



**GCE AS/A level**

**1212/01**

**GEOLOGY – GL2a**

**Investigative Geology**

**A.M. WEDNESDAY, 30 April 2014**

**1 hour 30 minutes plus your additional time allowance**

**Surname** \_\_\_\_\_

**Other Names** \_\_\_\_\_

**Centre Number** \_\_\_\_\_

**Candidate Number** 2 \_\_\_\_\_

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

## **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, black ball-point pen or your usual method.**

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

**Write your name, centre number and candidate number in the spaces provided on the front cover.**

**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.**

**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 opposite 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**

1(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** opposite with your evaluation and state your evidence. [3]

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

Name of rock \_\_\_\_\_

7

**TABLE 1**

<b>Statement</b>	<b>Evaluation (true / false)</b>	<b>Evidence from MAP 1</b>
"ROCK UNIT A is a dyke"	•	•
"ROCK UNIT A intruded at the same time as ROCK UNIT B"	•	•
<b>Statement</b>	<b>Evaluation (true / false)</b>	<b>Evidence from the composition of SPECIMEN A</b>
"ROCK UNIT A crystallised from the same magma as ROCK UNIT B"	•	•



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]

**TABLE 2**

<b>Statement</b>	<b>Evaluation (true / false)</b>	<b>Evidence from MAP 1</b>
<b>FAULT F1 shows strike-slip displacement</b>	•	•
<b>FAULT F1 dips at a lower angle than FAULT F2</b>	•	•

**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**

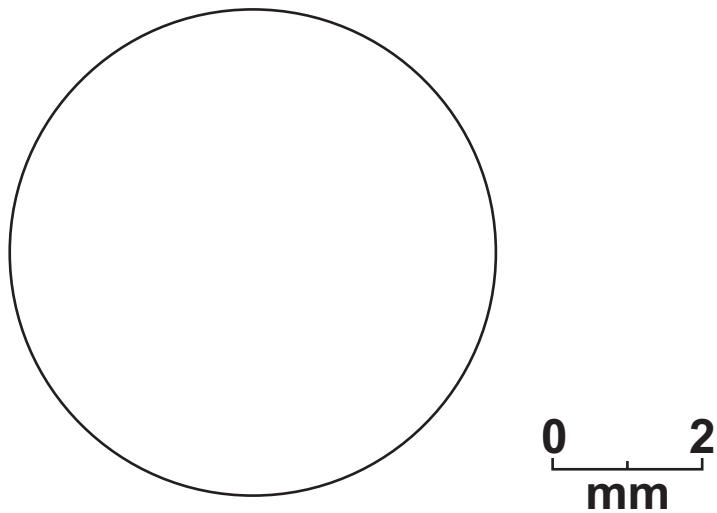
**Tick (✓) only ONE box**

<b>5</b>

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**



**3(a) (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]**

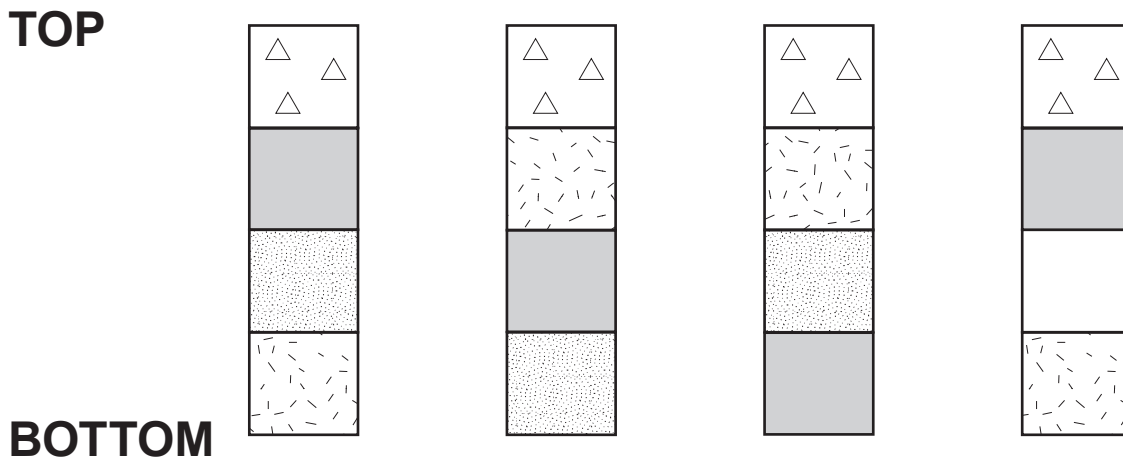
**TABLE 3**

<b>Description and result of test or observation</b>	<b>Name of mineral</b>
•	•

3(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



Tick (✓) only ONE box

Four empty square boxes are provided for marking the correct sequence:

**3(c) PHOTOGRAPH 1, on page 3 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** \_\_\_\_\_

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

**Name of rock** \_\_\_\_\_

**Reason** \_\_\_\_\_

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**3(c) (iii) Explain how ROCK C1 has been derived from rocks more typical of ROCK UNIT C.**

**[3]**

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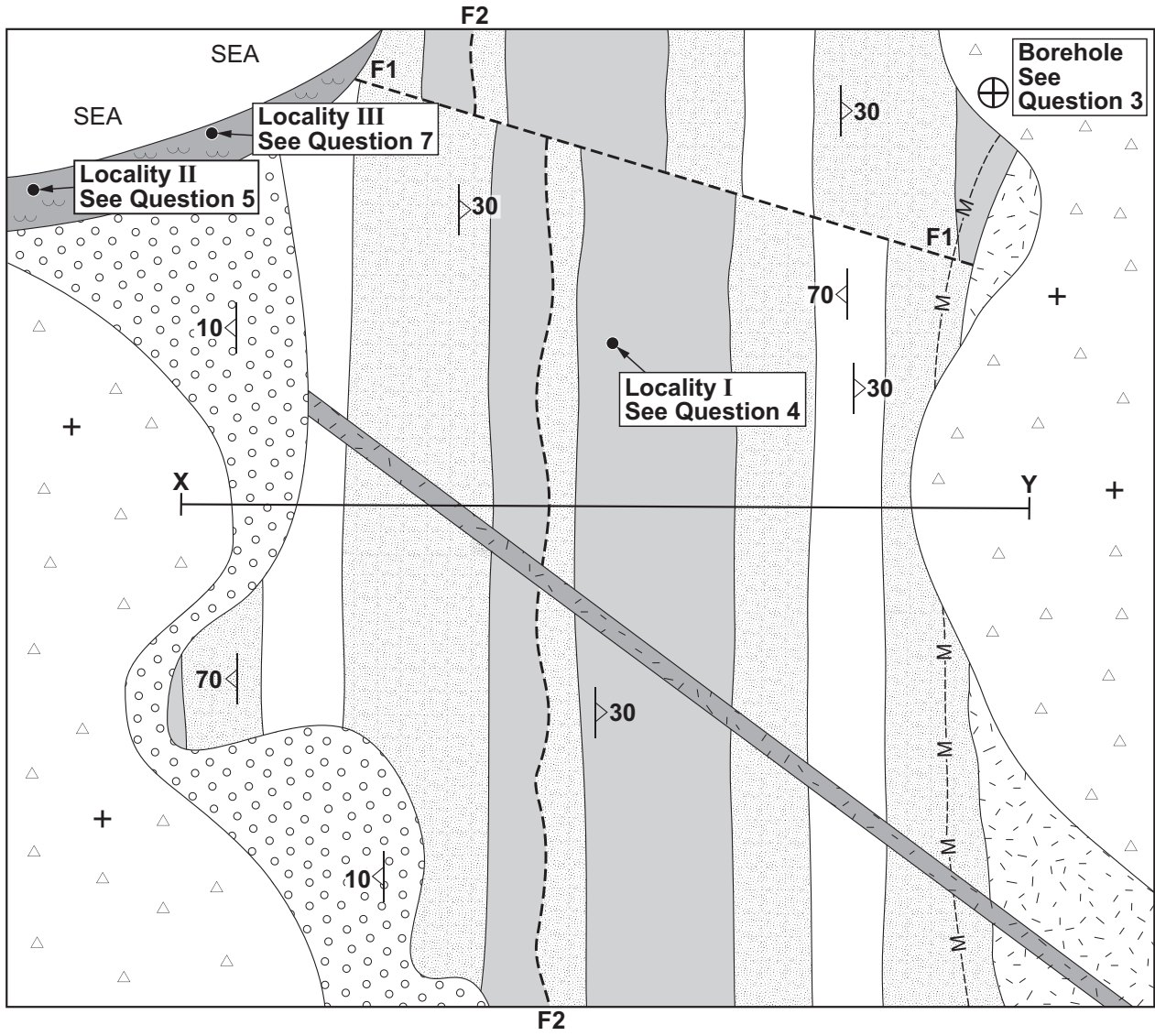
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# MAP 2





4. MAP 2 opposite is a reduction of MAP 1. The key for the rock units is the same as that for MAP 1.

(a) (i) Label on MAP 2 opposite, using the symbol U (U  $\longrightarrow$ ), 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 \_\_\_\_\_

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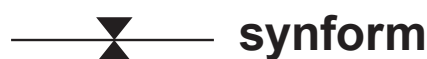
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Evidence 2 \_\_\_\_\_

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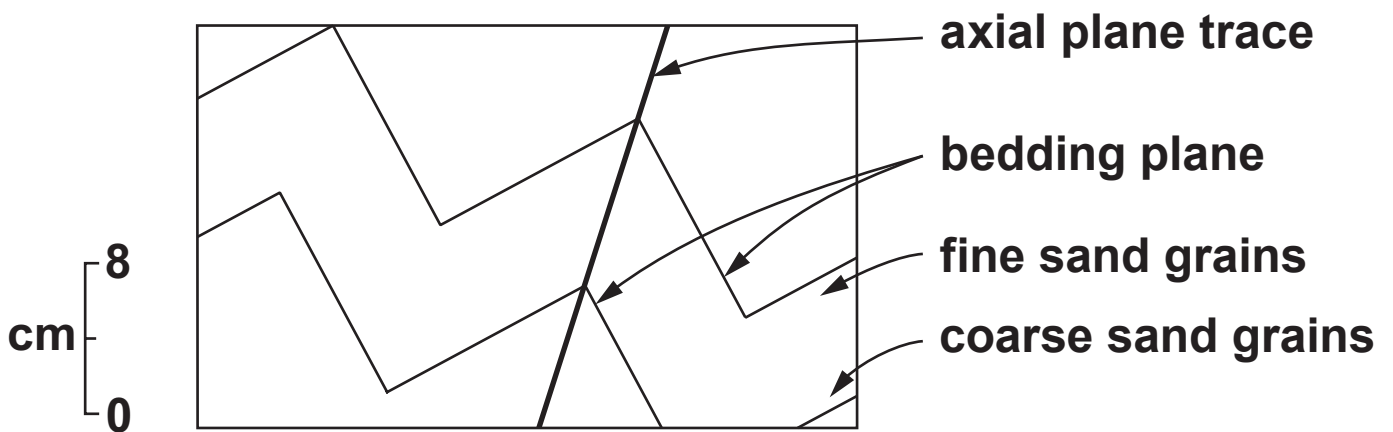
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(b) Clearly draw and label on MAP 2 the axial plane trace (APT) of a SYNFORM to the SOUTH of FAULT F1. Label it with the following symbol. [1]



4(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 \_\_\_\_\_

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- 4(c) (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**

4(c) (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]

Tick (✓) only ONE box

South

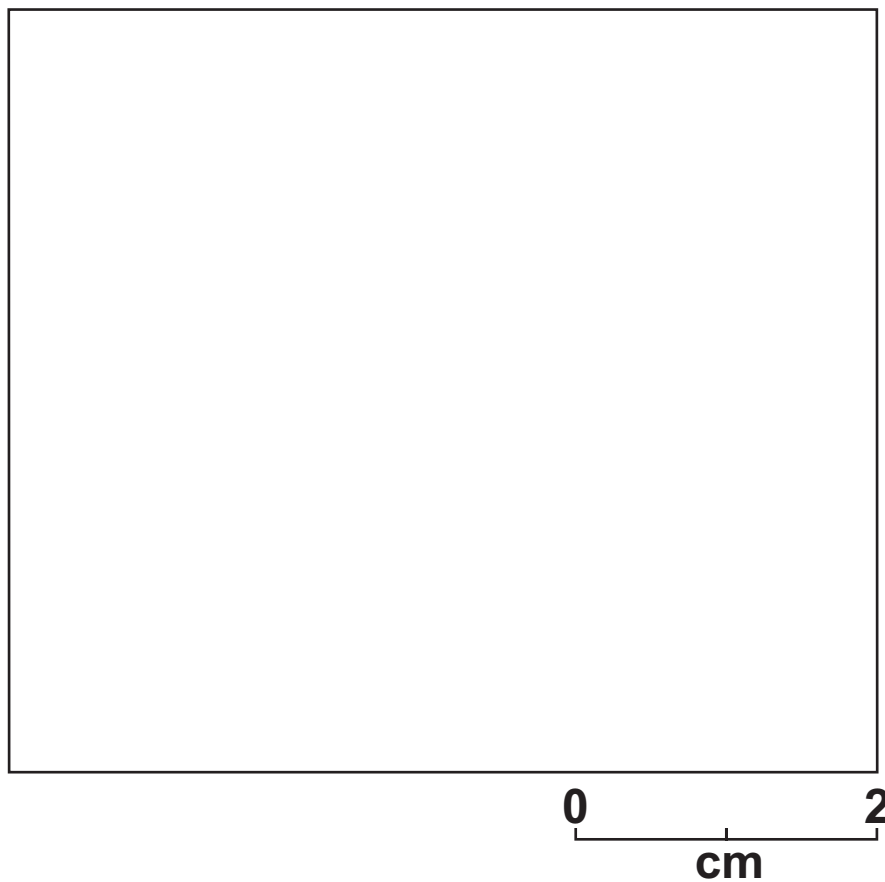
East

West

10

5. SPECIMEN R has been collected from LOCALITY II on MAP 1. PHOTOGRAPH 2 on page 3 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



5(b) Tick (✓) ONE box to indicate whether the deposit of shells in PHOTOGRAPH 2 on page 3 of the Resource Sheet represents a life assemblage or a death assemblage. Give a reason for your answer.

[1]

Tick (✓) only ONE box

Life assemblage  Death assemblage

Reason \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

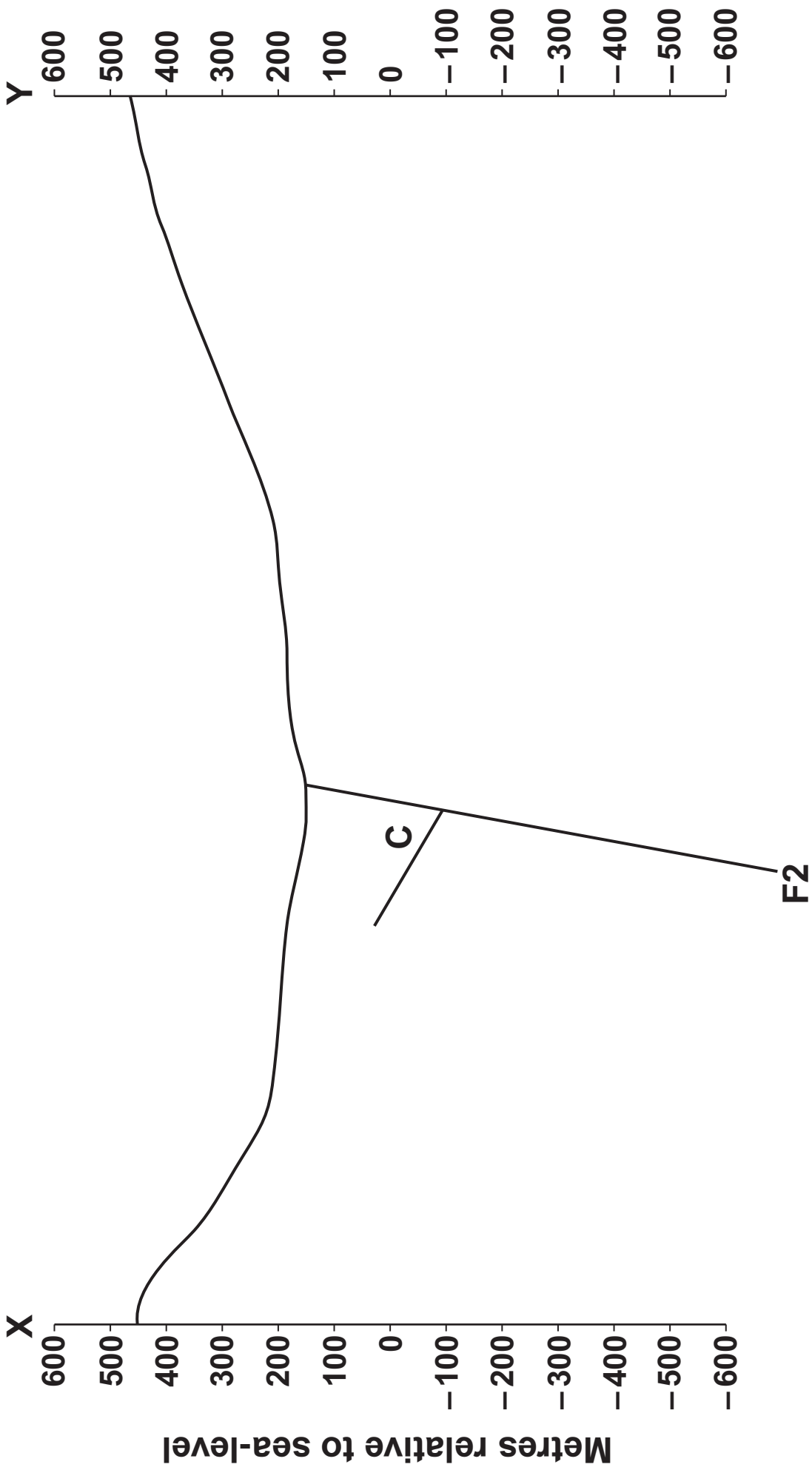
5

**6(a) The topographic profile opposite 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 opposite 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]**





- 6(b) The table opposite 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**

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 3 of the Resource Sheet) which is representative of SUPERFICIAL DEPOSIT UNIT F at LOCALITY III on MAP 1**
  
- PHOTOGRAPH 4 (on page 3 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]**











**ACKNOWLEDGEMENTS FOR RESOURCE SHEET**

**PHOTOGRAPH 1**

© Earth Science Education Unit:  
<http://www.earthscienceeducation.com>

**PHOTOGRAPH 2**

© Wikimedia Commons

**PHOTOGRAPH 3**

© [www.brynmawr.edu](http://www.brynmawr.edu)

**PHOTOGRAPH 4**

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