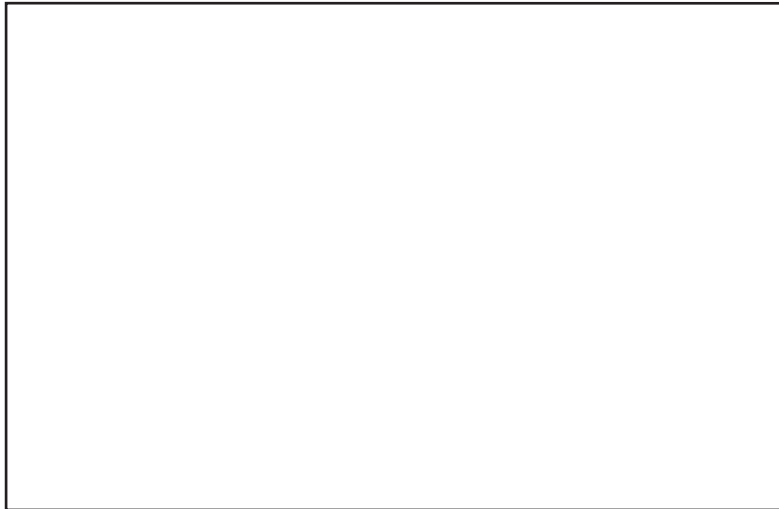
Table 2

Total 13 marks

Turn over.

2. (a) **Photograph 3**, on page 4 of the Resource Sheet, is representative of **Rock Unit B** on **Map 1**.

Draw, in the box below, a scaled diagram to show the texture of **Rock Unit B**. [4]



- (b) **Specimen B** is representative of the mineral which almost entirely forms **Rock Unit B**.

- (i) Use any of the equipment specified by the Supervisor to describe the result of **one** test/observation which **best** identifies the mineral forming **Rock Unit B**. [1]

.....
.....

- (ii) Name **Mineral Specimen B** [1]

(c) **Photograph 4**, on page 4 of the Resource Sheet, is of a fossil collected from **Rock Unit B** on **Map 1**.

(i) Use **Photograph 4** to clearly draw a suture line on **Figure 1**. [2]

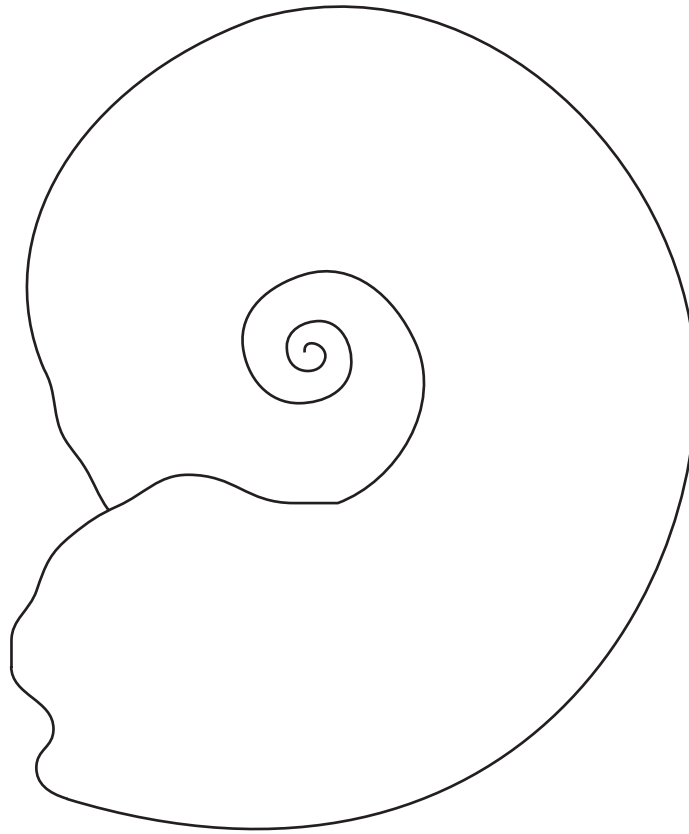


Figure 1

(ii) Suggest the era that **Rock Unit B** represents by choosing from the following list: [2]

Precambrian Lower Palaeozoic Upper Palaeozoic Mesozoic Cainozoic

Era

Give **one** reason for your choice of era.

.....
.....

- (d) It has been suggested that **Rock Unit B** was deposited in a “*deep-water, marine*” environment.

Evaluate this statement by completing **Table 3**, indicating in the evaluation column whether each of the statements relating to **Photographs 3 and 4** is true or false. Give a reason at each bullet point. [3]

	Statement	Evaluation (true/false)	Reason
Photograph 3	<i>deep-water</i>		•
Photograph 4	<i>marine</i>		• •

Table 3

Total 13 marks

3. Map 1 shows only the solid outcrops of **Rock Units A – F**.

Surface processes can lead to the deposition of superficial deposits which lie on top of the solid outcrop.

Two superficial deposits were sampled on top of **Rock Units A** and **C** respectively.

Each superficial deposit shows clasts (rock fragments) which:

- are dominated by the underlying rock unit;
- were released from the solid outcrop by physical weathering;
- have their own typical shapes determined by characteristic planes of weakness.

- (a) (i) Suggest **one** type of physical weathering which may have affected the solid outcrop on **Map 1**. [1]

- (ii) Describe the processes involved in this type of weathering. [2]

- (b) **Specimen C** was collected from the superficial deposit which lies on top of **Rock Unit C**. Using **Specimen C** only, give **one** textural and **one** mineralogical feature which indicates it is a schist. [2]

Textural

.....

.....

Mineralogical

.....

.....

- (c) **Figure 3a** indicates how shape can be described by the analysis of measurements of clast axes a , b and c . Each clast has its b axis measurement divided by that of the a axis, and its c axis by that of the b . **Figure 3b** shows the four shapes which can be described using these ratios. The results of the analysis of the two sampled superficial deposits are shown on **Figure 3c**.

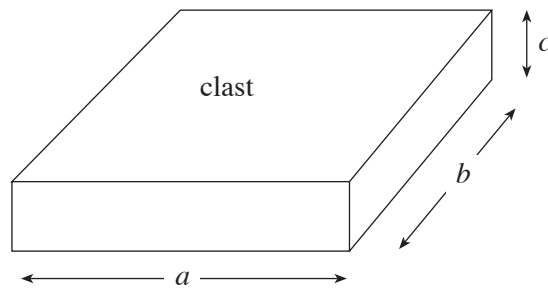


Figure 3a

shape	(b/a)	(c/b)
<i>sphere</i>	> 0.67	> 0.67
<i>disc</i>	> 0.67	< 0.67
<i>rod</i>	< 0.67	> 0.67
<i>blade</i>	< 0.67	< 0.67

Figure 3b

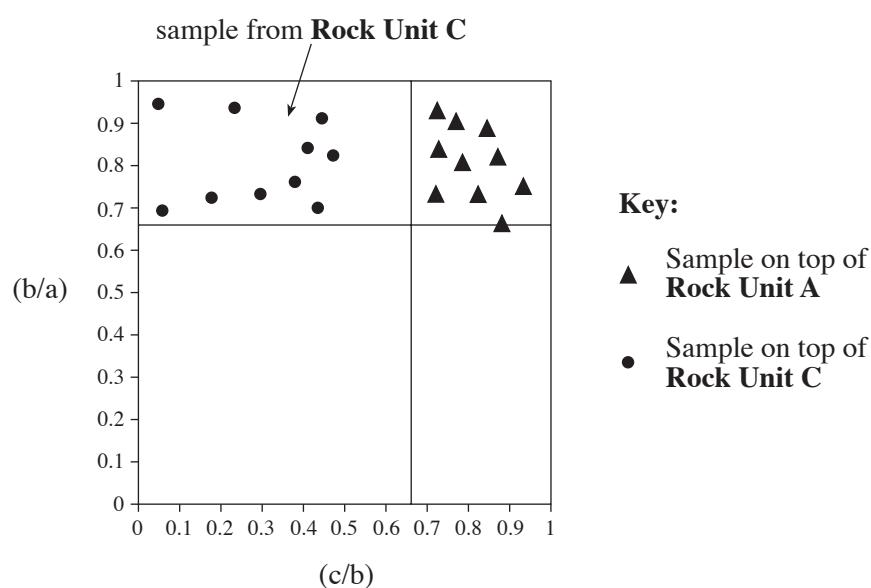


Figure 3c

- (i) Calculate in **Table 3** the following data for clast **Z** from one of the superficial deposits. [1]

axes measurement (mm)	(b/a)	(c/b)
$a = 250$ $b = 200$ $c = 25$		

Table 3

- (ii) Complete **Figure 3c** by plotting (use label: $\leftarrow$ **Z**) the data calculated in **Table 3**. [1]

- (iii) Suggest **one** reason why clasts weathered from **Rock Unit C** are typically *disc* shaped. [1]

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.....

.....

- (iv) Use **Figures 3b and 3c** to state the typical shape of clasts weathered from **Rock Unit A**. [1]

.....

- (v) Suggest **one** reason why clasts of **Rock Unit A** produce this shape. [2]

.....

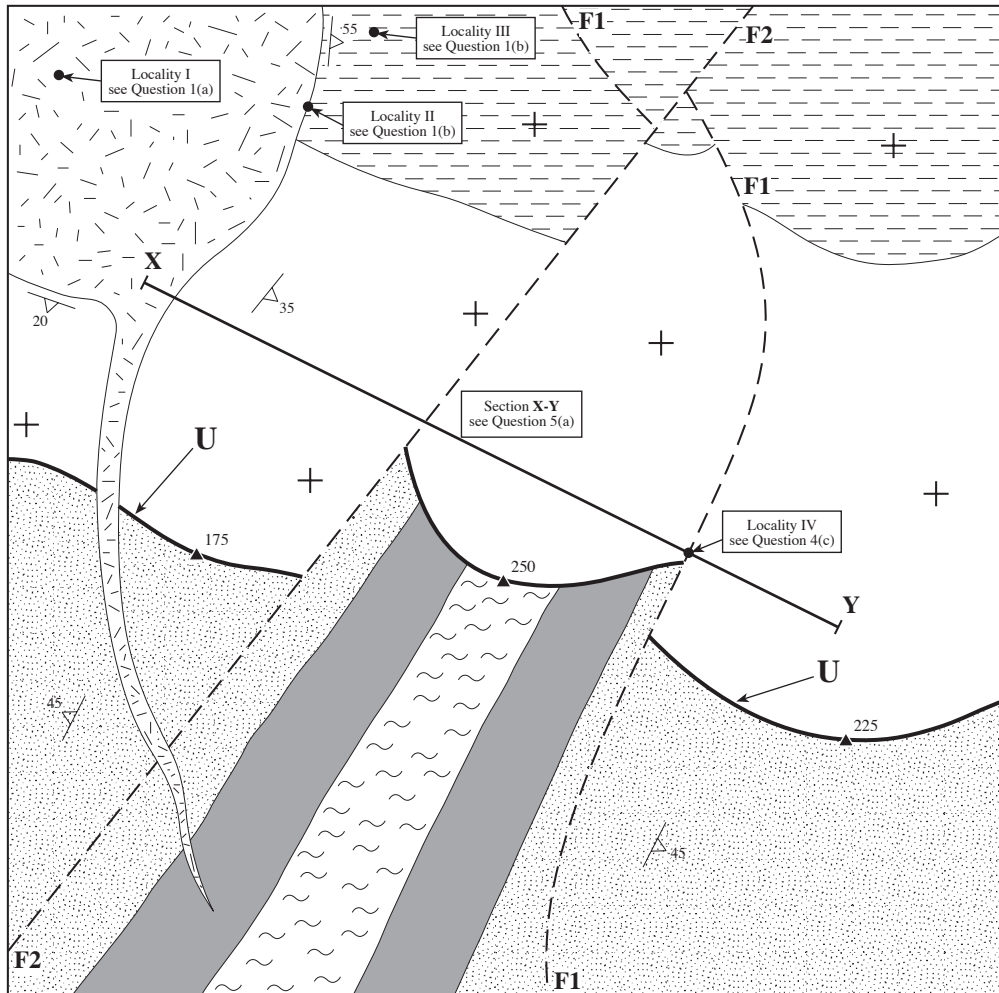
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Total 11 marks

4. (a) **Map 2** is a reduction of **Map 1**.



Map 2

- (i) The line labelled $\leftarrow$ U on **Map 2** is an *unconformity*.

State **one** piece of evidence from **Map 2** which confirms this statement.

[1]

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.....

.....

- (ii) State **one** other piece of evidence you would expect to find in the field to confirm the interpretation of an unconformity.

[1]

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.....

.....

- (b) Clearly draw and label on **Map 2** an *axial plane trace*.

[1]

- (c) (i) The throw of the faults on **Map 1** can be calculated using the spot heights.
Calculate the throw of **Fault F1**.

[1]

..... metres

- (ii) **Fault F1** at **Locality IV** on **Map 1** has a fault plane which dips towards the southeast at an angle of 75° .

Complete **Table 4** by considering each statement about **Fault F1**, and by ticking the **one correct** answer from each set of descriptions given. [2]

Statement	Description
Fault F1 downthrows to the	northwest ☐ southeast ☐
Fault F1 is classified as	reverse ☐ strike-slip ☐ thrust ☐ normal ☐

Table 4

- (iii) **Fault F2** has only a vertical movement.
Using **Map 1** only, explain why it is difficult to classify **Fault F2** as normal or reverse. [2]

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Total 8 marks

- (b) In the spaces below, complete the sequence of geological events represented in the area of **Map 1** in order of age, *oldest at the base*.

Your table should list, in the boxes provided, **each** Rock Unit in *order of deposition or emplacement*. Identify each Rock Unit by its letter given in the key to **Map 1**.

Clearly mark and label the position of:

← **Fault F2;**

← an episode of folding;

← superficial deposits.

[5]

YOUNGEST

← **Fault F1**

← unconformity

OLDEST

Total 15 marks

[illegible]