Surname	Centre Number	Candidate Number
First name(s)		2

GCE AS

B480U20-1

Z22-B480U20-1

THURSDAY, 26 MAY 2022 – MORNING

GEOLOGY – AS component 2
Foundation Geology

1 hour 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**13**	
2.	**14**	
3.	**20**	
4.	**15**	
5.	**13**	
6.	**15**	
Total	**90**	

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ADDITIONAL MATERIALS

In addition to this examination paper, you will need:
- a calculator
- a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

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

The assessment of the quality of extended response (QER) will take place in questions **3** and **5**.

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

1. **Figure 1a** shows a rock exposure. **Figure 1b** is a photomicrograph of the rock in **Figure 1a**.

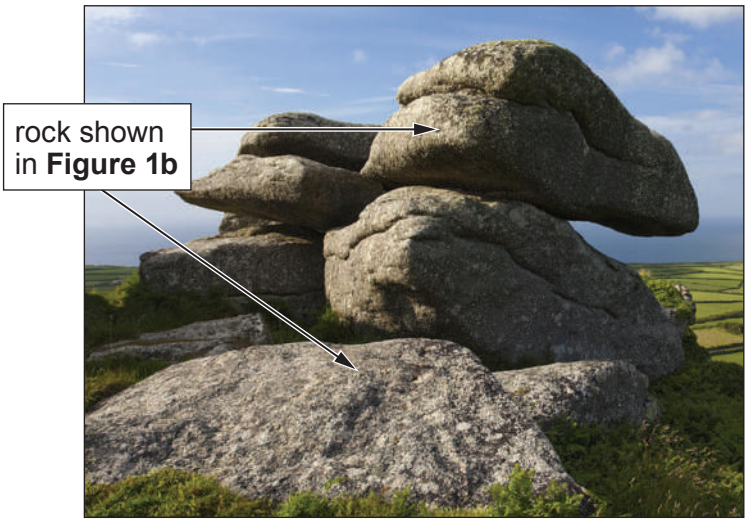


Figure 1a

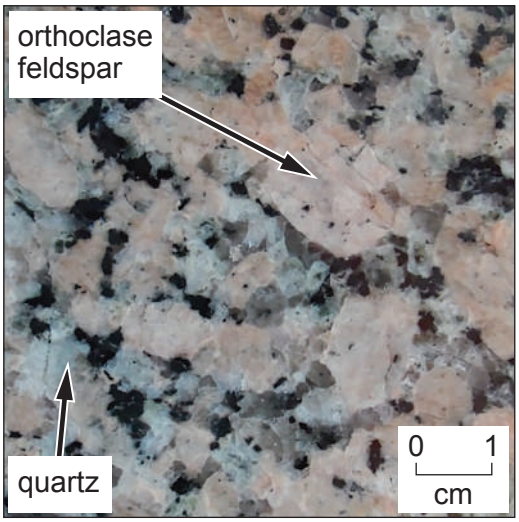


Figure 1b

Refer to **Figure 1a** and **Figure 1b**.

(a) (i) Describe the texture of the rock shown in **Figure 1b**. [3]

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(ii) State the name of the rock shown in **Figure 1b**. [1]

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(b) The rock outcrop in **Figure 1a** is weathered by chemical processes.

(i) Name **two** products of this chemical weathering. [2]

1. .....

2. .....

(ii) Explain **one** process likely to be involved in this chemical weathering. [2]

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Figure 1c shows a weathered surface of the rock shown in **Figure 1a**.

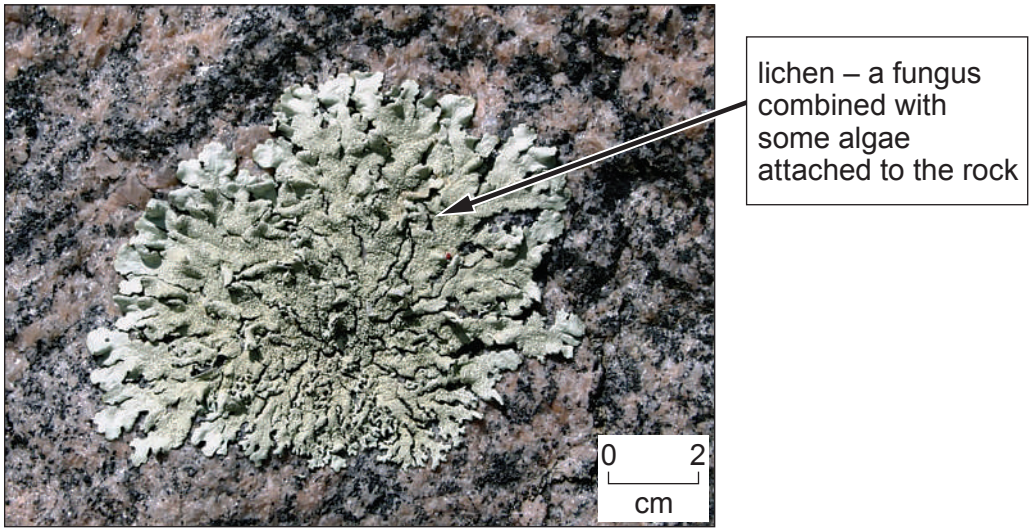


Figure 1c

(c) Describe the possible processes by which lichen in **Figure 1c** is contributing to the weathering of the rock. [2]

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(d) Products of weathering from the rocks shown in **Figure 1a**, **Figure 1b** and **Figure 1c** are often deposited by flocculation. Explain the process of flocculation. [3]

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2. **Table 1** shows the silicate structure and pictures of two silicate minerals forming grains **A** and **B**.

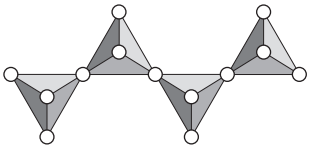
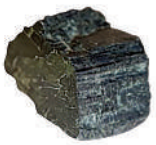
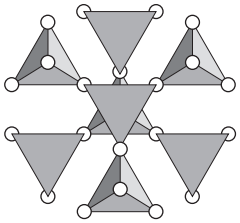
	Silicate structure	Name of silicate structure	Mineral	Picture
Grain **A**		•		
Grain **B**		•	Quartz	

Table 1

(a) (i) Complete **Table 1** by stating the name of the two silicate structures shown. [2]

(ii) Grain **A** and grain **B** were originally the same size and have both undergone identical transportation in a river. Grain **A** has been eroded to a smaller size than grain **B**. Explain how the silicate structures have controlled this difference in size. [4]

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(b) Grain **A** is not scratched by a steel pin. Use the information in **Table 1** and the classification system shown in **Figure 2a** to identify the mineral forming grain **A**. [1]

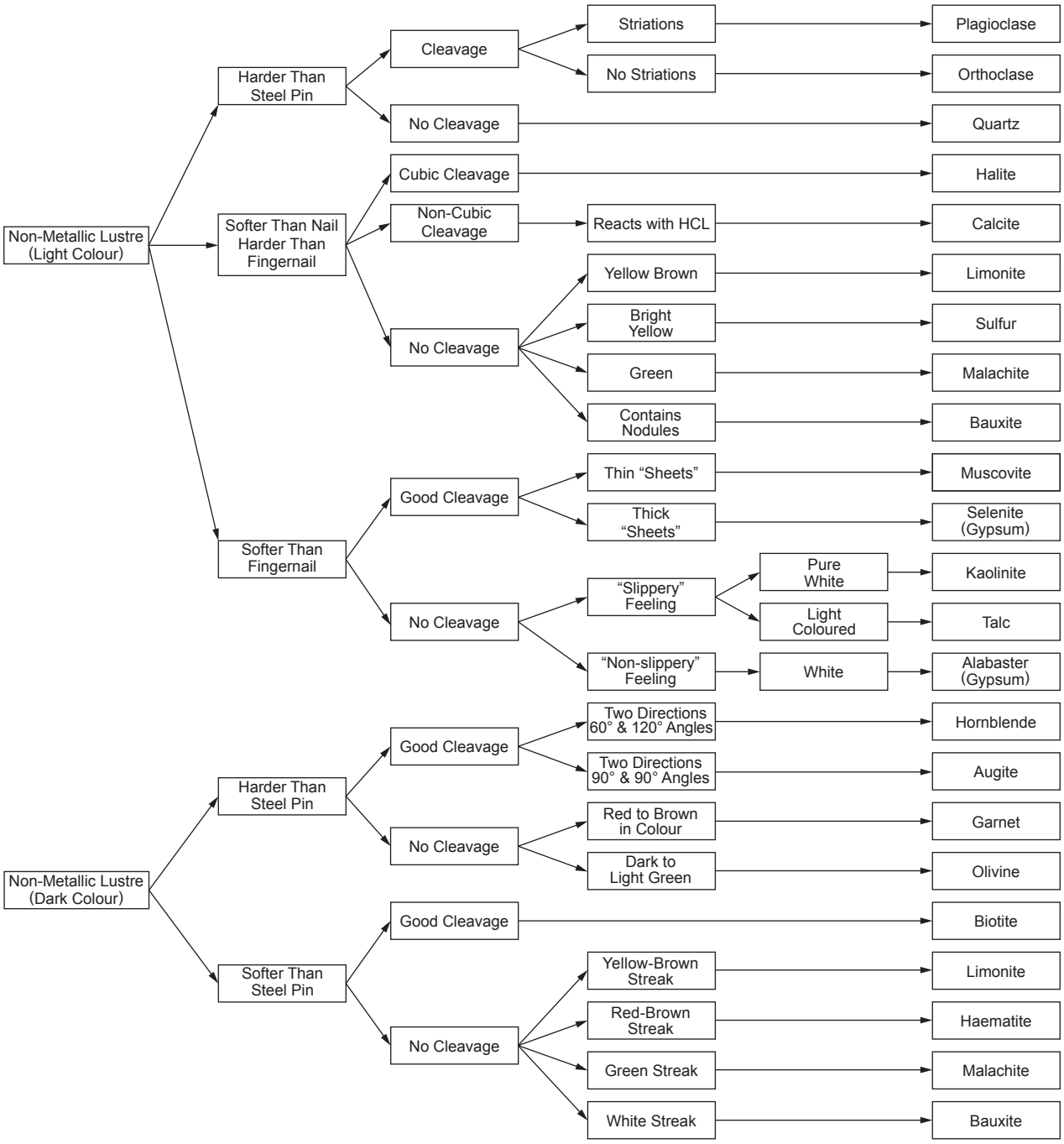


Figure 2a

Mineral forming grain **A** .....

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Figure 2b is a model which can be used to determine the flow velocity of a river at the time of deposition based on grain size.

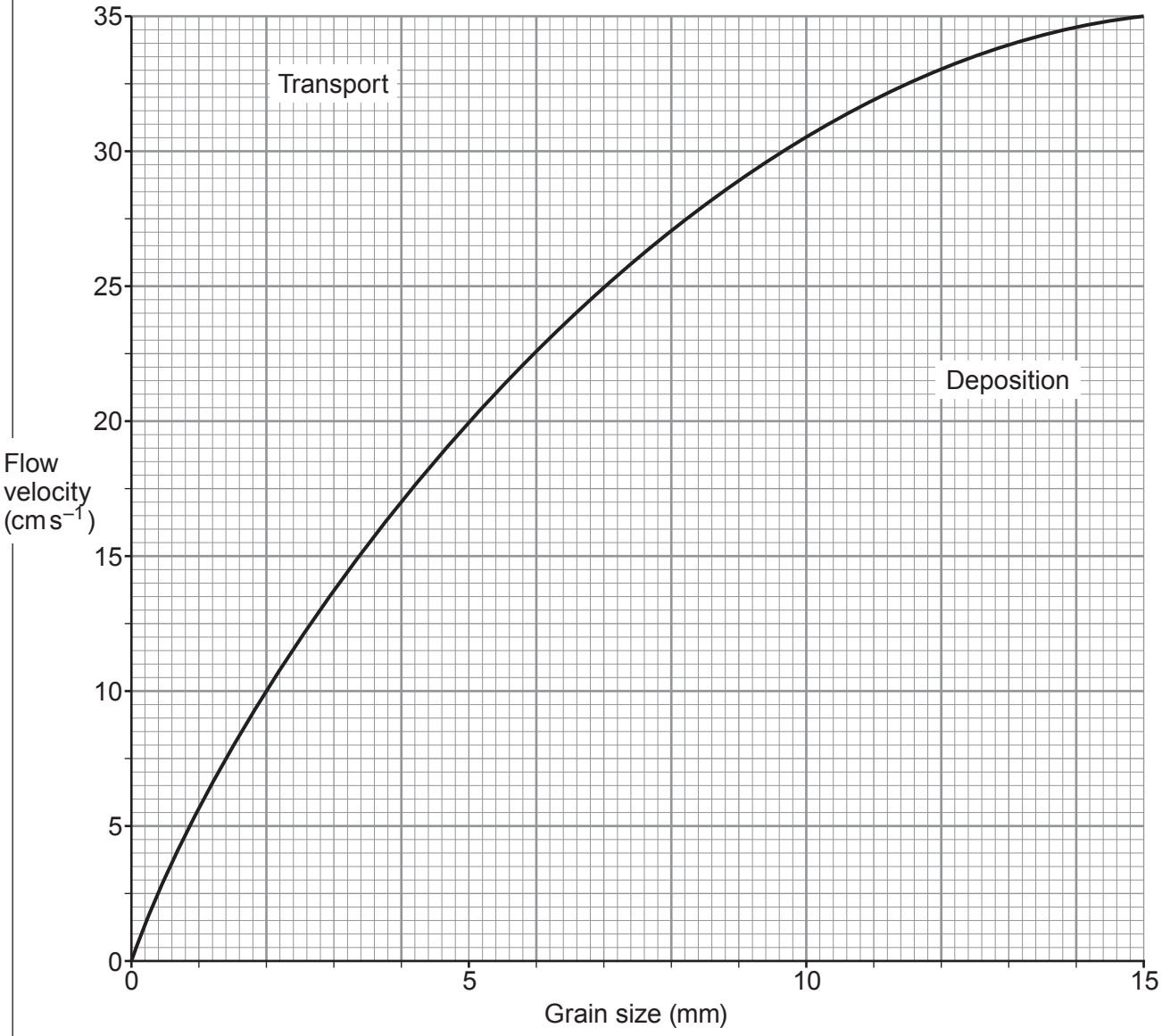


Figure 2b

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(c) (i) Using **Figure 2b**, complete **Table 2** showing the flow velocities at which grain **A** and grain **B** were deposited. [1]

Grain	Size (mm)	Flow velocity at deposition ($cm\,s^{-1}$)
A	3	•
B	11	•

Table 2

(ii) State **two** features of grains, other than grain size, which might affect the flow velocity at which a grain is deposited. [2]

1. .....

2. .....

(d) Explain the processes which could erode and transport grain **B**. [4]

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3. **Figure 3a** is a cross-section through an orogenic belt in a collision zone. **Figure 3b** is a model produced from laboratory experiments showing the expected continental geotherm and the temperature at which granite begins to melt.

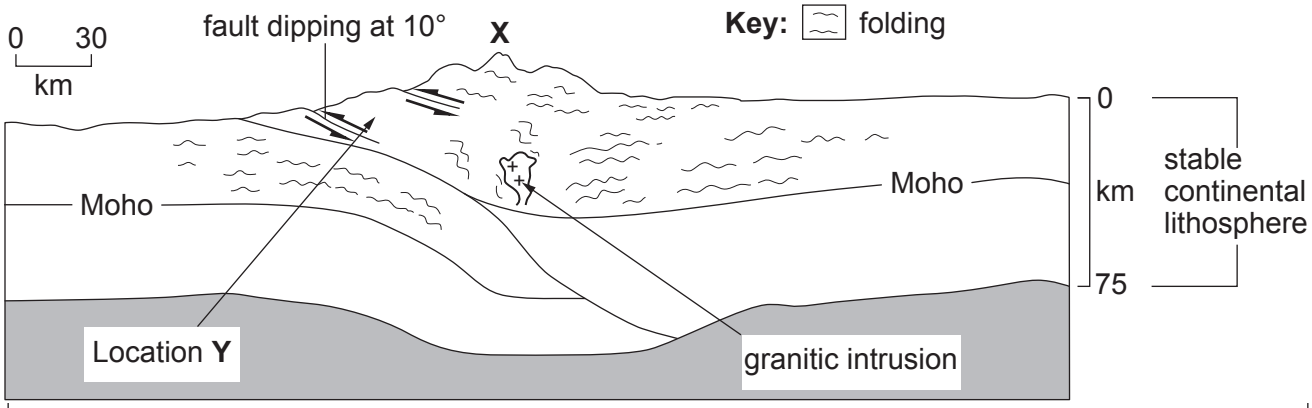


Figure 3a

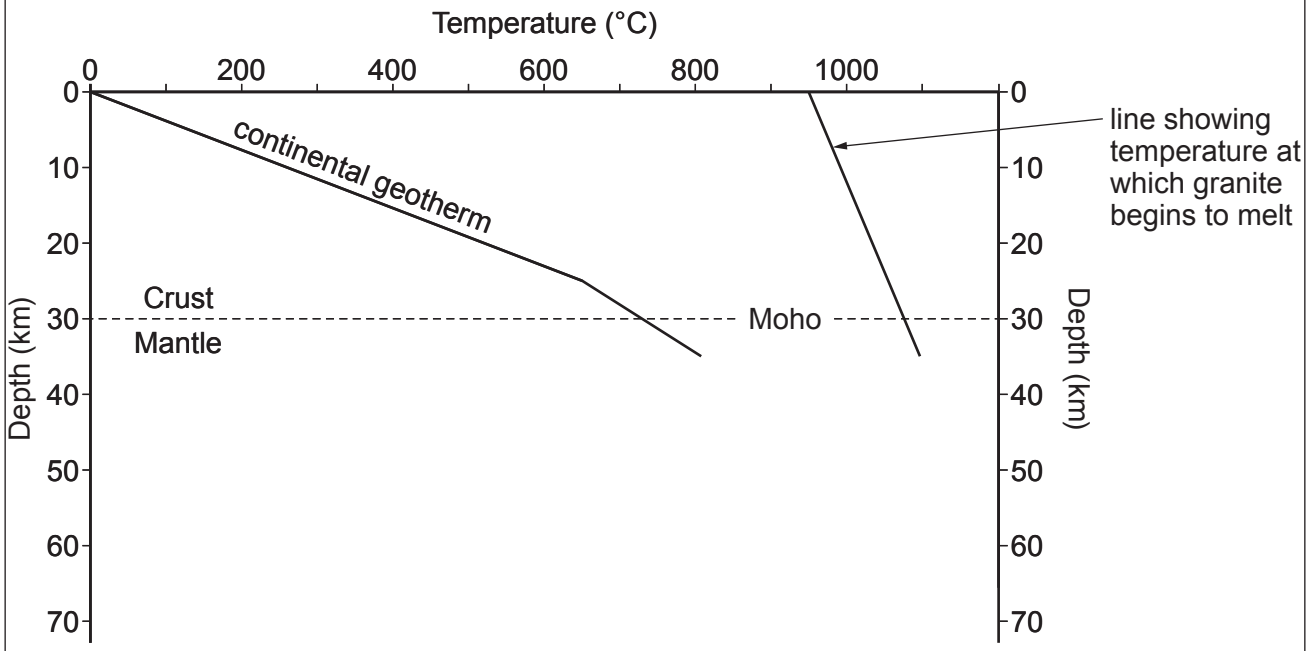


Figure 3b

Refer to **Figure 3a** and **Figure 3b**.

(a) (i) Using **Figure 3b**, calculate the geothermal gradient from the surface to the Moho. Show your working. [2]

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(ii) Using **Figure 3a**, calculate the percentage lithospheric thickening beneath point **X**. Show your working. [2]

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(iii) With reference to **Figure 3b**, estimate the depth at which the model predicts granite will begin to melt. [2]

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(iv) With reference to **Figure 3a** and **Figure 3b**, explain the presence of granitic intrusions in orogenic belts. [4]

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Figure 3c is a metamorphic rock found at location **Y** in **Figure 3a**.

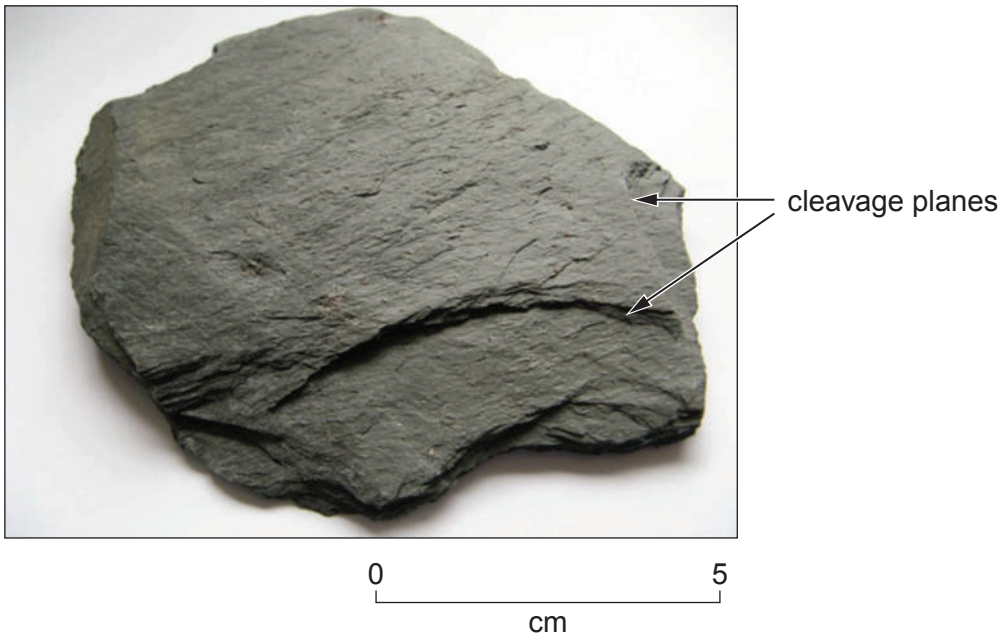


Figure 3c

(b) (i) State the name of the rock shown in **Figure 3c**. [1]

.....

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(ii) Explain the conditions which lead to the formation of the rock shown in **Figure 3c**. [3]

(c) With reference to **Figure 3a** evaluate the statement 'the type of crustal deformation that occurs in collision zones is controlled **solely** by temperature'. [6 QER]

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4. **Figure 4a** shows two specimens (**C** and **D**) from separate fossil groups.

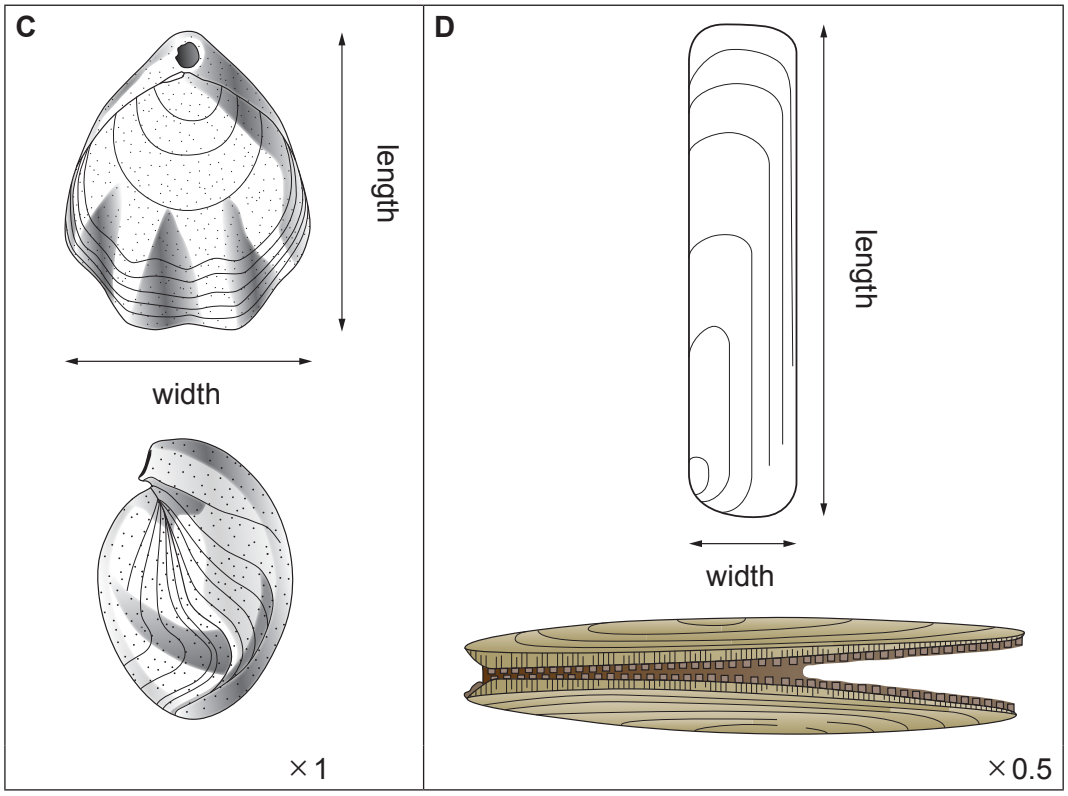


Figure 4a

Refer to **Figure 4a**.

(a) (i) Label the following on specimen **C**

- umbo
- hinge line. [2]

(ii) Draw on **Figure 4a** the line of symmetry for specimen **C** and the line of symmetry for specimen **D**. [1]

(b) Complete **Table 3** by calculating the width:length ratio of specimen **D**. Show your working. [2]

	Width : length ratio
C	1 : 1.19
D	1 : .....

Table 3

(c) State the name of the fossil groups to which specimens **C** and **D** belong. [2]

Fossil group **C** .....

Fossil group **D** .....

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Figure 4b shows possible habitats for specimen **D** and the internal structure of specimen **D**.

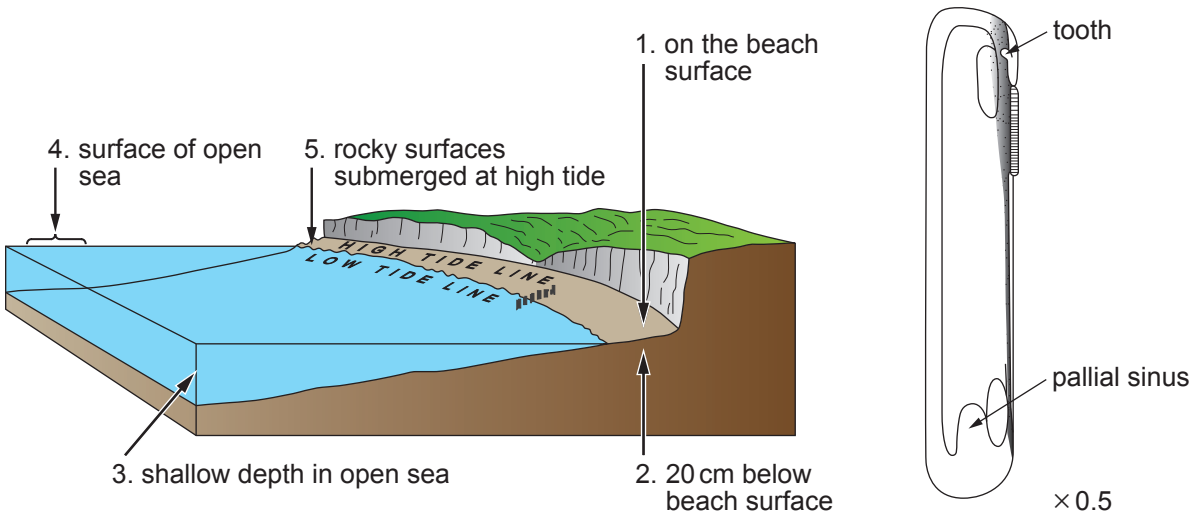


Figure 4b

(d) (i) State in which **one** of the habitats (1–5) specimen **D** is most likely to have lived. Give **two** reasons for your answer. [3]

Habitat .....

.....

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.....

(ii) Explain why mode of life can be more accurately interpreted for specimen **D** than for trilobites. [2]

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(iii) Explain why the fossil record is biased and incomplete. [3]

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5. **Figure 5a** shows the location of the 2018 eruption of the Indonesian volcano Anak Krakatoa.



Figure 5a

Refer to **Figure 5a**.

(a) (i) Draw an arrow in each of the blank circles on **Figure 5a** to indicate the relative direction of plate movement at these locations. [1]

(ii) State the type of lava (ultra-mafic, mafic, intermediate or silicic) most likely to be erupted at Anak Krakatoa. [1]

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(iii) Explain the processes that lead to the production of magma at this location. [3]

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Figure 5b shows two satellite images of Anak Krakatoa before and after the explosive eruption on the 22nd December 2018.



Figure 5b

(b) Using the grid in **Figure 5b**, estimate the area of Anak Krakatoa that was destroyed in the explosive eruption. Show your working. [2]

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(c) Earlier in 2018 the Hawaiian volcano Kilauea, which is located in an intraplate setting, erupted. With reference to **Figure 5a** and the tectonic setting of both volcanoes, explain why the eruption in Hawaii was less explosive than that at Anak Krakatoa. [6 QER]

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Turn over.

6. **Figure 6a** is a geological cross-section showing the true dip of two faults **F1** and **F2**. **Figure 6b** shows a specimen of rock **X**.

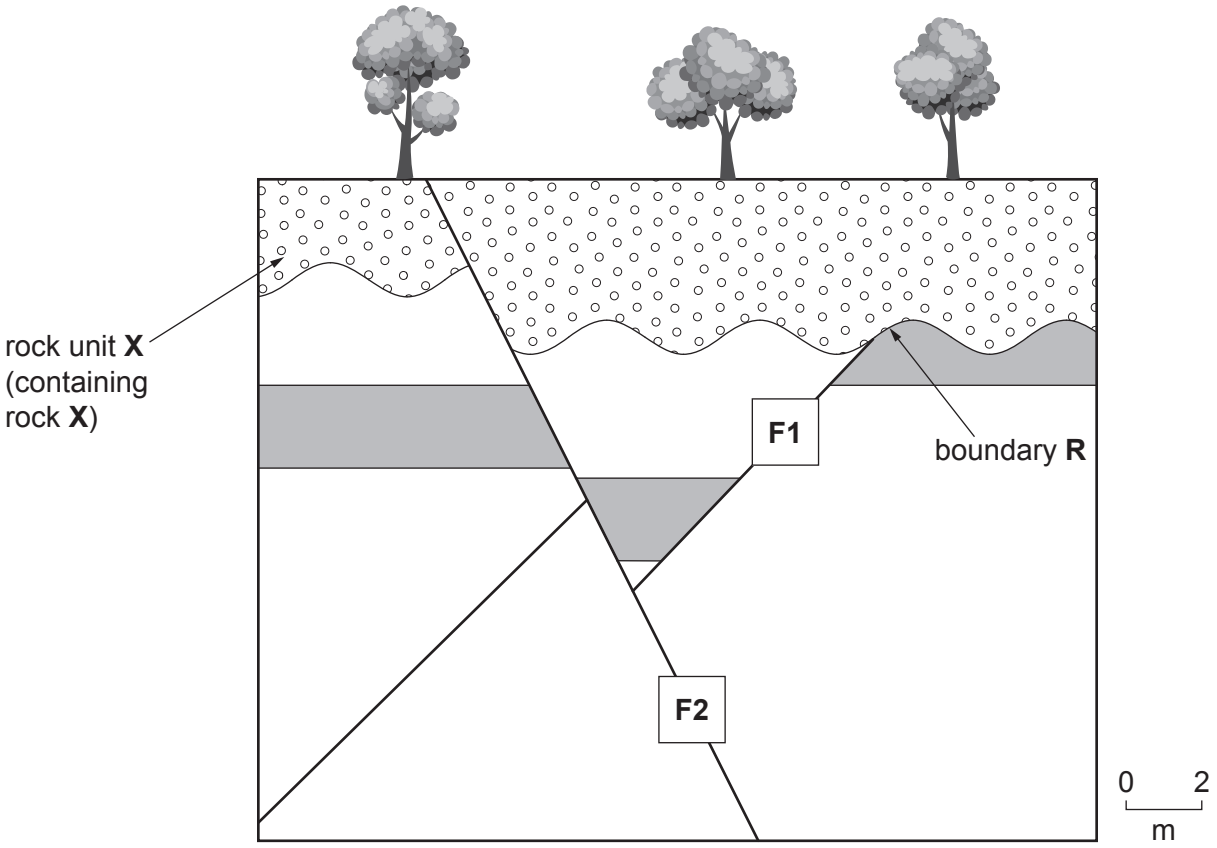


Figure 6a

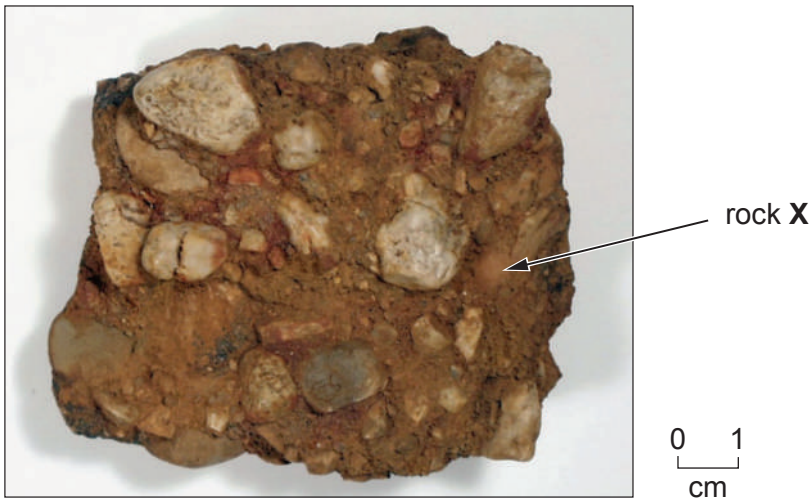


Figure 6b

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Refer to **Figure 6a** and **Figure 6b**.

(a) (i) Describe the texture of rock **X** in **Figure 6b**. [3]

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(ii) State the name of rock **X**. [1]

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(b) Explain the processes that lead to the formation of boundary **R** shown in **Figure 6a**. [3]

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(c) (i) State the type of fault shown by fault **F1**. Give a reason for your answer. [2]

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(ii) Calculate the vertical displacement of fault **F2**. Show your working. [2]

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(d) 'Fault **F1** and fault **F2** were formed by the same tectonic forces at the same time.' Evaluate this statement. [4]

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END OF PAPER

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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Acknowledgements

Figure 1a https://fineartamerica.com/featured/
Figure 1b ESEU https://www.earthscienceeducation.com/
Table 1 grain A - https://www.flickr.com/photos/udgeology/2315098493
Figure 2a adapted from https://www.soinc.org/sites/default/files/uploaded_files/MineralIDChartRM2013.pdf
Figure 3c ESEU https://www.earthscienceeducation.com/
Figure 5a Google Earth
Figure 5b https://www.bbc.co.uk/news/science-environment-46743362
Figure 6b ESEU https://www.earthscienceeducation.com/

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