

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	
Total	80	

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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]

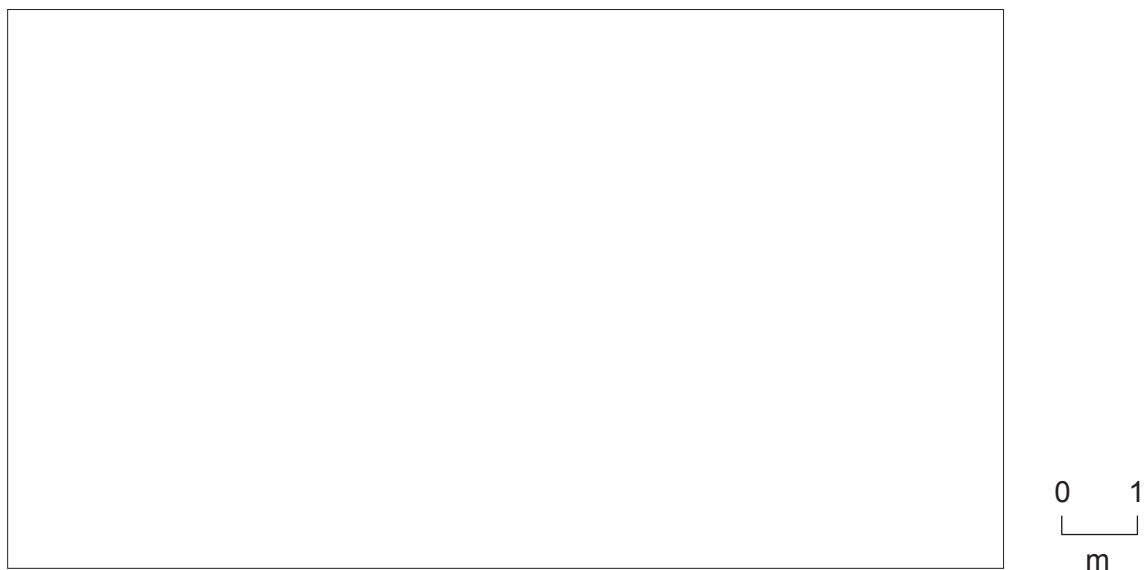


Figure 1b

(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]

.....

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

[2]

Safety measure 1

.....

Safety measure 2

.....

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

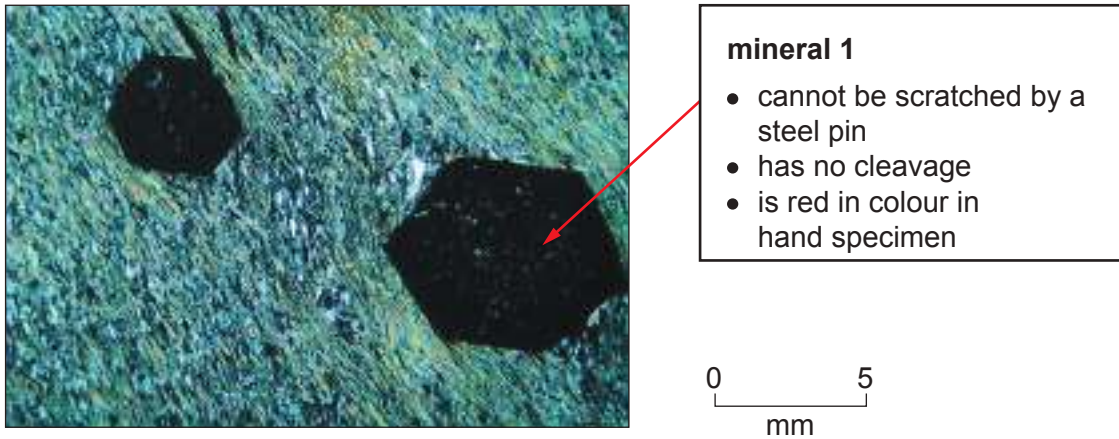


Figure 2

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

[4]

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

Table 1

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

[3]

.....

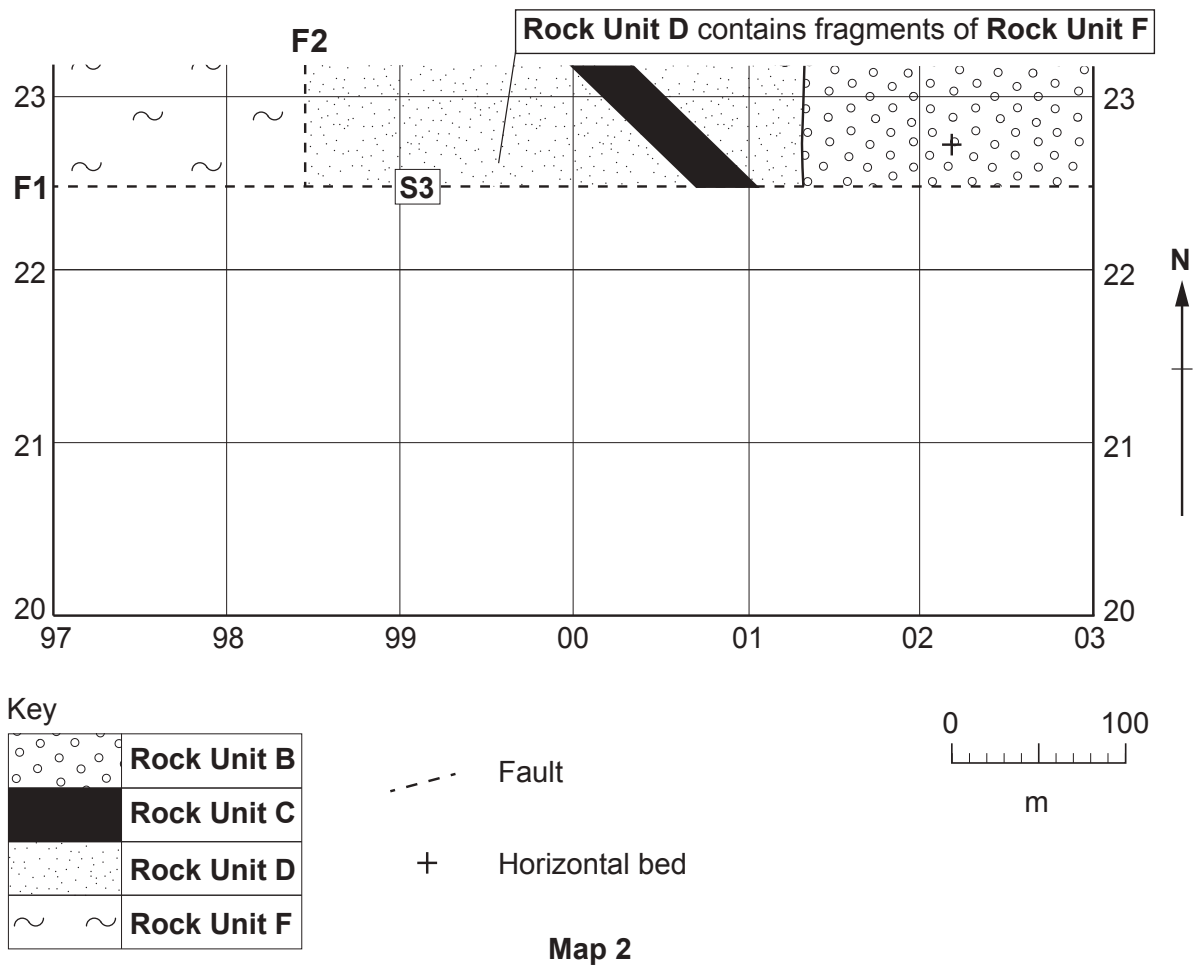
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3. **Map 2** shows **Map 1** south of grid line 23.



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

.....

.....

.....

(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

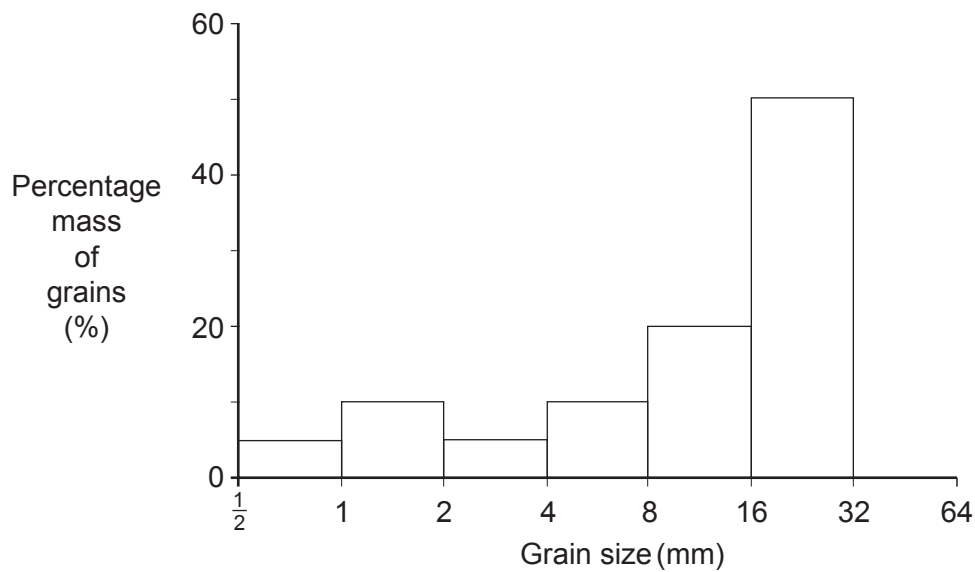


Figure 4b

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

.....

.....

.....

- (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.

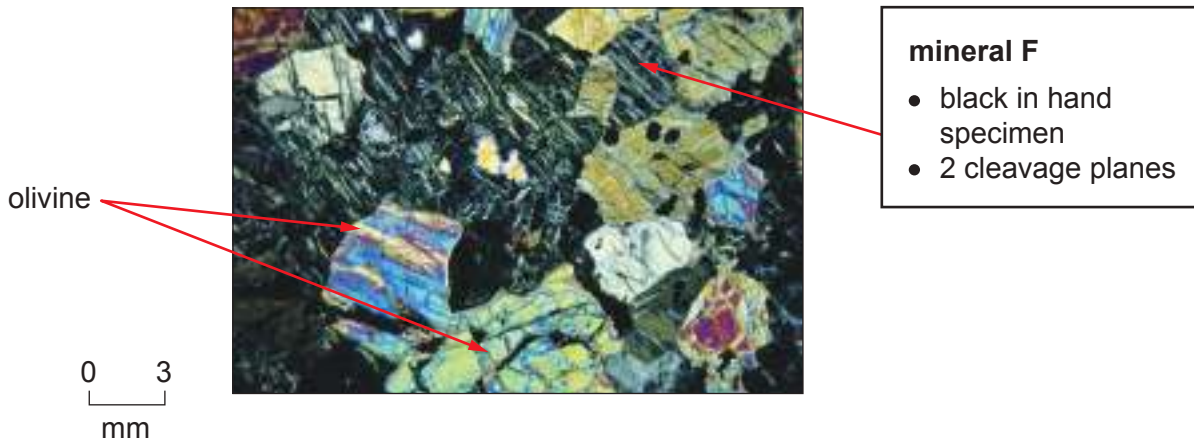


Figure 4c

- (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 Rock Unit G	Mean crystal size (mm)
mineral F	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**.



0 30
cm

Figure 4d

- Explanation

- [6 QER]

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

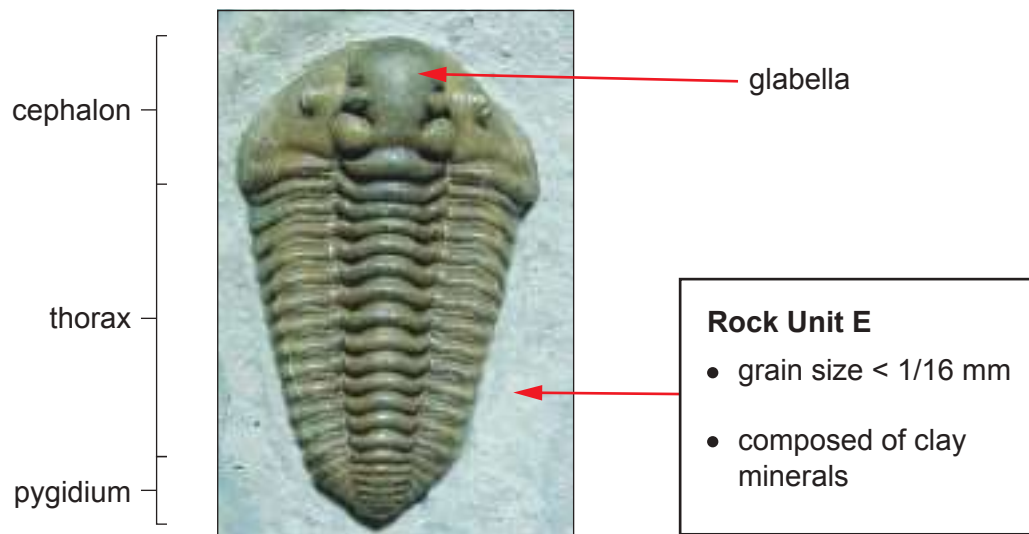


Figure 5a

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]

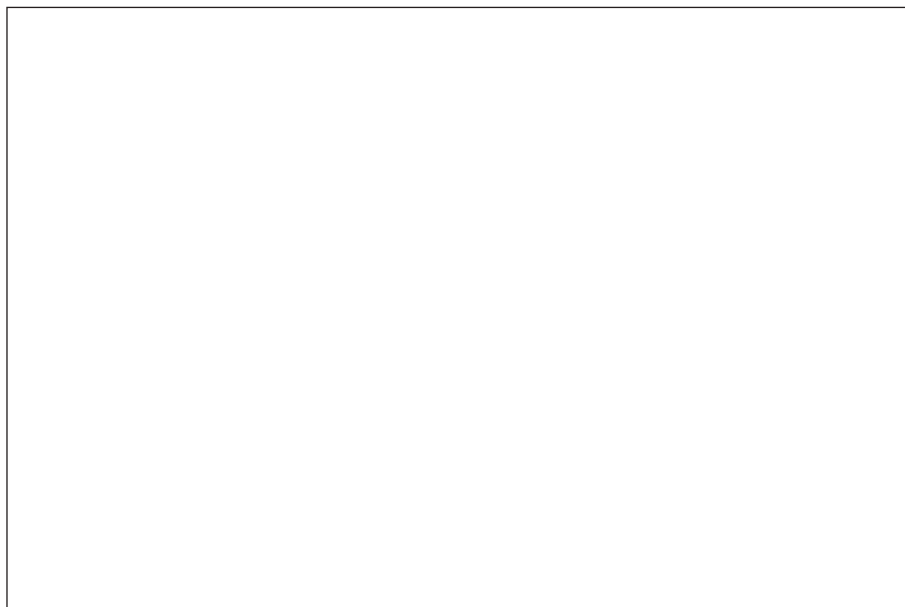


Figure 5b

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	<i>Asaphus</i>
3.	Glabella wider than pygidium	<i>Trinucleus</i>
	Glabella the same size as pygidium	<i>Agnostus</i>
4.	Spines on thorax	<i>Paradoxides</i>
	No spines on thorax	<i>Calymene</i>

Figure 5c

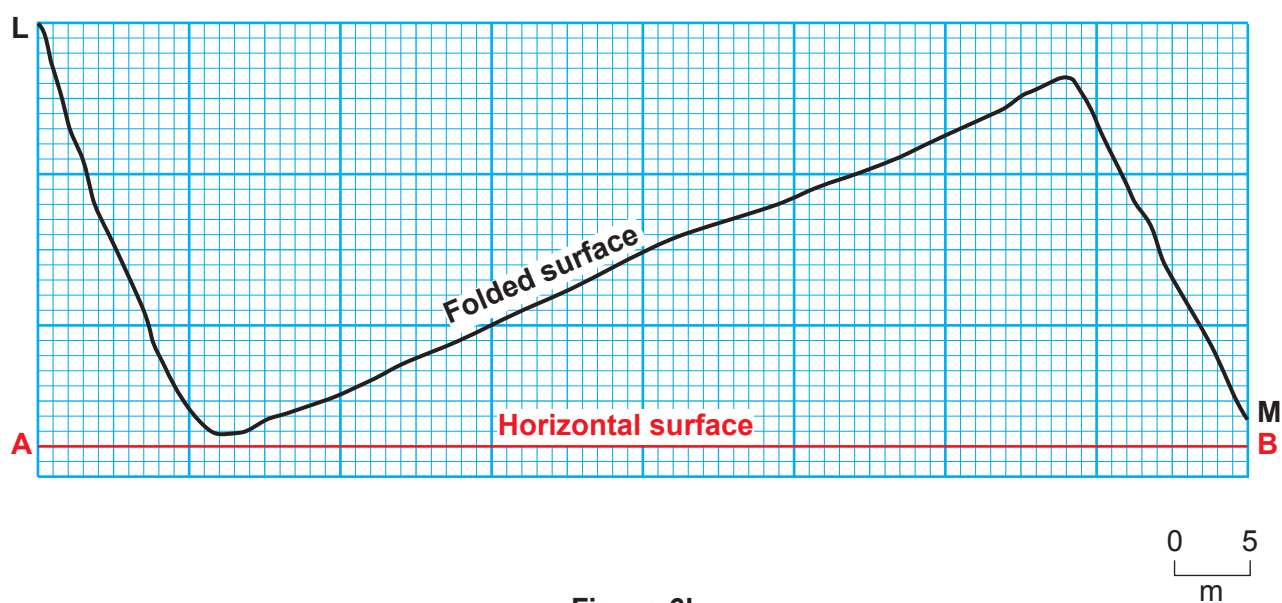
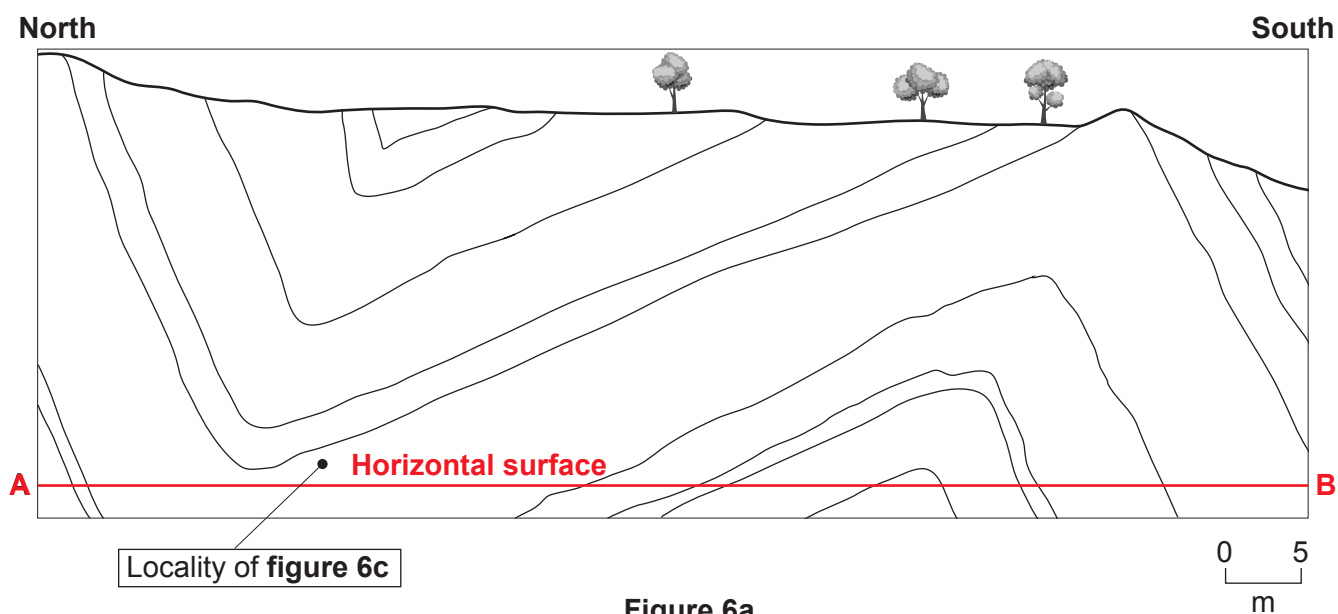
(i) Using **Figure 5c**, name the trilobite shown in **Figure 5a**.

[1]

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

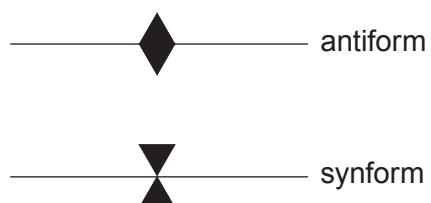
[4]

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.



(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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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	
Rock Unit B - oolitic limestone	95.7	98.3	100.5	102.0	104.2	107.5	
Rock Unit E	78.6	79.3	80.0	80.5	81.5	81.5	2.9
Rock Unit D	62.4	62.6	62.8	62.9	63.4	63.4	1
Rock Unit C	110.5	110.5	110.5	110.5	110.5	110.5	0

Table 3

(a) Refer to **Table 3**.

- Complete **Table 3** by showing the change in mass of the sample from **Rock Unit B** after 50 minutes. [1]
- 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]

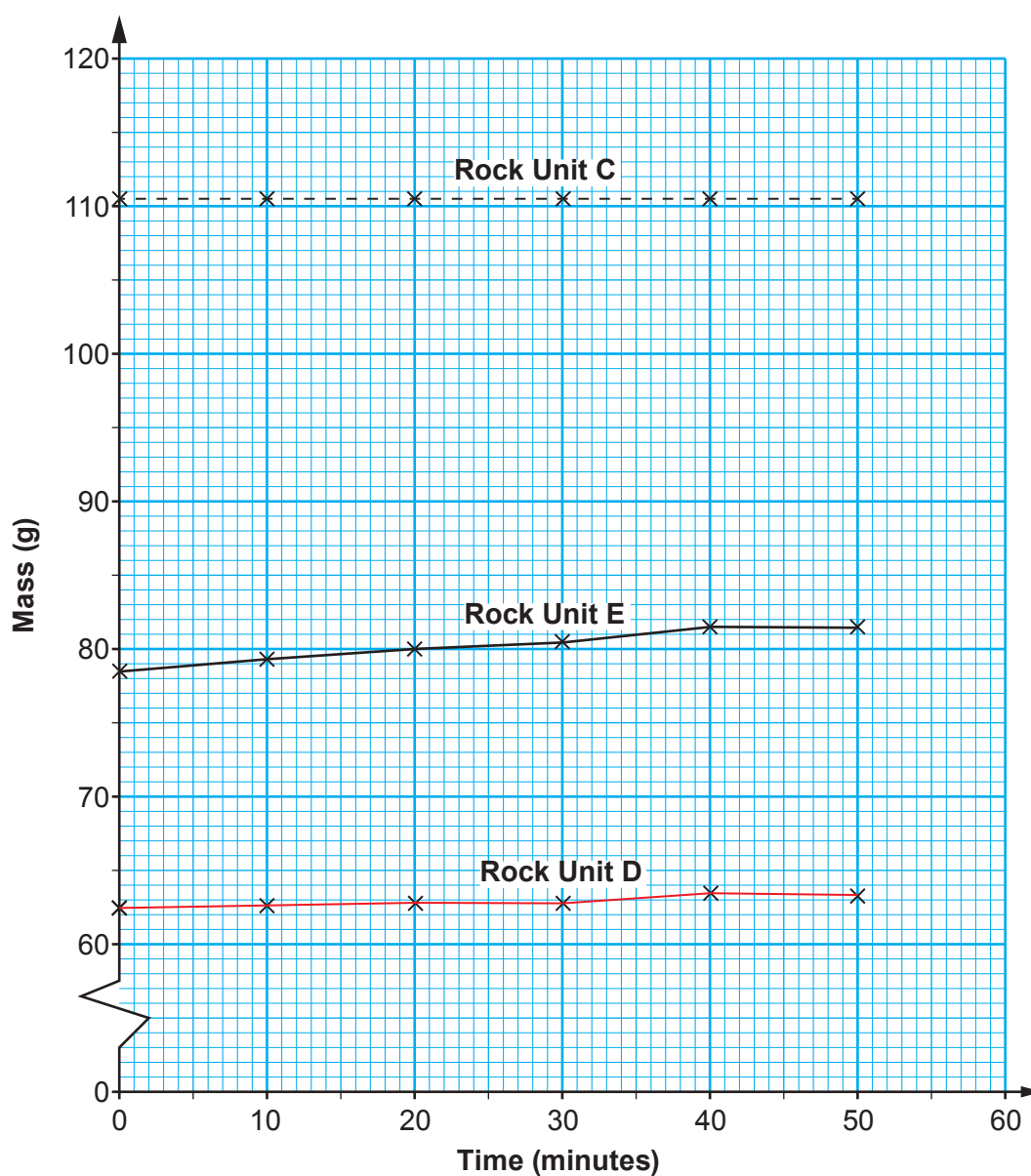


Figure 7

- (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 (%)
Rock Unit B - oolitic limestone	12.3
Rock Unit E	
Rock Unit D	1.6
Rock Unit C	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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.....

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END OF PAPER

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Acknowledgements

Figure 4c https://www.earthscienceeducation.com/virtual_rock_kit/

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