

Surname	Centre Number	Candidate Number
Other Names		0



GCSE – NEW

C480U20-1



GEOLOGY – Component 2

Investigative Geology

FRIDAY, 24 MAY 2019 – MORNING

1 hour 30 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	20	
2.	23	
3.	17	
4.	10	
5.	10	
Total	80	

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ADDITIONAL MATERIALS

In addition to this examination paper you will need Map 1, the Data Sheet, a protractor and 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 **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

Plain paper may be obtained from the supervisor on request.

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

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Answer all questions.

1. (a) A student measured the maximum dimension of 100 crystals in **Rock Unit A** on **Map 1**. The results have been recorded in **Table 1a**.

Crystal Size (mm)	Frequency
0 – 1.9	0
2 – 3.9	15
4 – 5.9	85
6 – 7.9	0
8 – 9.9	0

Table 1a

- (i) Using the information in **Table 1a**, complete **Figure 1a** to show the texture of **Rock Unit A**. [3]

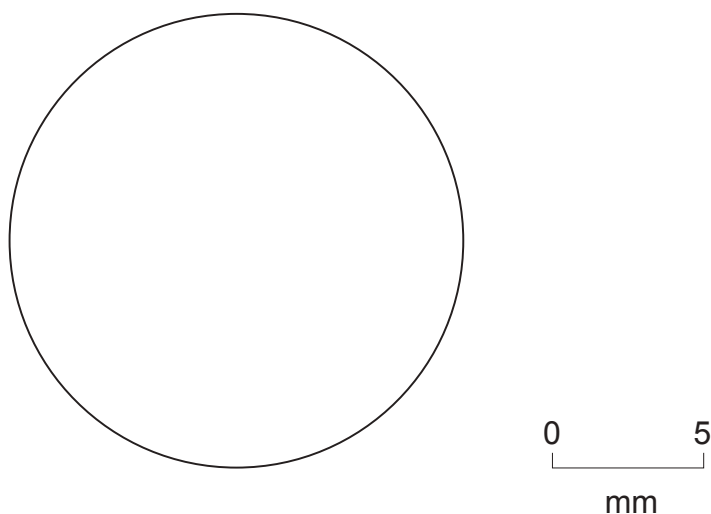


Figure 1a

- (ii) State the name of the crystalline texture shown by **Rock Unit A**. [1]

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- (iii) Explain how the texture of **Rock Unit A** has been formed. [2]

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- (b) **Figure 1b** is a photograph of **Rock Unit B** taken at **Locality 1** on **Map 1**. **Table 1b** shows the result of an analysis of 50 crystal orientations found in **Rock Unit B** at **Locality 1**.



Figure 1b

- (i) Complete **Table 1b** to record the orientations of the crystals circled on **Figure 1b**. [2]
- (ii) Using the data provided in **Table 1b**, complete the rose diagram in **Figure 1c**. [2]

NW – SE		N – S		NE – SW		E – W	
total	30	total	•	total	•	total	•

Table 1b

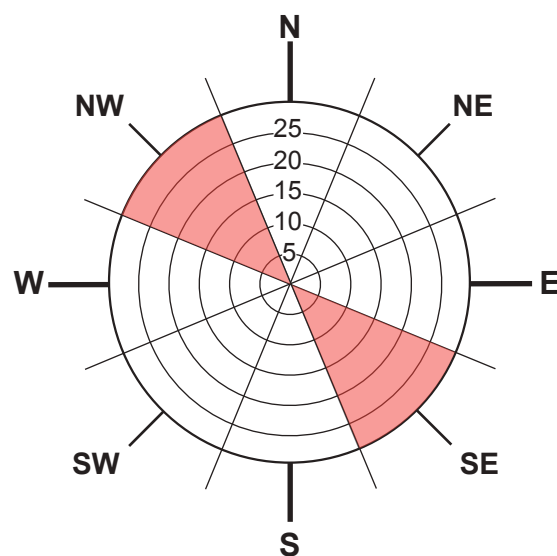
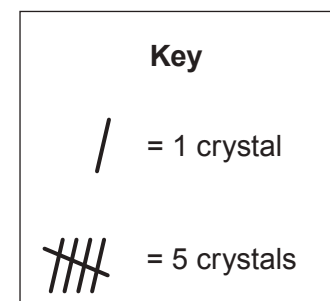


Figure 1c



- (iii) Using evidence from the completed **Figure 1c**, state the most likely direction in which the magma flowed. Give reasons for your answer. [3]

Direction

Reasons

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- (c) Refer to **Figure 1b** only. State the name of the rock making up **Rock Unit B**. Give **two** reasons for your answer. [3]

Name

Reason 1

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Reason 2

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- (d) Refer to **Map 1** only. State **one** difference and **one** similarity between the igneous bodies forming **Rock Unit A** and **Rock Unit B** on **Map 1**. [2]

Difference

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Similarity

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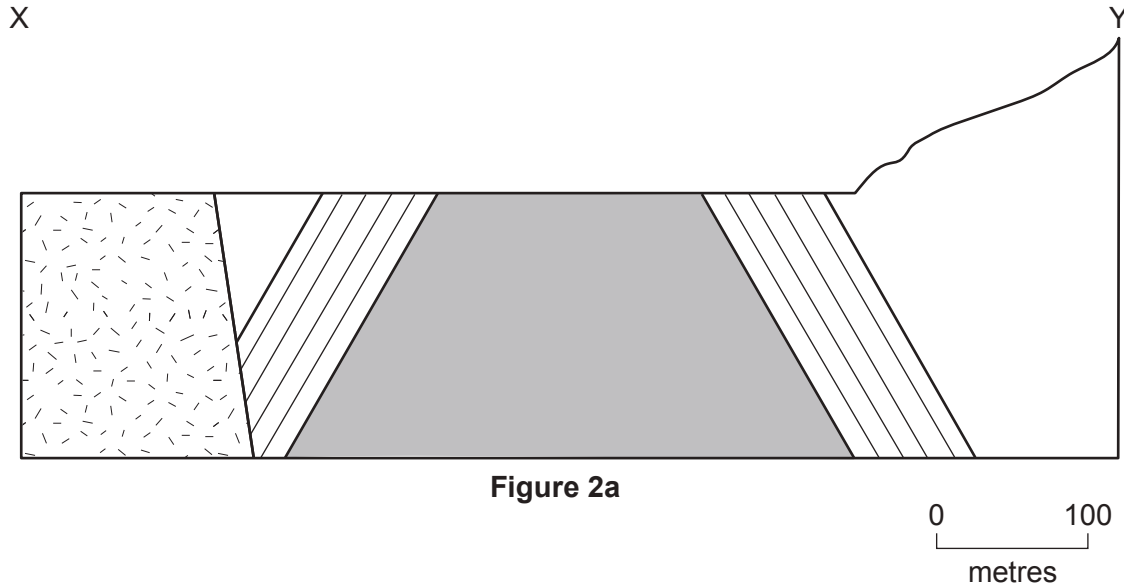
- (e) State the types of igneous bodies forming **Rock Unit A** and **Rock Unit B** on **Map 1**. [2]

A

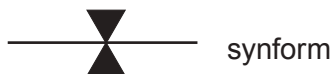
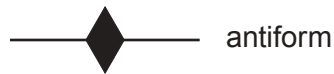
B

2. **Figure 2a** is a partly completed geological cross-section along line **X-Y** on **Map 1**.

- (a) (i) Complete the cross-section **Figure 2a** along the line **X-Y**. Draw the boundaries between the different rock units. Use similar ornament or letters for these, as on **Map 1**. [4]



- (ii) Draw and label the fold axis on **Figure 2a**, using one of the following symbols. [2]



- (iii) **Rock Unit B** was intruded at a temperature of 800 °C. Metamorphism starts at 200 °C. If the rate of temperature change across a metamorphic aureole is 6 °Cm⁻¹, calculate the width of the metamorphic aureole. Show your working. [2]

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- (iv) Mark on **Figure 2a**, the edge of the metamorphic aureole formed by **Rock Unit B**. [1]

- (v) A dip and strike measurement was taken at **Locality 2** on **Map 1**. Using **Map 1** and **Figure 2a**, complete **Table 2a** below. [3]

strike directions	•
dip angle	•
dip direction	•

Table 2a

- (b) **Figure 2b** is a microscope view of **Rock Unit G**, which only contains mineral **P**. It was collected from **Locality 3** on **Map 1**.

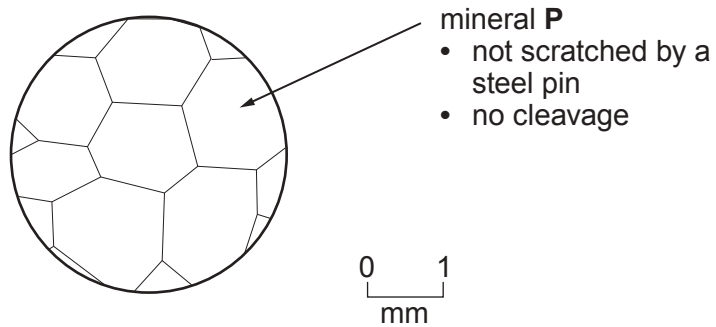


Figure 2b

- (i) Complete **Table 2b** using information in **Figure 2b**. [4]

mean size of crystals (mm)	•
name of mineral P	•
rock group (igneous, sedimentary or metamorphic)	•
name of rock at Locality 3	•

Table 2b

- (ii) With reference to **Map 1** and **Figure 2b**, explain the evidence that suggests that **Rock Unit H** forms a sill rather than a lava flow. [3]

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- (c) For each of the pairs of rocks, or geological features given below, state where possible which is older and give your reasons. [4]

The fault and **Rock Unit B**.

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Rock Unit A and **Rock Unit B**.

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3. **Figure 3a** is a partly completed sedimentary log recorded within **Rock Unit E** at **Locality 4** on **Map 1**. **Table 3** describes the sedimentary characteristics of the rocks within beds 1 - 6 of the sedimentary log.

(a) Complete **Figure 3a** by adding beds 3, 4 and 5 using the descriptions in **Table 3**. [3]

Bed number	Description
6	10 m thick bed of limestone with corals
5	12 m thick bed which has a medium grain size. Figure 3b shows structures found in bed 5
4	8 m thick bed of conglomerate with an erosional base
3	18 m thick bed of black shale
2	12 m thick bed with an erosional base; it has a medium grain size at the base, grading into fine at the top
1	10 m thick bed of black shale

Table 3

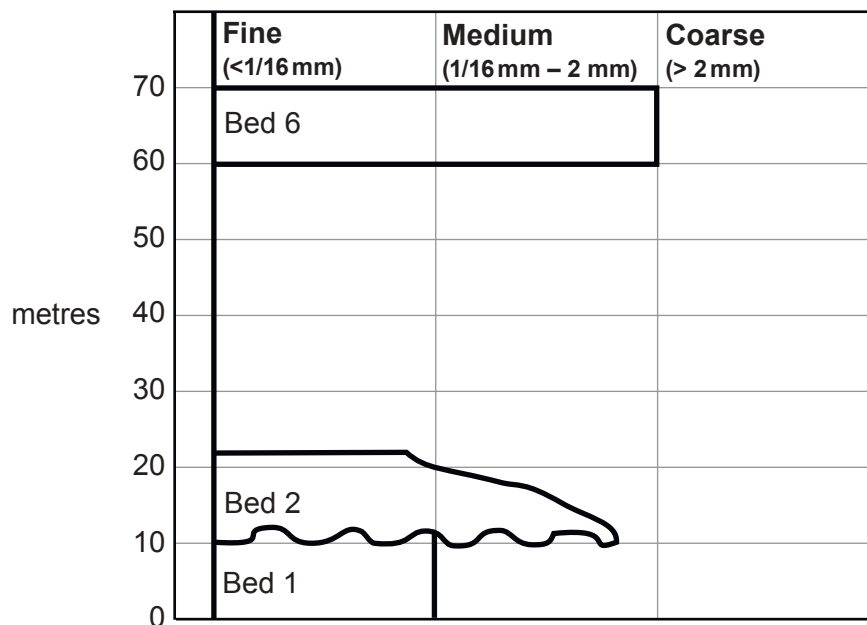


Figure 3a

- (b) **Figure 3b** shows a sedimentary structure found on the upper surface of bed 5.



Figure 3b

State the name of the sedimentary structure in **Figure 3b** and explain how it forms. [3]

Name

Explanation

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- (c) **Figure 3c** is a photograph of a fossil collected from bed 1.



scale $\times \frac{1}{2}$

Figure 3c

- (i) Complete **Figure 3d** below by drawing the fossil shown in **Figure 3c**. Measure and draw the fossil using the scale provided. [3]

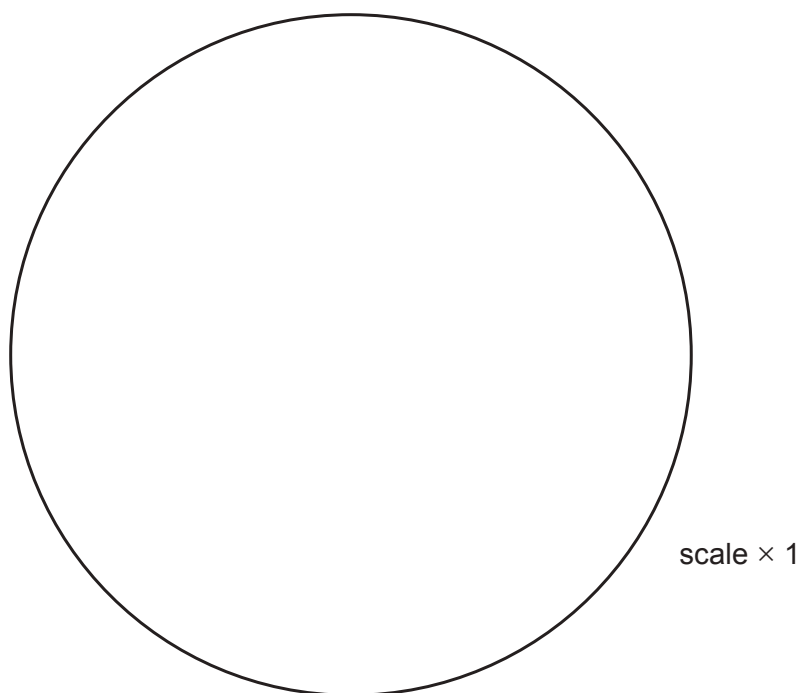


Figure 3d

- (ii) Label a theca on **Figure 3d**. [1]
- (iii) State the name of the fossil group shown in **Figure 3c**. [1]

- (d) Evaluate the statement “**Figures 3a, 3b and 3c and Table 3**, provide evidence of changing energy conditions and changing sedimentary environments”. [6 QER]

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4. **Figure 4a** is a cliff face that cuts through a small fault in the area shown on **Map 1**.

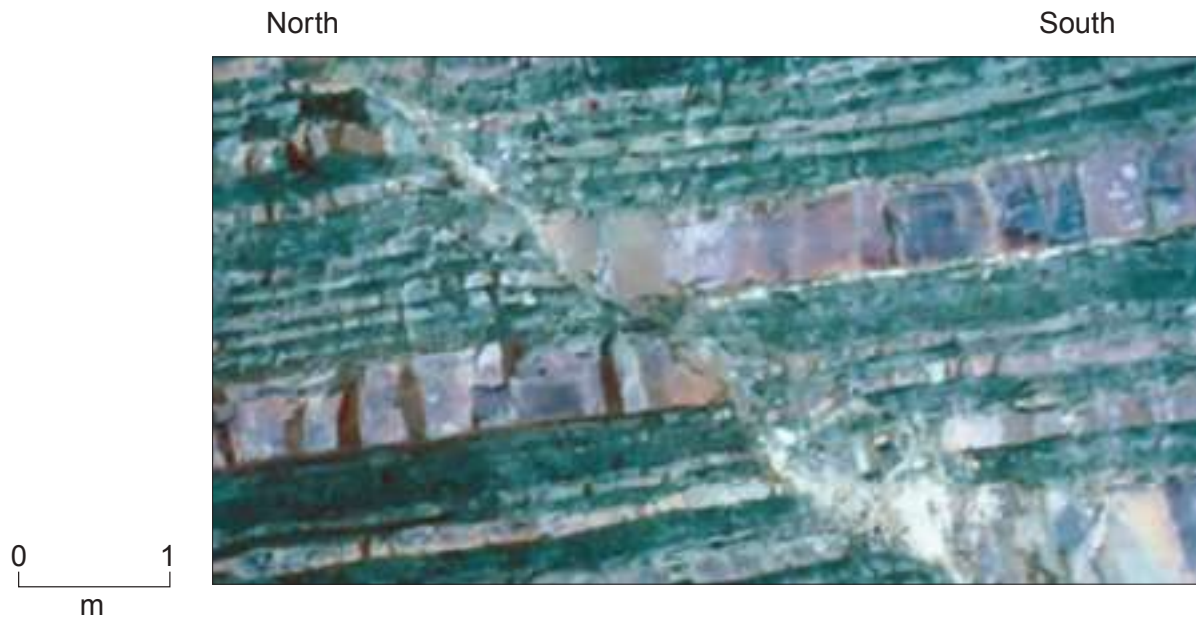


Figure 4a

- (a) Refer to **Figure 4a**.

- (i) In **Figure 4b** draw to scale, the main geological features shown in **Figure 4a**. [5]

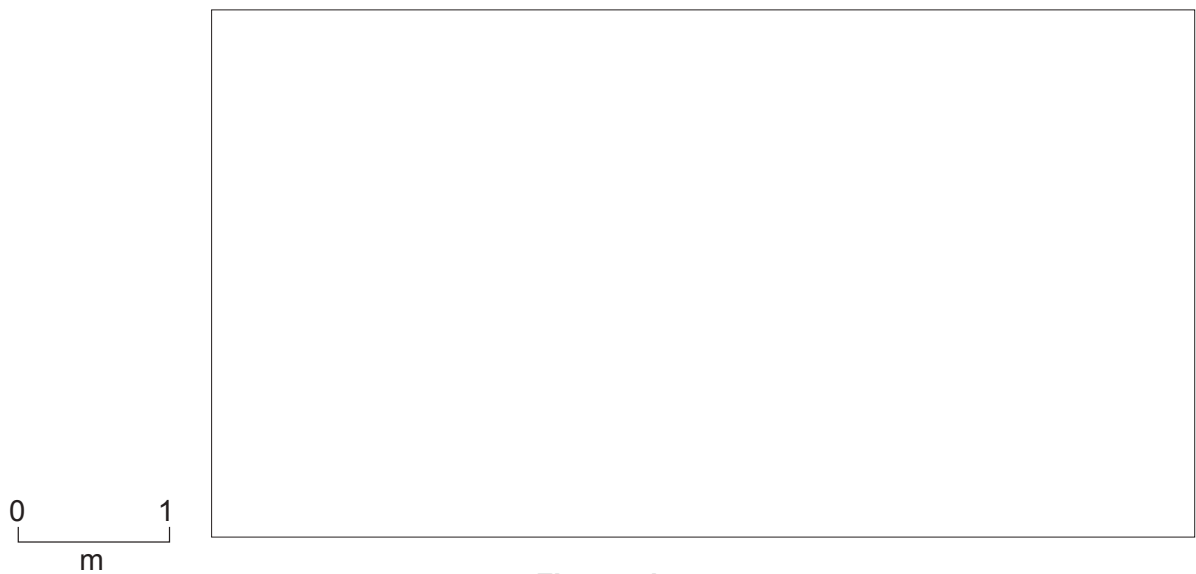


Figure 4b

- (ii) On your drawing in **Figure 4b** label the downthrown side of the fault. [1]
- (iii) Using **Figure 4a** measure the displacement along the fault. [1]
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- (b) State the type of stress that formed the fault in **Figure 4a**. Give reasons for your answer. [3]

Type of stress

Reasons

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5. **Figure 5a** shows mineral **Q** which was collected from **Locality 5** on **Map 1**. Mineral **Q** is the only mineral forming **Rock Unit D**.

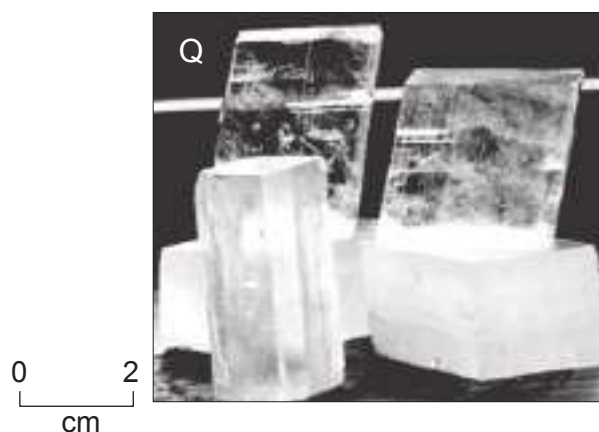


Figure 5a

- (a) (i) Complete **Table 5** which refers to tests **most useful** for identifying mineral **Q** in **Figure 5a**. [5]

You may wish to refer to the Data Sheet.

Test name	Description of test	Result of test
colour	observe mineral in natural light	white to colourless
•	•	effervesces giving off CO ₂
•	Look for regular planes of weakness	•
hardness	•	hardness is between 3.5 and 2.5 on Mohs hardness scale

Table 5

(ii) State the name of the rock forming **Rock Unit D**.

[1]

Examiner
only

(b) Using evidence from **Map 1** and your identification of **Rock Unit D**, evaluate the suitability of **Locality 5** as a possible site of a reservoir.

[4]

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END OF PAPER

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Acknowledgement

Figure 4a <http://www.pitt.edu/~cejones/Geolimages/7structures>