

Surname	Centre Number	Candidate Number
First name(s)		0



**GCSE**

C480U20-1



**MONDAY, 9 NOVEMBER 2020 – MORNING**

**GEOLOGY – Component 2**  
**Investigative Geology**

1 hour 30 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	12	
2.	7	
3.	9	
4.	21	
5.	8	
6.	13	
7.	10	
<b>Total</b>	<b>80</b>	

**ADDITIONAL MATERIALS**

In addition to this examination paper you will need Map 1, the Data Sheet, a calculator, a protractor and a ruler.

**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 **4**.

Answer all questions.

1. **Figure 1a** is a photograph of sedimentary rocks taken at **Locality 1** on **Map 1**, facing east.

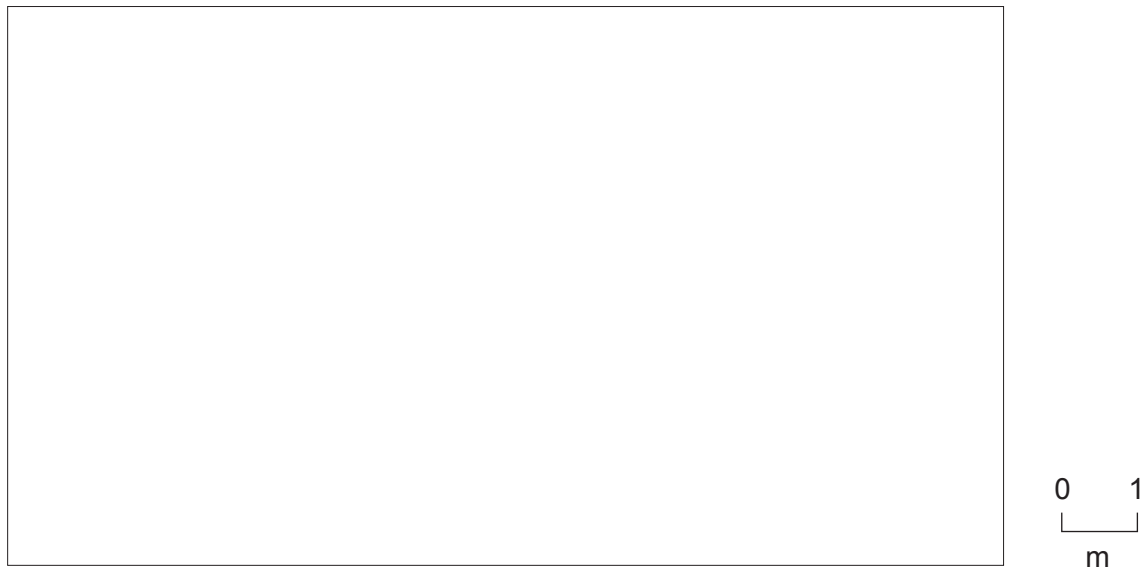


**Figure 1a**

(a) Refer to **Figure 1a**.

- (i) State the six figure grid reference of **Locality 1** on **Map 1**. [1]

- (ii) In **Figure 1b** draw to scale, the main geological features shown in **Figure 1a**. [4]



**Figure 1b**

(iii) State the angle of dip of **Rock Unit A** in **box P** on **Figure 1a**. [1]

..... °

(iv) Name the geological feature forming the boundary between **Rock Unit A** and **Rock Unit B** in **Figure 1a**. [1]

.....

(b) (i) Describe how the measurements were made at this locality to record the dip and strike of the beds. You may wish to use an annotated diagram(s). [3]

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.....  
.....  
.....

(ii) State **two** safety measures that should be taken when undertaking fieldwork at **Locality 1**. [2]

Safety measure 1 .....

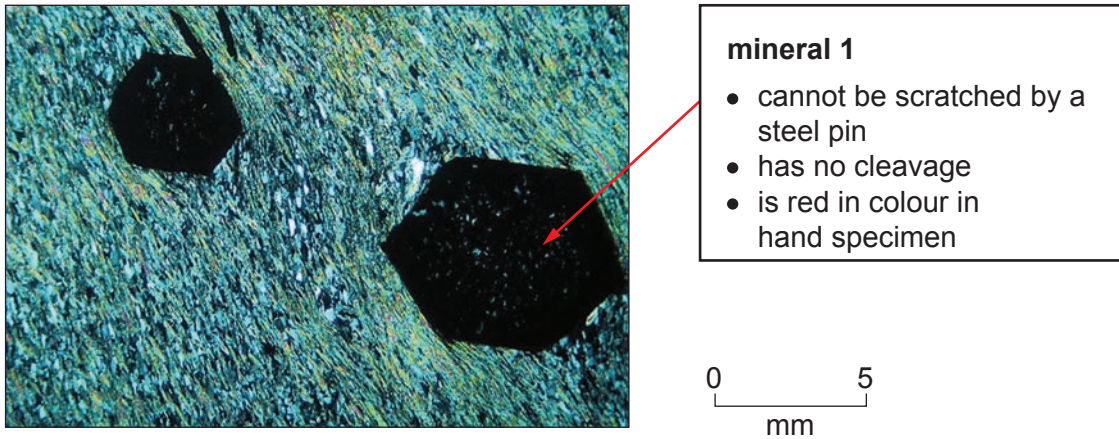
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Safety measure 2 .....

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2. **Figure 2** shows a microscope view of **Rock Unit F** at **Locality 2** on **Map 1**.



**Figure 2**

(a) Complete **Table 1** using information in **Figure 2**.

[4]

Name of <b>mineral 1</b>	•
Name of crystalline texture	•
Rock group (igneous, sedimentary or metamorphic)	•
Name of <b>Rock Unit F</b>	•

**Table 1**

(b) Refer to **Figure 2**. Explain how **Rock Unit F** formed.

[3]

.....

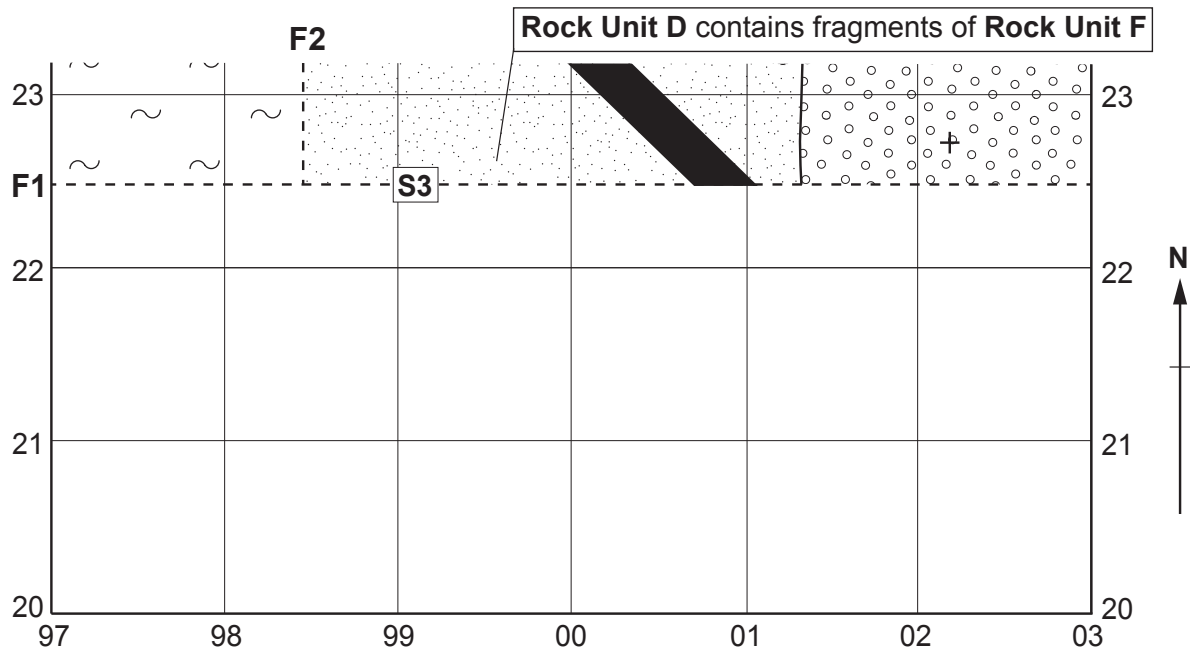
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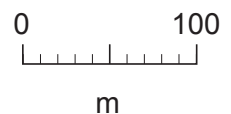
3. Map 2 shows Map 1 south of grid line 23.



Key

	<b>Rock Unit B</b>
	<b>Rock Unit C</b>
	<b>Rock Unit D</b>
	<b>Rock Unit F</b>

Fault  
 Horizontal bed



Map 2

Refer to Map 2.

(a) Using the information below, plot **Rock Unit B**, **Rock Unit C** and **Fault F2**, to the south of **Fault F1**. [4]

- **Fault F1** has displaced the base of **Rock Unit B**, horizontally, 100m to the east.
- **Fault F1** is older than **Fault F2**.
- **Rock Unit C** is younger than **Fault F1** and older than **Rock Unit B**.

(b) State which side of **Fault F2** has been upthrown. Explain your answer. [3]

Upthrown side .....

Explanation .....

.....

.....

.....

Examiner  
only

(c) **Rock Unit C** forms a dyke. Give **two** pieces of evidence to support this statement. [2]

1. ....

2. ....

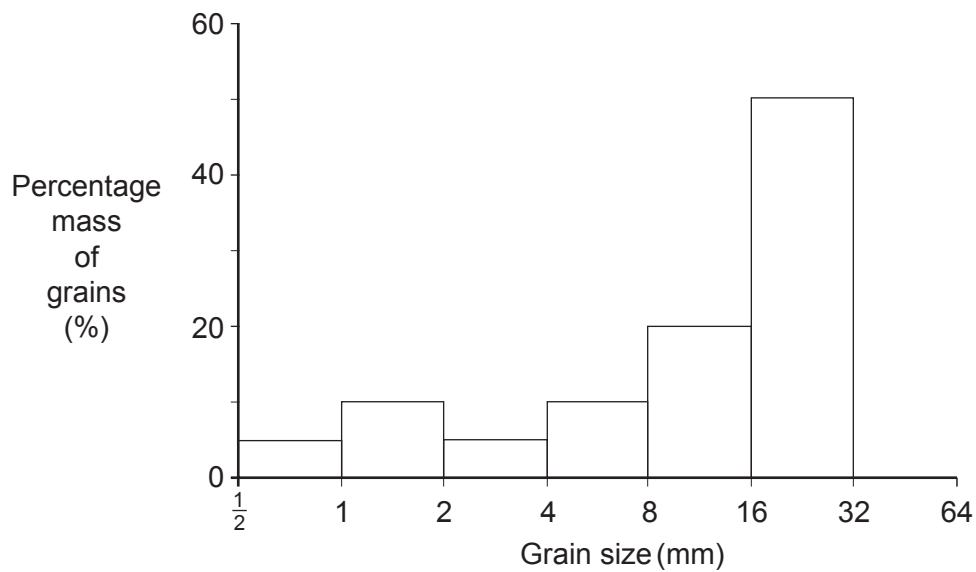
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4. **Figure 4a** is a photograph of **Rock Unit D** on **Map 1**. **Figure 4b** shows the grain size distribution of **Rock Unit D**.



**Figure 4a**



**Figure 4b**

- (a) (i) Refer to **Figure 4a** and **Figure 4b**. Describe the texture of **Rock Unit D**. [3]

.....

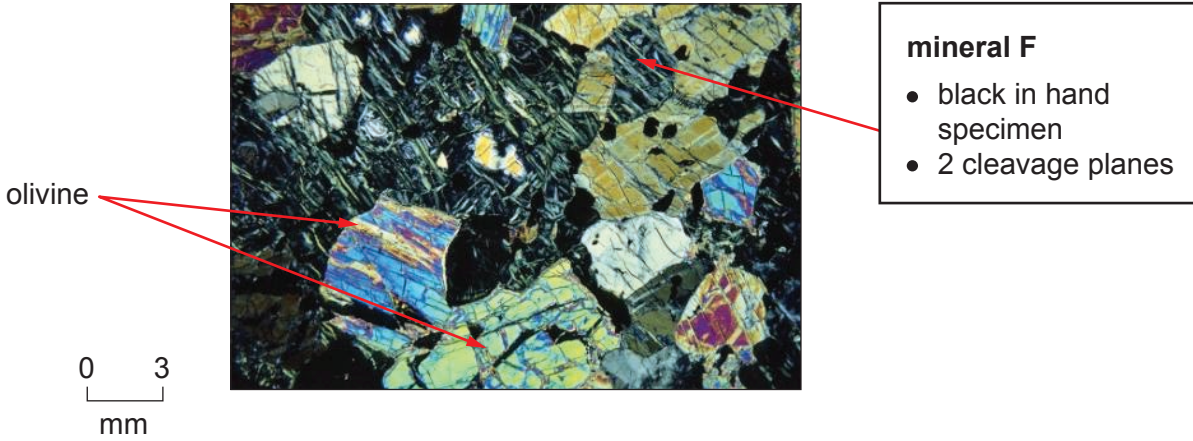
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- (ii) State the name of **Rock Unit D**. [1]

.....

(b) **Figure 4c** is a microscope view of a **fragment** of igneous rock collected from **Rock Unit D** at **Locality 3** on **Map 1**. It is composed of only two minerals.



**Figure 4c**

(i) Using the Data Sheet, identify **mineral F** in **Figure 4c**. [1]

.....

(ii) Describe the texture of the igneous rock shown in **Figure 4c**. [3]

.....

.....

.....

.....

.....

(iii) State the name of the igneous rock in **Figure 4c**. [1]

.....

(c) **Table 2** shows the mineralogy and crystal size in **Rock Unit G** collected from **Locality 4** on **Map 1**.

Mineral	Percentage of minerals in <b>Rock Unit G</b>	Mean crystal size (mm)
<b>mineral F</b>	65	0.5
feldspar	30	0.5
olivine	5	0.6

**Table 2**

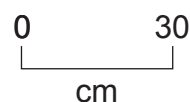
(i) Refer to **Table 2**. State the name of **Rock Unit G**. Give **two** reasons for your answer. [3]

Name .....

1. ....

2. ....

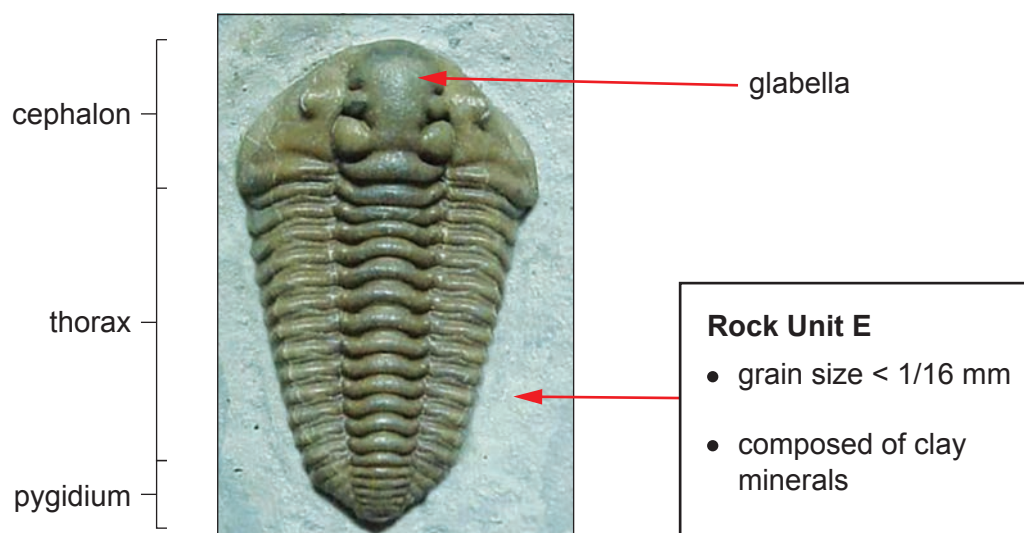
**Figure 4d** is a photograph of igneous structures taken at **Locality 4** on **Map 1**.



**Figure 4d**



5. **Figure 5a** is a photograph of a trilobite collected from **Rock Unit E**.

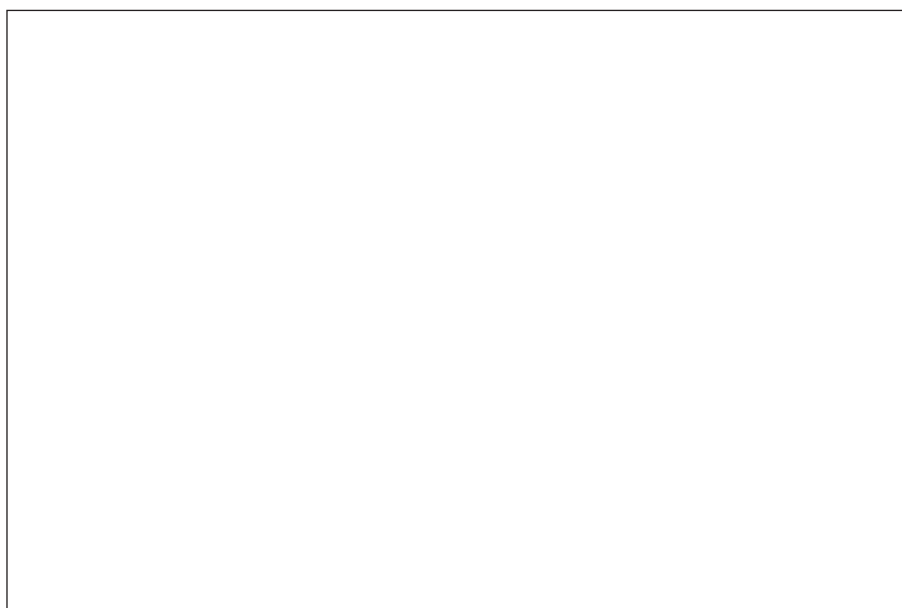


**Figure 5a**

Scale × 1

(a) Complete **Figure 5b** by drawing the cephalon of the trilobite shown in **Figure 5a**. Measure and draw the cephalon using the scale provided.

[3]



**Figure 5b**

Scale × 2

(b) **Figure 5c** is a key used to classify trilobites.

1.	Eyes .....	Go to 2
	No eyes .....	Go to 3
2.	Eyes on cephalon .....	Go to 4
	Eyes on stalks .....	<b>Asaphus</b>
3.	Glabella wider than pygidium .....	<b>Trinucleus</b>
	Glabella the same size as pygidium .....	<b>Agnostus</b>
4.	Spines on thorax .....	<b>Paradoxides</b>
	No spines on thorax .....	<b>Calymene</b>

**Figure 5c**

(i) Using **Figure 5c**, name the trilobite shown in **Figure 5a**. [1]

.....

(ii) Refer to **Figure 5a**.  
Evaluate the statement '**Rock Unit E** was deposited in a low energy, river environment'. [4]

.....  
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6. **Figure 6a** is a field sketch showing the true dip of folded beds. A student took ten dip measurements along the transect line from **A** to **B** and constructed the cross-section in **Figure 6b** to show the folding of one bed.

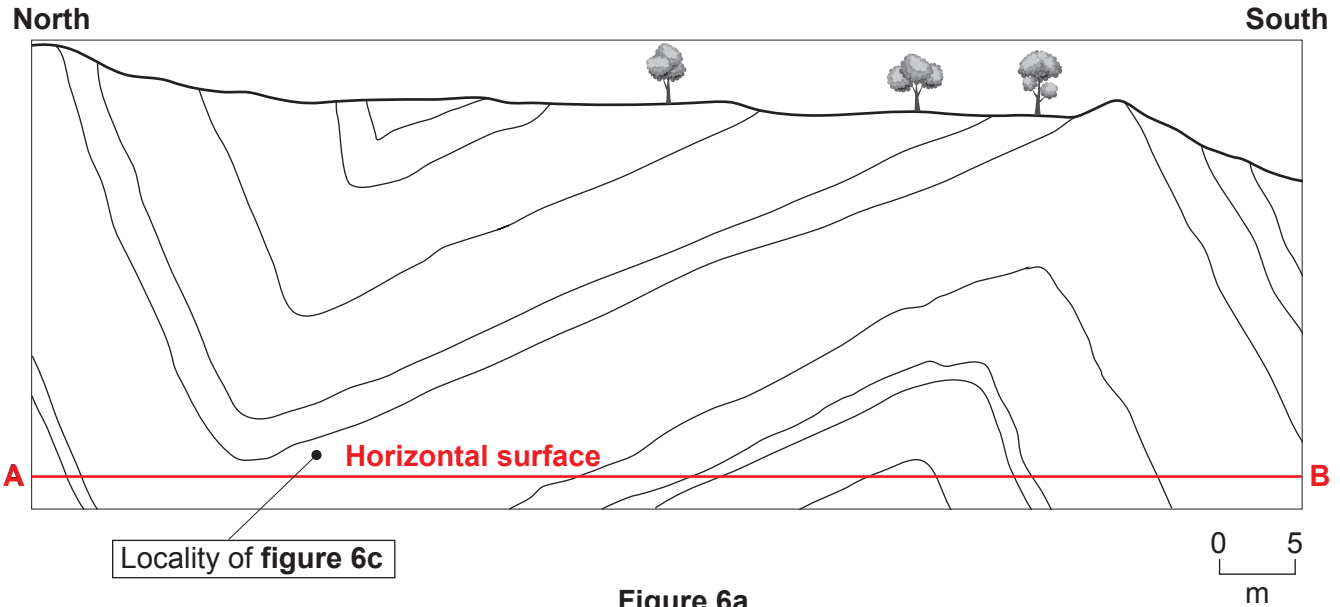


Figure 6a

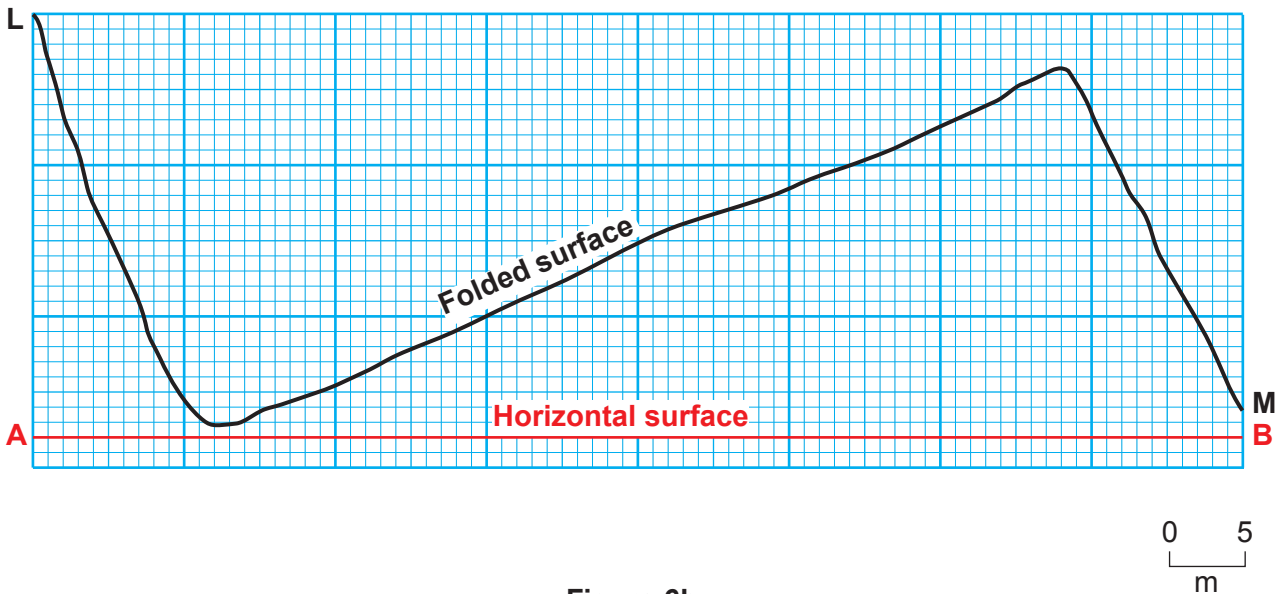


Figure 6b

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

(i) Draw and label the fold axes of two folds on **Figure 6a**, using the following symbols. [2]



(ii) State the strike orientation of the axial plane traces of the two folds. [1]

(iii) Using the following formula, calculate the percentage of crustal shortening between **A** and **B** on **Figure 6b**. Show your working. [2]

$$\text{Percentage of crustal shortening} = \frac{\text{length of the folded surface L to M} - \text{length of the horizontal surface A to B}}{\text{length of the folded surface L to M}} \times 100\%$$

Percentage of crustal shortening .....%

(b) A student used systematic sampling to collect the dip measurements at 10 metre intervals, along the transect line from **A** to **B**. State **one** advantage and **one** disadvantage of using systematic sampling to collect the data along the transect. [2]

Advantage .....

Disadvantage.....

(c) **Figure 6c** is a sedimentary structure found on **Figure 6a**.



**Figure 6c**

Refer to **Figure 6c**.

(i) Draw an arrow in the box in **Figure 6c** to show the current direction at the time of deposition. [1]

(ii) State the name of the sedimentary structure and explain how it formed. [3]

Name .....

Explanation .....

(iii) Evaluate the statement '*the rocks in Figure 6a have been overturned*'. [2]

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.....

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7. **Table 3** shows the results from an investigation into the porosity of four rocks from **Map 1**. The method is outlined below and the results have been recorded in **Table 3**.

Method

- The rocks were initially weighed and then submerged in water.
- At 10 minute intervals the rocks were dried to remove excess water and then reweighed.
- Initial mass (time 0) = dry mass prior to submersion

Rock Unit	Mass (g)						Total change in mass after 50 mins
	Initial mass	10 mins	20 mins	30 mins	40 mins	50 mins	
<b>Rock Unit B - oolitic limestone</b>	95.7	98.3	100.5	102.0	104.2	107.5	.....
<b>Rock Unit E</b>	78.6	79.3	80.0	80.5	81.5	81.5	2.9
<b>Rock Unit D</b>	62.4	62.6	62.8	62.9	63.4	63.4	1
<b>Rock Unit C</b>	110.5	110.5	110.5	110.5	110.5	110.5	0

**Table 3**

- (a) Refer to **Table 3**.
- (i) Complete **Table 3** by showing the change in mass of the sample from **Rock Unit B** after 50 minutes. [1]
- (ii) On **Figure 7** opposite, draw a line to show the increase in mass of **Rock Unit B**. Data for **Rock Unit C**, **Rock Unit D** and **Rock Unit E** have already been plotted. [2]

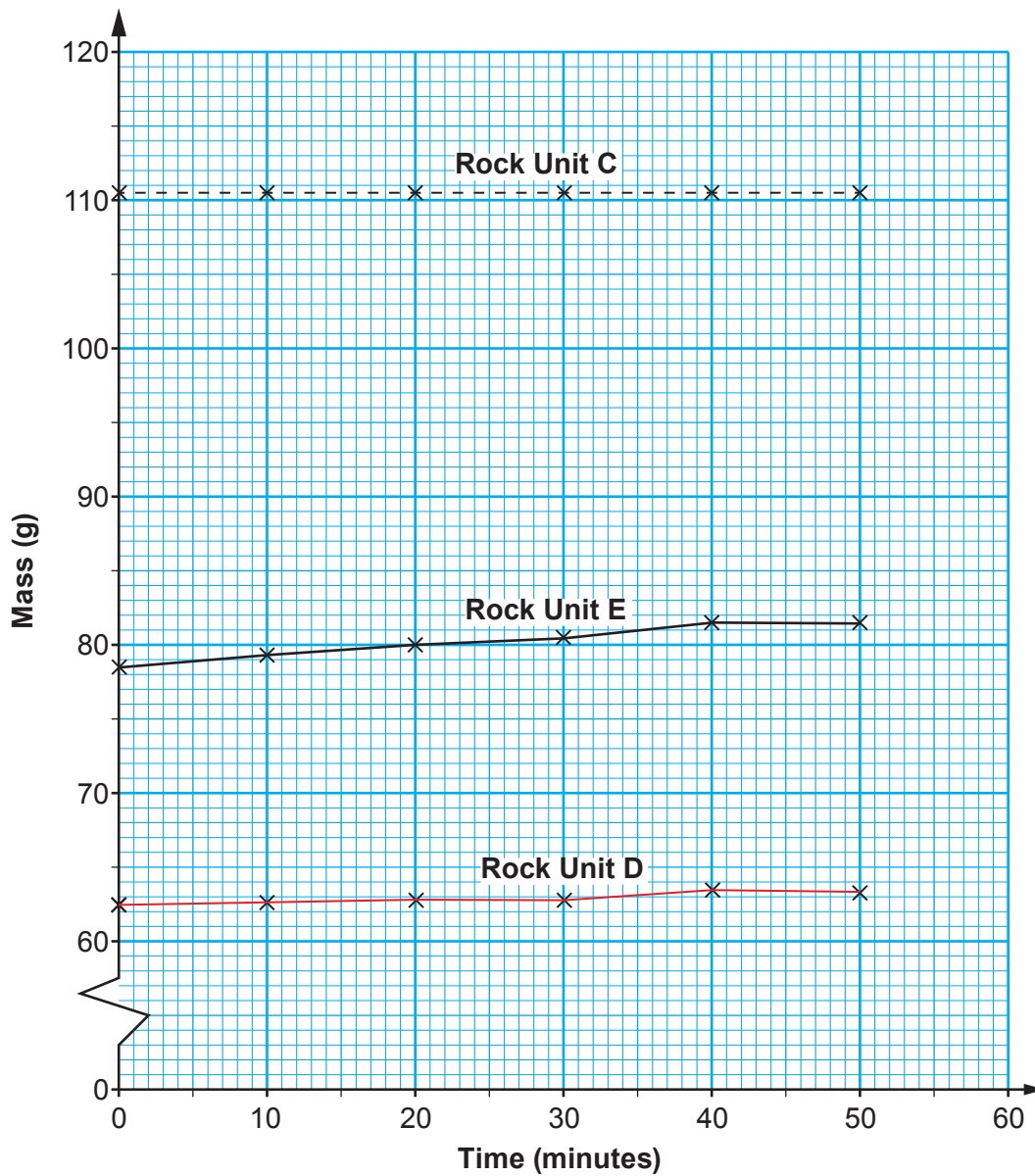


Figure 7

(iii) Complete **Table 4** to show the porosity of **Rock Unit E**.

[1]

Use the following formula:

$$\text{Porosity} = \frac{\text{total change in mass (g)}}{\text{initial mass (g)}} \times 100$$

Rock Unit	Porosity (%)
<b>Rock Unit B</b> - oolitic limestone	12.3
<b>Rock Unit E</b>	.....
<b>Rock Unit D</b>	1.6
<b>Rock Unit C</b>	0

Table 4

- (b) Three sites, **S1**, **S2** and **S3** have been identified on **Map 1** as potential sources of spring water. Using **Map 1**, **Table 4** and your geological knowledge, evaluate the suitability of each site. [6]

Site 1 .....

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Site 2 .....

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Site 3 .....

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**END OF PAPER**

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*Acknowledgements*

*Figure 4c* [https://www.earthscienceeducation.com/virtual\\_rock\\_kit/](https://www.earthscienceeducation.com/virtual_rock_kit/)

*Figure 5a* <https://alchetron.com/>