Surname	Centre Number	Candidate Number
Other Names		2

GCE A level

1215/04

GEOLOGY - GL5
THEMATIC UNIT 4
GEOLOGY OF THE LITHOSPHERE

P.M. FRIDAY, 10 June 2011

ONE of TWO units to be completed in 2 hours

			Examiner only
Section A	**1.**	**15**	
Section B	**2.**	**25**	
	3.		
	4.		
Total		**40**	

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ADDITIONAL MATERIALS

In addition to this and one other examination paper, you may require a calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **question 1** in Section A (15 marks) and **one** question from Section B (25 marks).

INFORMATION FOR CANDIDATES

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

You are reminded of the necessity for good English and orderly presentation in your answers.

Examiner only

SECTION A

1. **Figure 1a** shows a fold that has been produced by compression, the directions of two of the principal stresses (σ_x and σ_y) being given. Two parts of the fold have been highlighted in boxes labelled **A** and **B**.

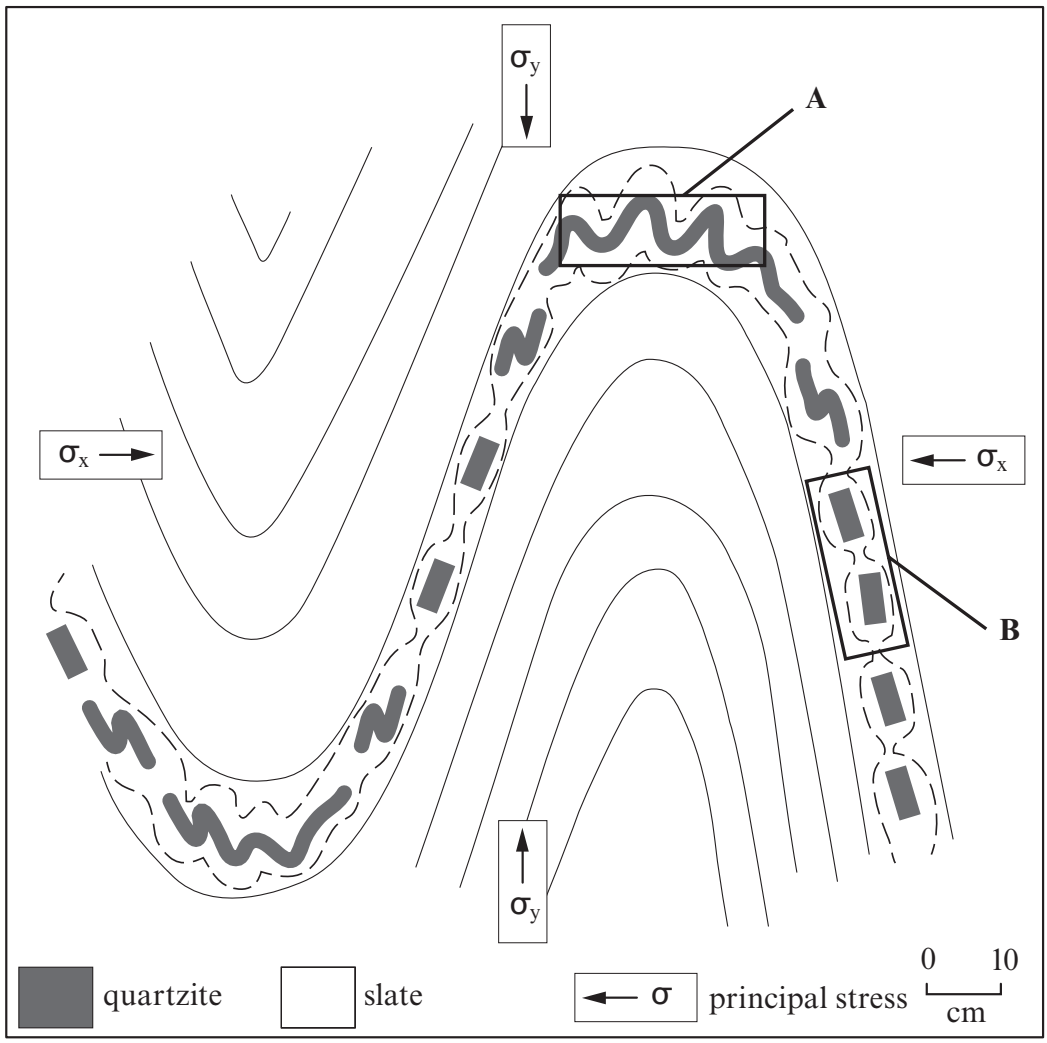

Figure 1a

(a) (i) Identify the principal stresses σ_x and σ_y as σ_{min} σ_{int} or σ_{max}. [2]

σ_x .....

σ_y .....

(ii) Describe the differences in the deformation of the quartzite in box **A** compared with box **B**. Give possible reasons for the differences you have described. [3]

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Figure 1b shows the results of an experiment to compare the behaviour of three rocks **L**, **M** and **N** under the same stress conditions.

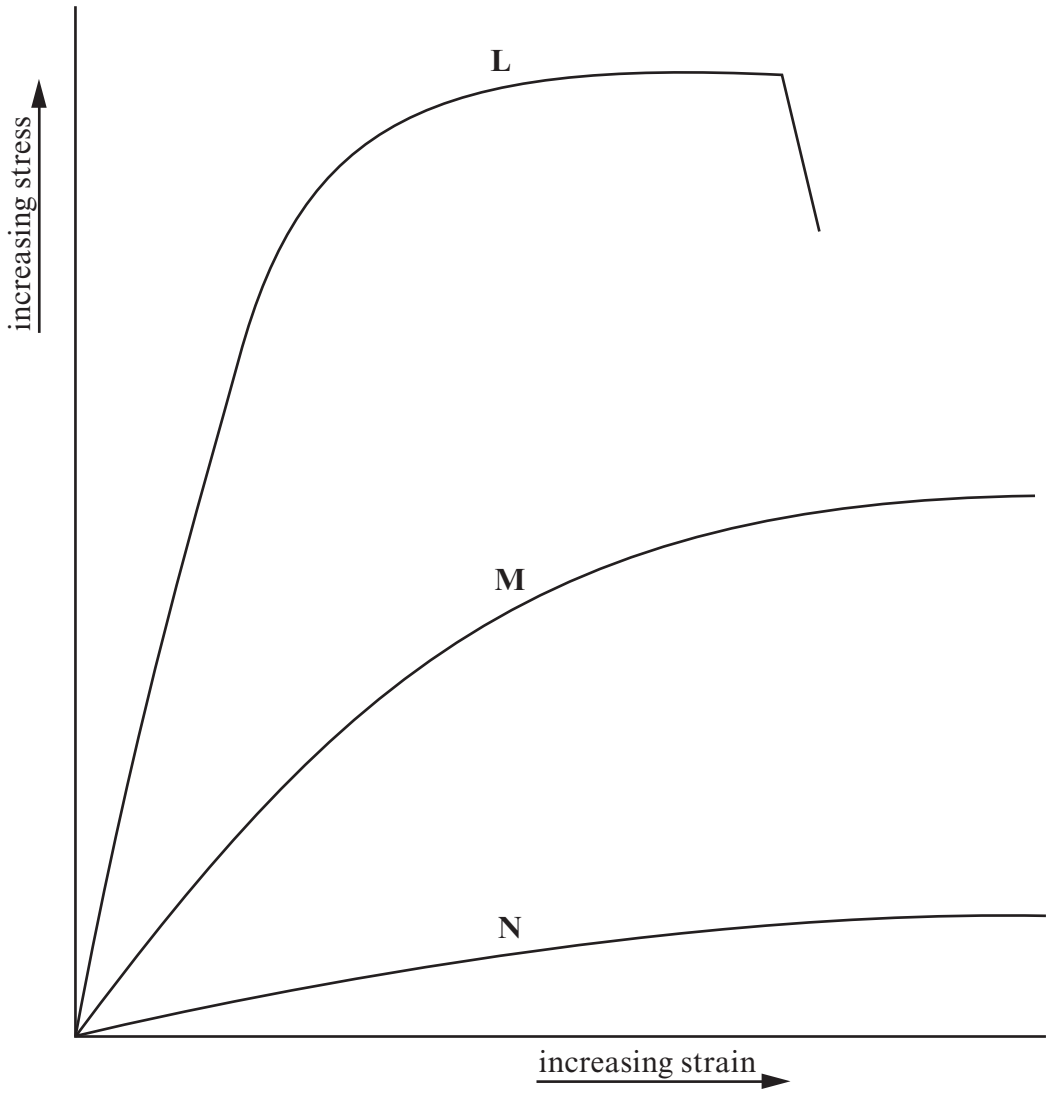

Figure 1b

(b) A student used the experimental results on the three rocks **L**, **M** and **N**, as shown in **Figure 1b**, to conclude that curve **L best** demonstrated the deformation shown by the quartzite in boxes **A** and **B**. Use **Figures 1a** and **1b** to evaluate the reliability of this conclusion and comment on the use of the experimental data in **Figure 1b** to explain the field data in **Figure 1a**. [3]

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Experimental evidence suggests that the fold in **Figure 1a** formed at a temperature of 200 °C to 220 °C as shown by the shaded area of **Figure 1c**, and at a pressure of approximately 6 kb to 10 kb as shown by the area between the two horizontal lines. Three geothermal gradients of 5 °C km^{-1}, 10 °C km^{-1} and 15 °C km^{-1} are also shown.

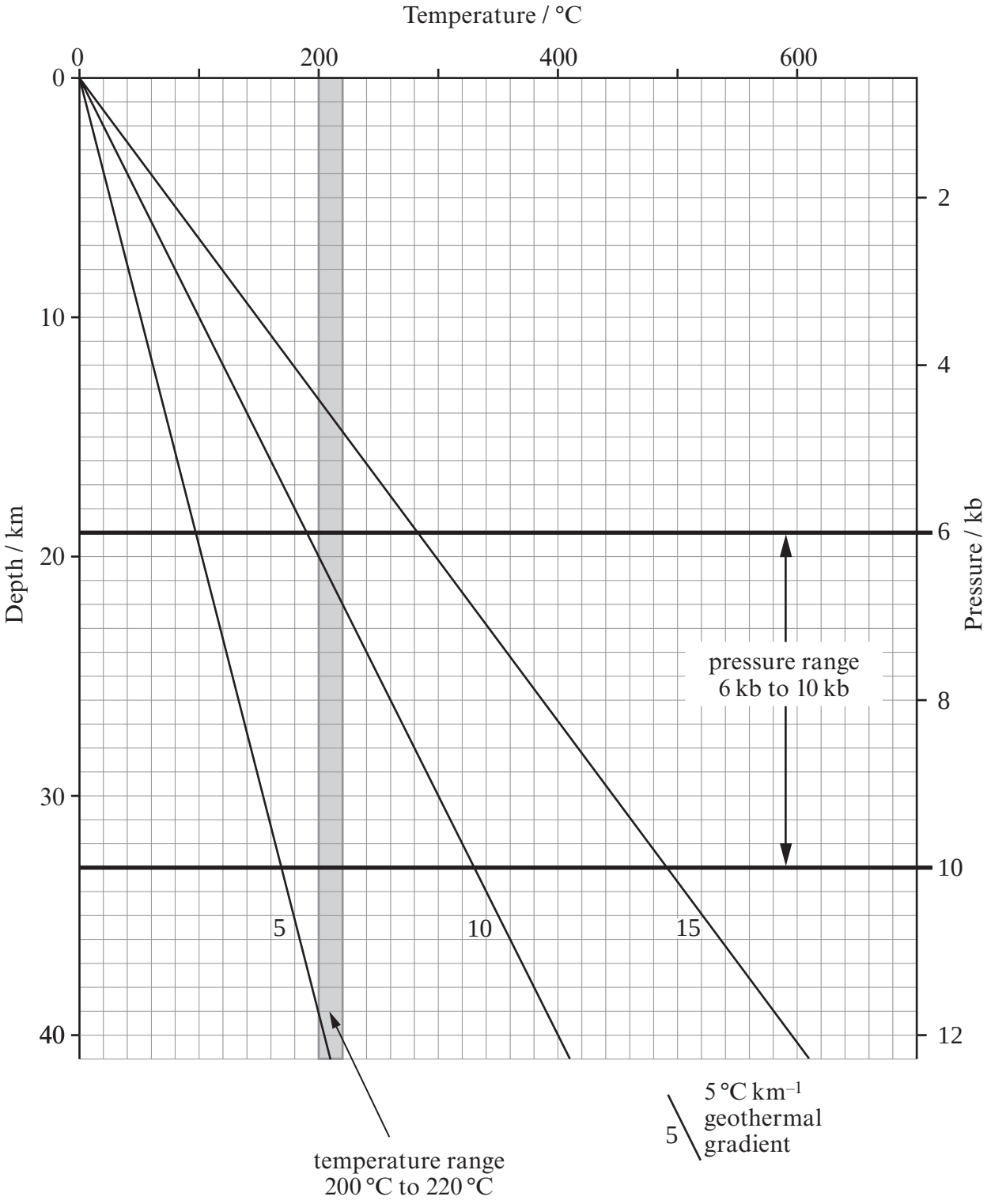

Figure 1c

(c) (i) Suggest which of the geothermal gradients in **Figure 1c** is the most likely to have been present where the folding shown in **Figure 1a** was formed. Give **two** reasons for your suggestion. [3]

Geothermal gradient .....

Reasons .....

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(ii) Using the information given in **Figure 1c** the student correctly concluded that the folding formed at a depth of 20 km to 22 km. Evaluate this conclusion. [2]

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(iii) Assuming that the geothermal gradient in stable continental crust is approximately 30 °C km^{-1}, with reference to **Figures 1a**, **1b** and **1c** suggest a possible geological plate tectonic setting in which the folding occurred. Give **one** reason for your choice of setting. [2]

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Total 15 marks

SECTION B

Answer **one** *question only.*

Write your answer in the remaining pages of this booklet.

2. Oceanic lithosphere is reabsorbed into the mantle at either:

(i) ocean-ocean boundaries, or
(ii) ocean-continent boundaries.

Describe briefly how the reabsorption takes place in **each** of the plate tectonic settings (i) and (ii) and evaluate the importance of the setting to the types of magmas produced. [25]

3. Both oceanic crust and continental crust are typically layered. Describe briefly the layering in **each** of the types of crust and evaluate the contribution of sedimentary rocks to the formation of the layering. [25]

4. *(a)* Describe the distribution of ages of rocks in continental areas.

(b) Evaluate the role of plate tectonics in the formation of this distribution. [25]

Examiner only

Turn over.

Examiner only

Examiner only