

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Education
Advanced



CYD-BWYLLGOR ADDYSG CYMRU
Tystysgrif Addysg Gyffredinol
Uwch

455/03

GEOLOGY GL5

THEMATIC UNIT 3

GEOLOGICAL EVOLUTION OF BRITAIN

P.M. TUESDAY, 19 June 2007

For Examiner's Use only.

Section A	1	
	2	
Section B	3	
	4	
	5	
Total	50	

Answer **both** questions in Section A (25 marks) and **one** question in Section B (25 marks).

SECTION A

Answer **both** questions in the spaces provided.
This section should take approximately half an hour to complete.

1. **Figure 1a** is a map showing some of the Variscan structures present in south west England and south Wales. The locations (1, 2 and 3) of three field sketches are also shown.

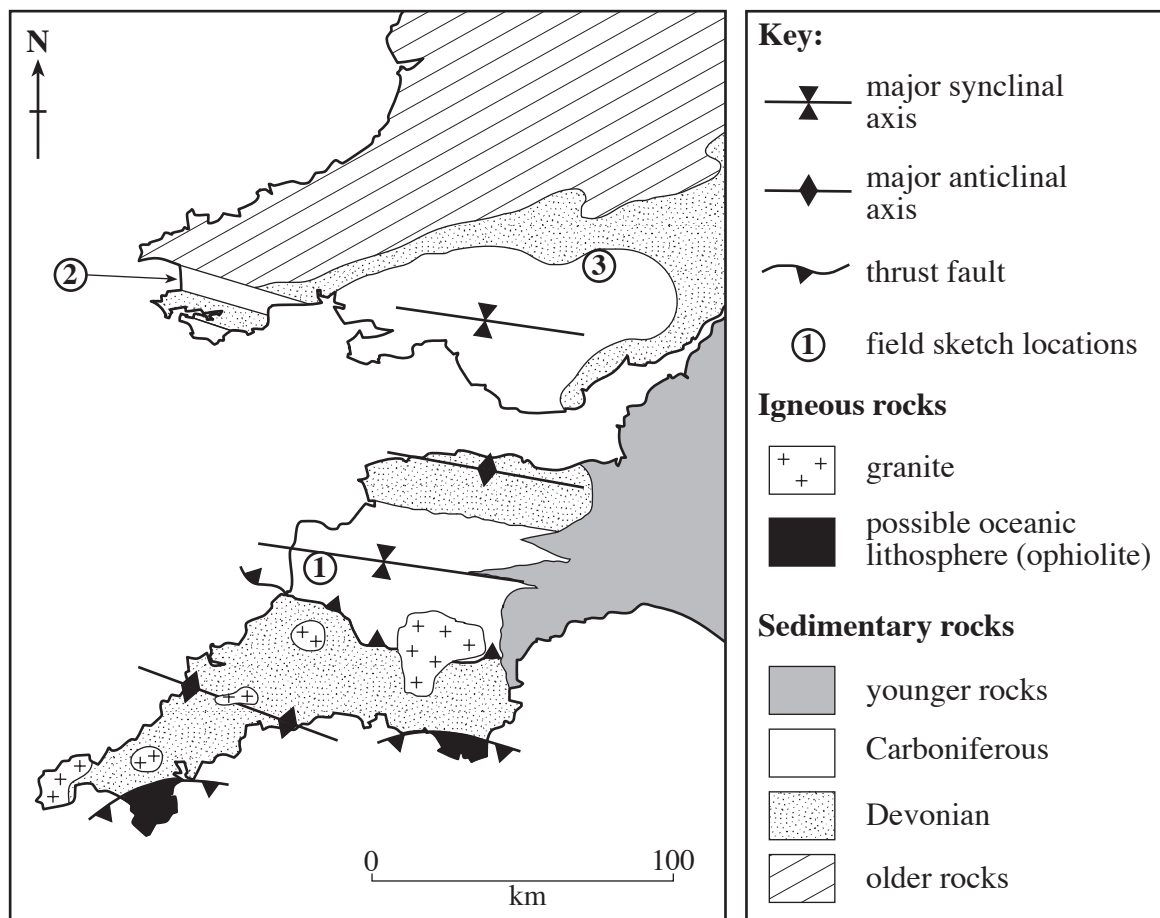


Figure 1a

(a) Using **Figure 1a**,

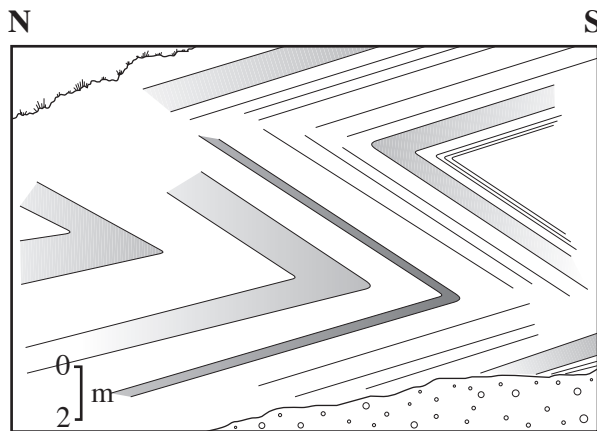
- (i) state the regional trend of the major fold axes,

[1]

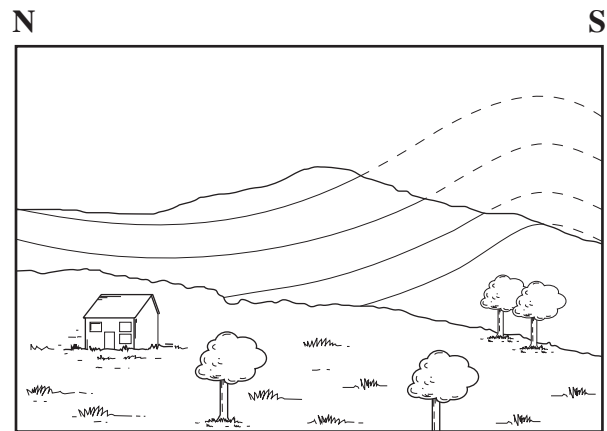
- (ii) state the directions of the greatest compressional stresses ($\sigma_{\max}$) which produced the structures.

[1]

(b) Field sketches at locations **1** and **3** are shown in **Figure 1b**.



Field sketch location 1



Field sketch location 3

Figure 1b

- (i) Complete **Table 1a** by adding appropriate descriptions of the folds shown in the field sketch at location **1**. [3]

Fold description at location 1	
shape of the fold hinge	
apparent angle of dip of the axial plane	
interlimb angle	

Table 1a

- (ii) Describe **two** differences between the folds at locations **1** and **3**. [2]

1.
.....
2.
.....

- (c) A field sketch of the structures at location **2** is shown in **Figure 1c**.

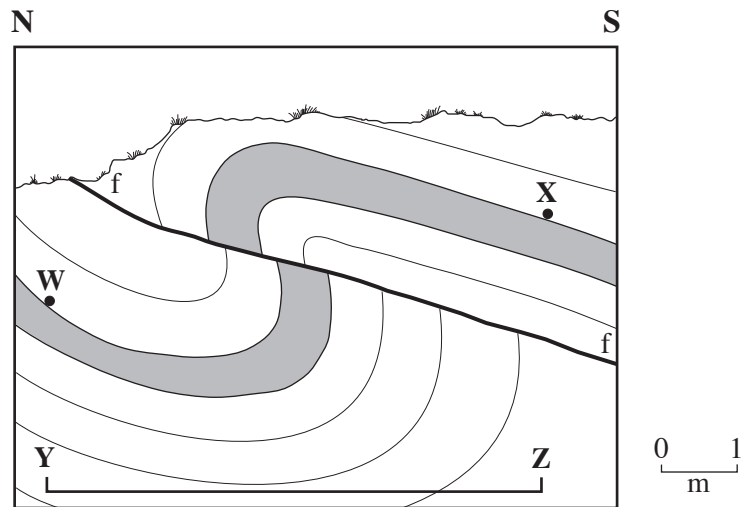


Figure 1c

Calculate the amount of crustal shortening produced at location **2** using the formula below and enter the result in **Table 1b**. The distance **W** to **X** is 10 m measured along the bedding plane. Show your working. [2]

$$\% \text{ crustal shortening} = \frac{\text{distance along bed from } \mathbf{W} \text{ to } \mathbf{X} - \text{distance } \mathbf{Y} \text{ to } \mathbf{Z}}{\text{distance along bed from } \mathbf{W} \text{ to } \mathbf{X}} \times 100$$

Location	1	2	3
crustal shortening	60%		2%
cleavage	strong	weak	none

Table 1b
Showing crustal shortening and cleavage at each location

- (d) *'South Wales and the south west of England were close to the site of a probable destructive plate margin during the Variscan Orogeny.'*

Evaluate this statement using **Figure 1a**, **Table 1a** and **Table 1b**.

[5]

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Total 14 marks

2. **Figure 2a** is a simplified geological map showing the Palaeozoic (Ordovician and Silurian) rocks of the Southern Uplands of Scotland. Numbers **1-3** show the locations of the three borehole logs drawn below the map in **Figure 2b**. **Figure 2c** shows the details of turbidite units from borehole **2**.

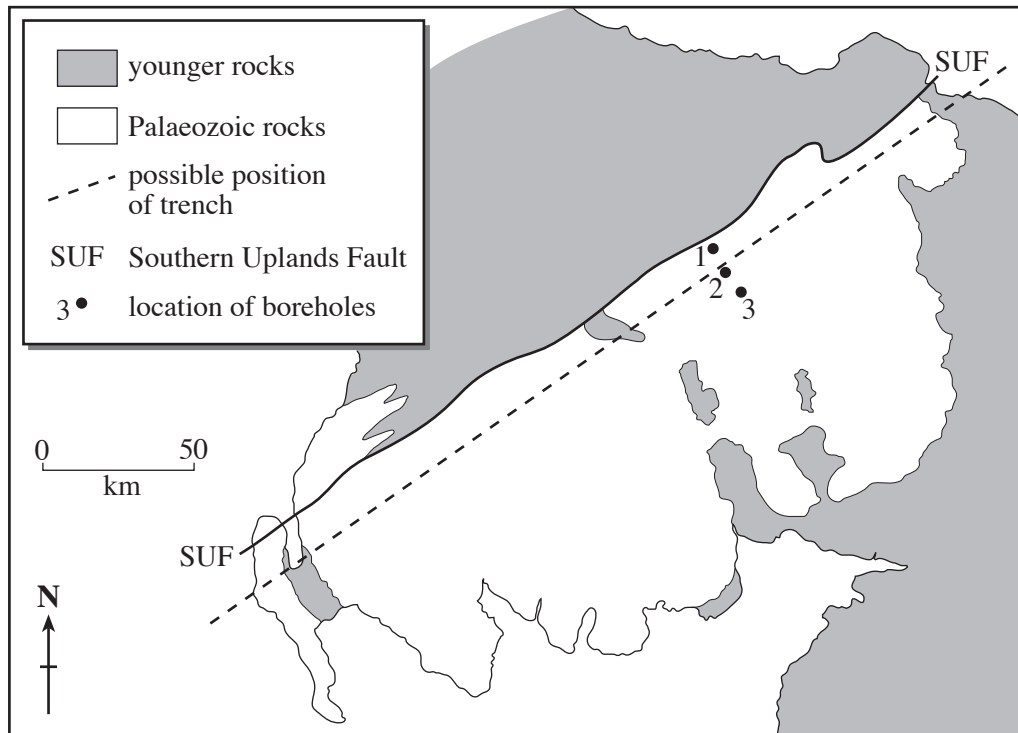


Figure 2a

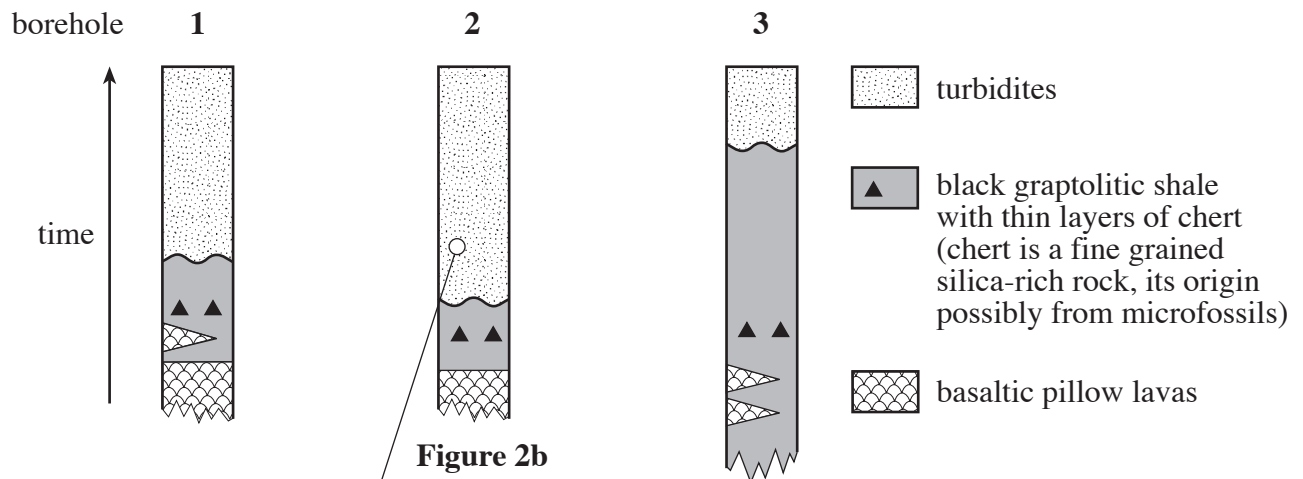


Figure 2b

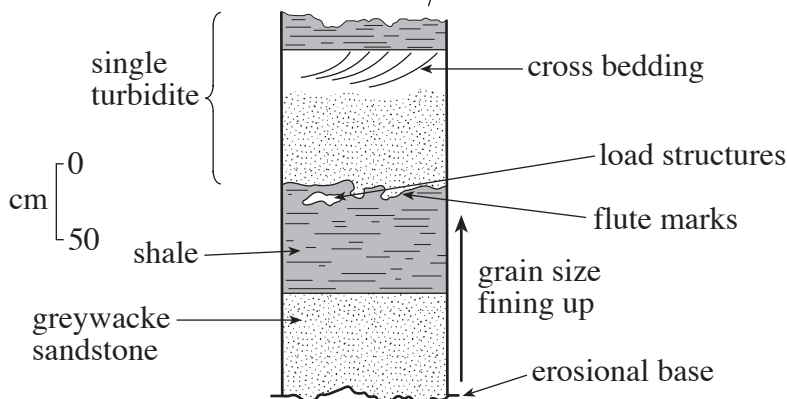


Figure 2c

adapted from:
Hunter and Easterbrook
Geological History
of the British Isles
(Open University)

Refer to Figure 2c.

- (a) (i) Name **one** sedimentary structure present in a single turbidite unit which can be used to determine the direction of current flow. [1]

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- (ii) Explain the origin of the fining upwards grain size within the single turbidite. [3]

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Refer to Figure 2b.

- (b) (i) Describe the likely environment of deposition of the black graptolitic shale with thin layers of chert present in all three boreholes. State the evidence for your conclusions. [3]

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- (ii) Explain the possible significance of the basaltic pillow lavas in the boreholes. [2]

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Refer to Figures 2a and 2b.

- (c) The position of a possible oceanic trench has been marked on **Figure 2a**. State the evidence from the sediments in the boreholes which could be used to support this interpretation. [2]

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Total 11 marks

SECTION B

*Answer **one** question from this section.*

Write your answer in the remaining pages of this booklet.

3. (a) Interpret the geology of the Tertiary Igneous Province of north west Britain in plate tectonic terms.
- (b) Describe the evidence for rifting and subsidence in the North Sea and evaluate its relationship to plate movements in the Mesozoic and Tertiary. [25]
4. Palaeomagnetic evidence suggests that during the Late Palaeozoic (Devonian, Carboniferous and Permian), Britain drifted across the Equator.
- (a) Describe the evidence from **sedimentary rocks** and **fossils** which suggests an equatorial climate in Britain in the Late Palaeozoic.
- (b) Describe and evaluate the **palaeomagnetic** evidence. [25]
5. (a) Describe a range of techniques for collecting geological data in the field and explain how the data can be presented in a variety of forms.
- (b) Evaluate the usefulness of these techniques in the interpretation of the geology of an area with which you are familiar. [25]

(455-03)

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