

Surname	Centre Number	Candidate Number
Other Names		0



GCSE – NEW

C480U20-1



S19-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	

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]

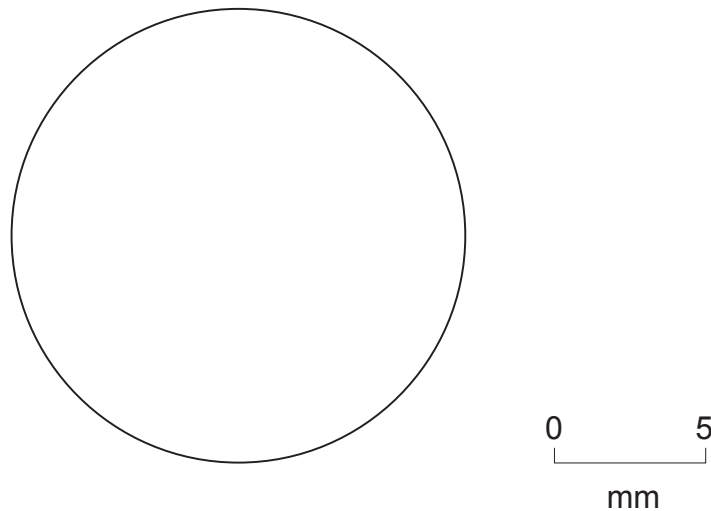


Figure 1a

- (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

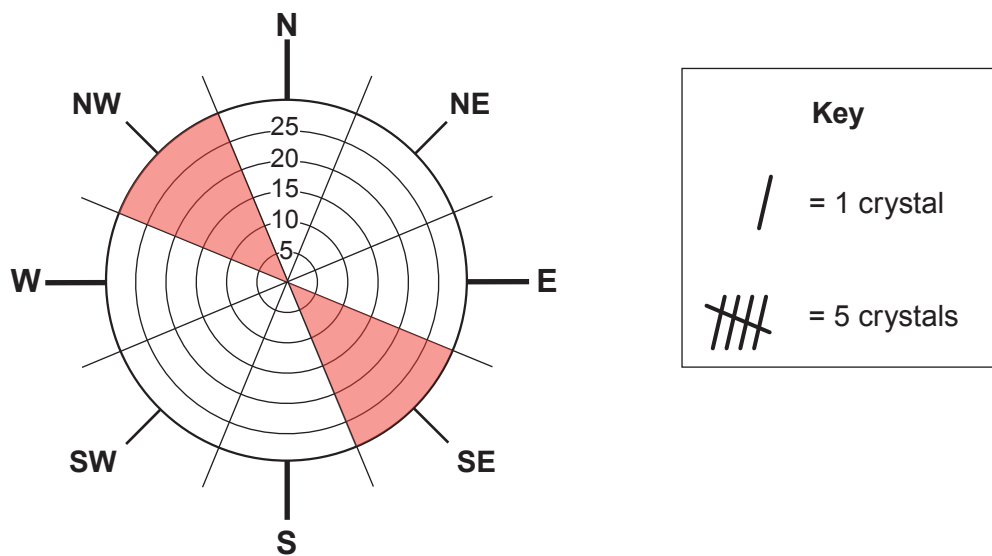


Figure 1c

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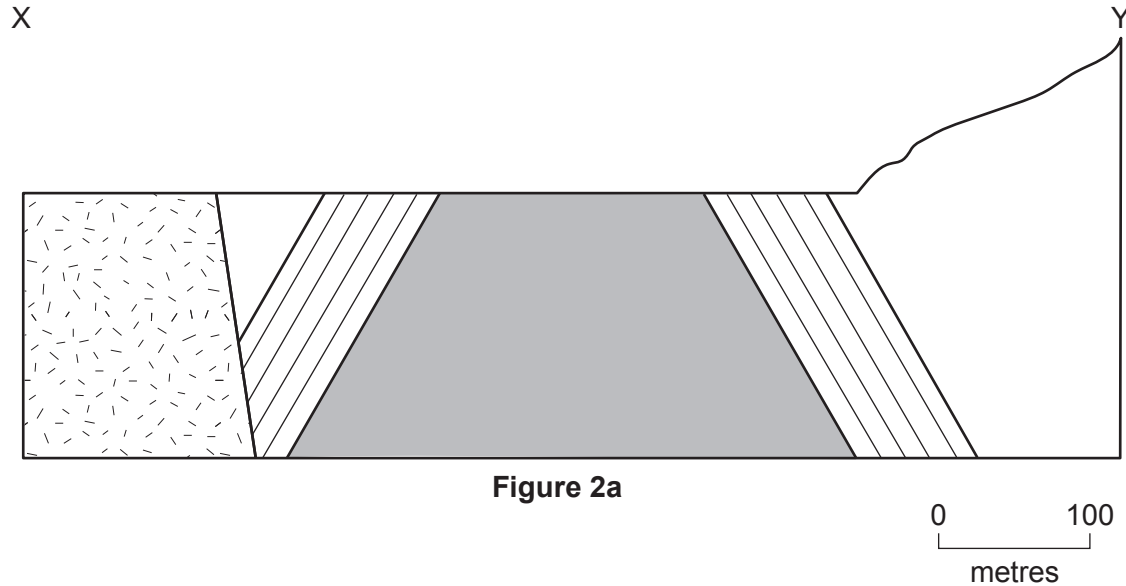
(e) State the types of igneous bodies forming **Rock Unit A** and **Rock Unit B** on **Map 1**. [2]

A

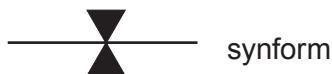
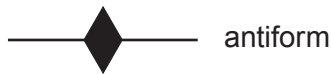
B

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]

..... m

- (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**.

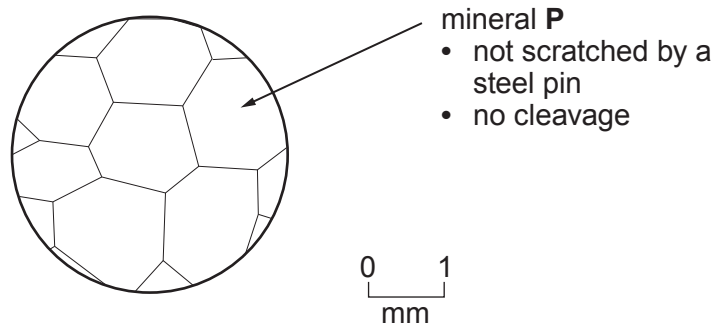


Figure 2b

- (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

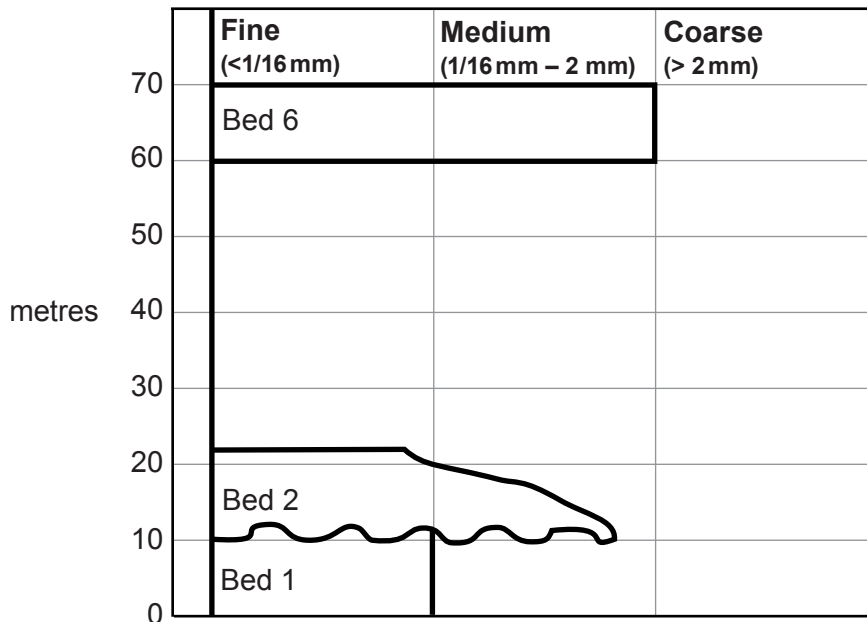


Figure 3a

(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]

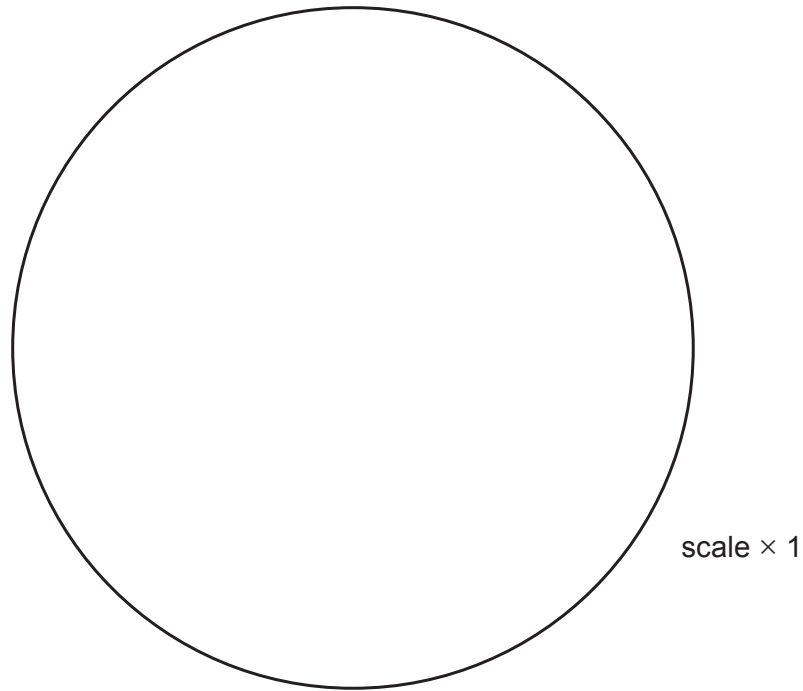


Figure 3d

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

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- (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**.

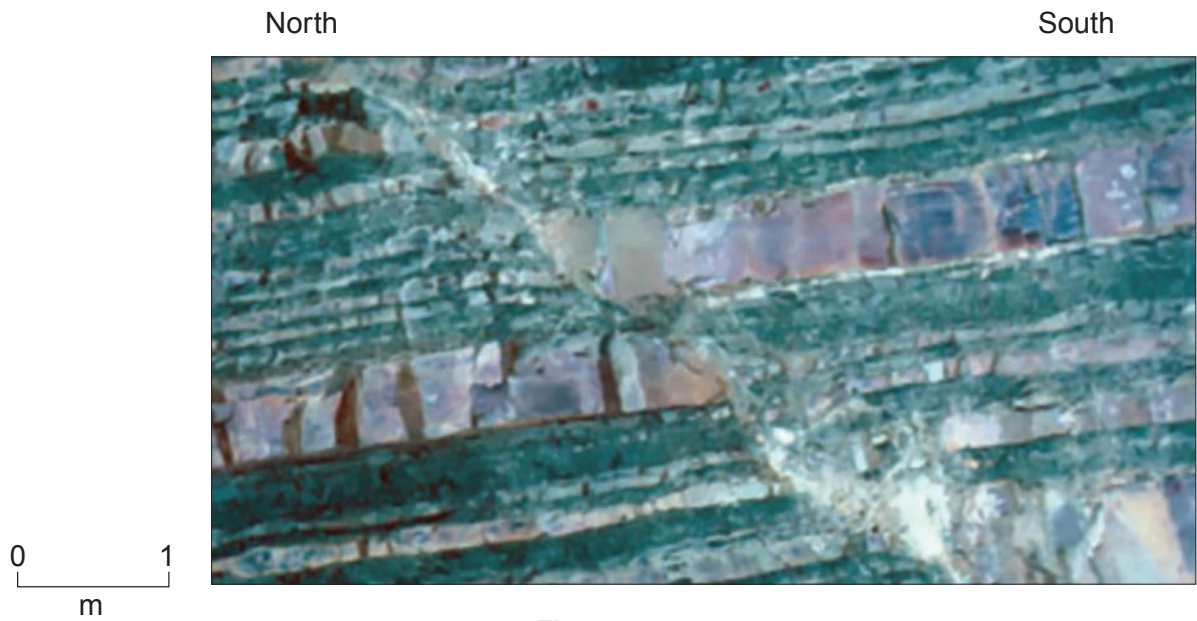


Figure 4a

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

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

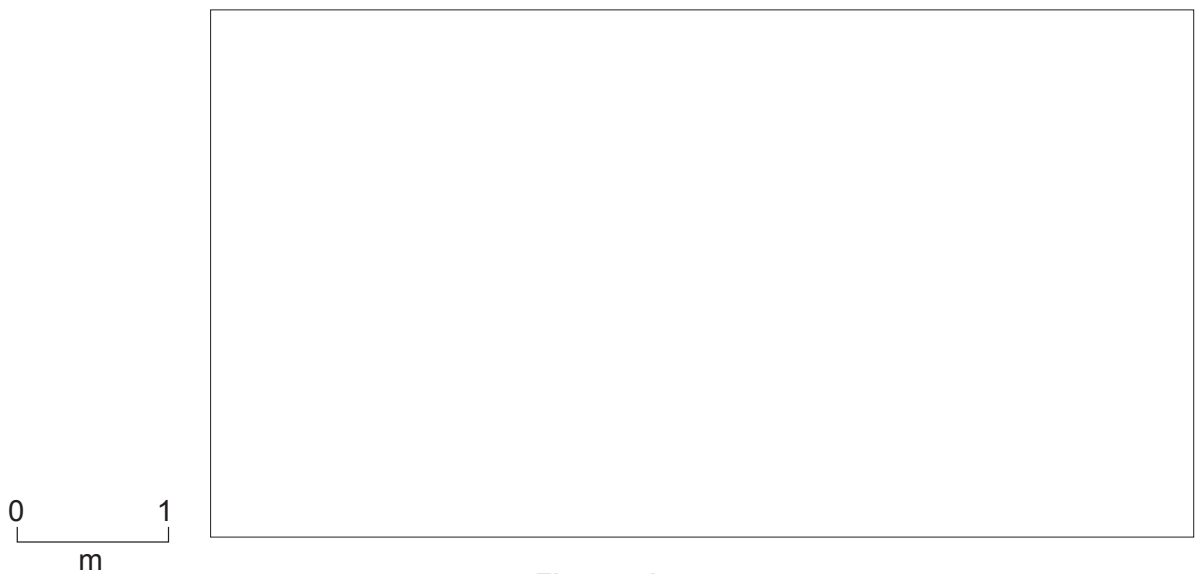


Figure 4b

(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]

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only

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**.

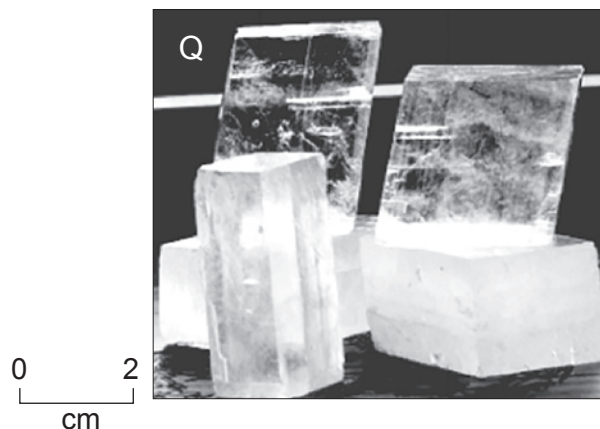


Figure 5a

- (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]

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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>