

Surname	Centre Number	Candidate Number
First name(s)		0



GCSE

C480U20-1



Z22-C480U20-1



FRIDAY, 10 JUNE 2022 – AFTERNOON

GEOLOGY – Component 2
Investigative Geology

1 hour 30 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	14	
2.	16	
3.	15	
4.	7	
5.	11	
6.	13	
7.	4	
Total	80	

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ADDITIONAL MATERIALS

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

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.

Plain paper may be obtained from the supervisor on request.

The assessment of the quality of extended response (QER) will take place in question 2(c).



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Answer **all** questions.

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

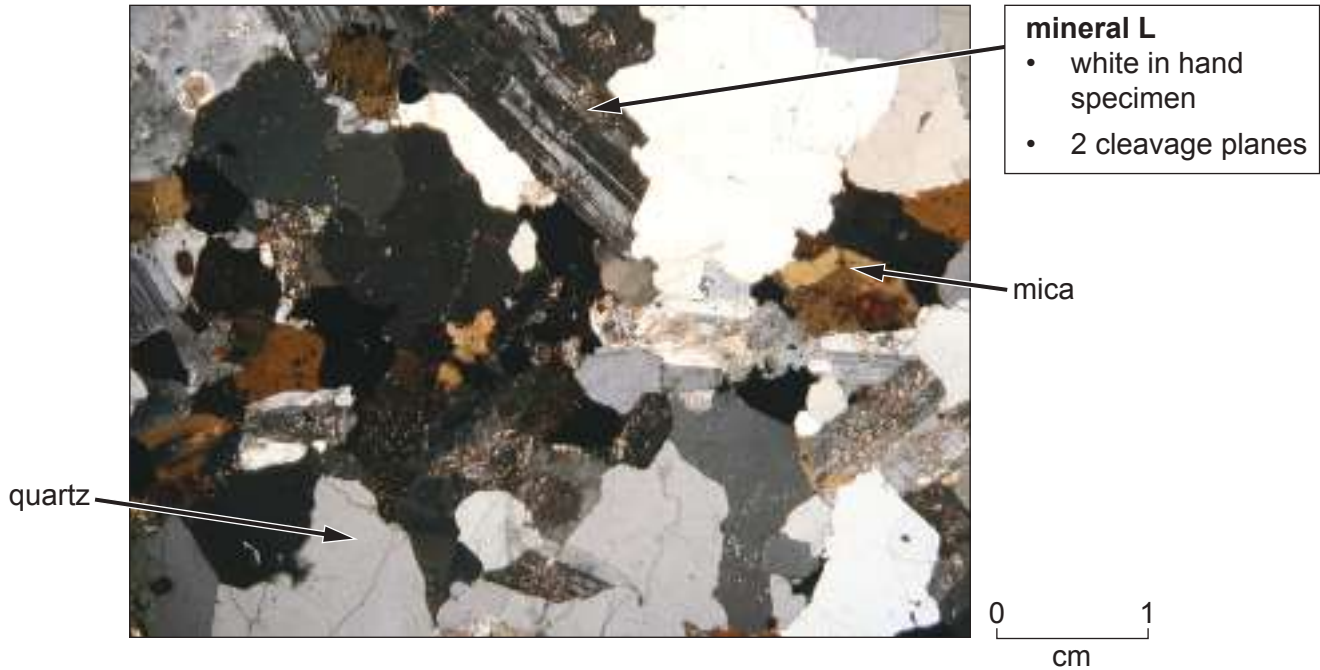


Figure 1a

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

[4]

crystalline texture	coarse crystals •
name of mineral L	•
rock group (igneous, sedimentary or metamorphic)	•
name of rock at Locality 1	•

Table 1



(b) **Table 2** shows how the average crystal size varies between **P** and **Q** on **Map 1**.

Distance from P (metres)	0	10	20	30	40	50
Crystal size (millimetres)	0.5	5	6	7	7.5	8

Table 2

- (i) Complete **Figure 1b** by plotting the data in **Table 2**. Join up the points with a curved line. [2]

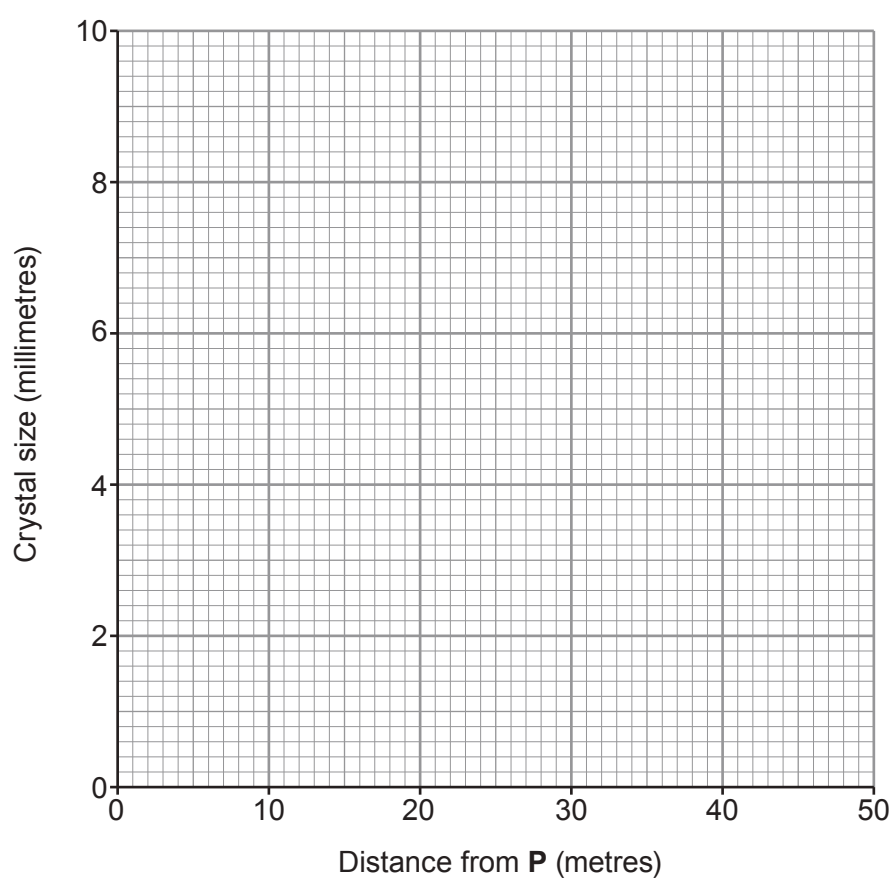


Figure 1b

- (ii) Explain the change in crystal size with distance from **P** in **Figure 1b**. [2]

.....

.....

.....



- (c) A student concluded that **Rock Unit A** forms a mafic pluton. Using evidence from **Figure 1a** and **Map 1**, evaluate this statement. [4]

Figure 1c is a photograph of **Rock Unit A** taken at **Locality 2** on **Map 1**.

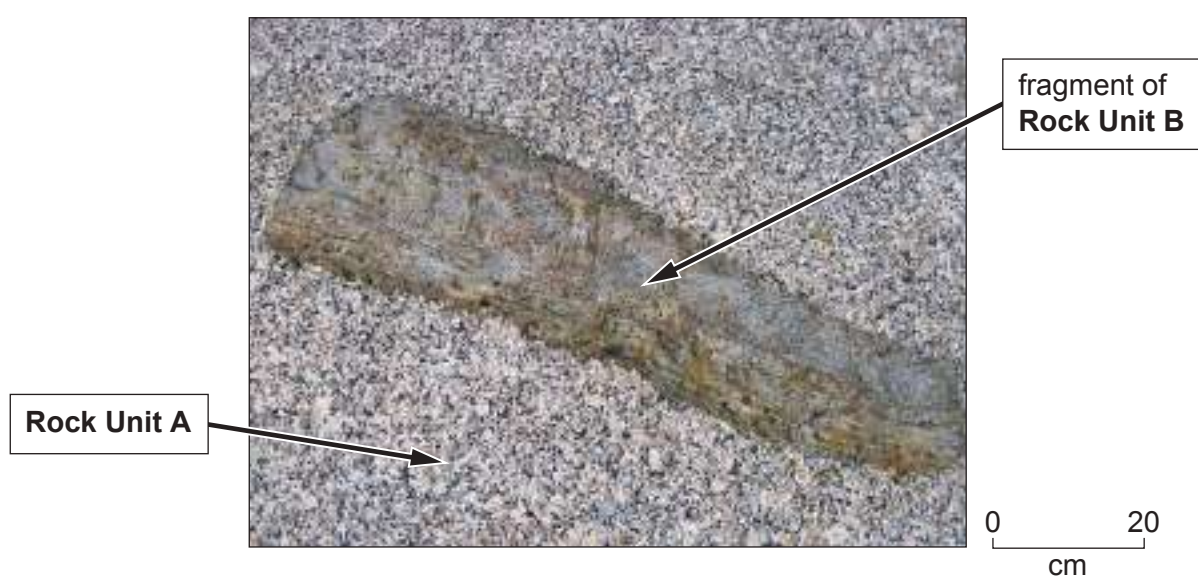


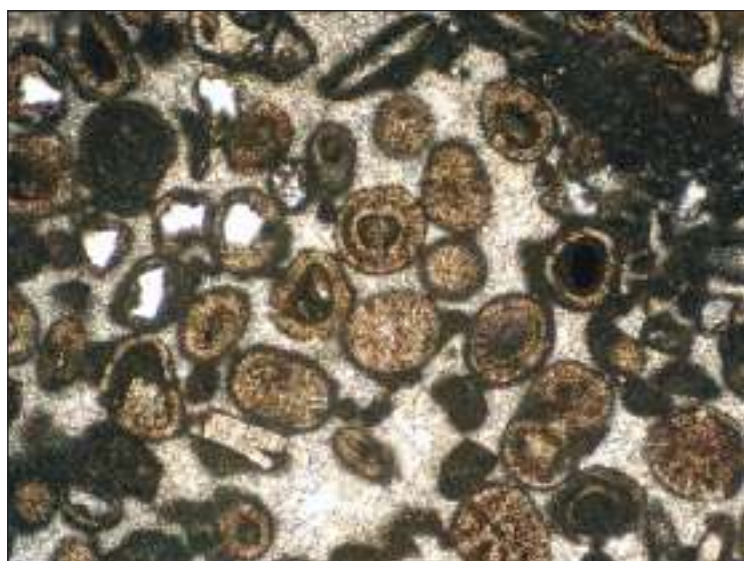
Figure 1c

- (d) Refer to **Figure 1c**.

State the relative age of **Rock Unit A** compared with the fragment of **Rock Unit B**. Explain your answer. [2]



2. **Figure 2a** is a microscope view of **Rock Unit B** collected from **Locality 3** on **Map 1**.



Rock Unit B

- composed of only one mineral
- effervesces with hydrochloric acid

0 2
mm

Figure 2a

(a) Refer to **Figure 2a**.

(i) Refer to the Data Sheet. State the name of the mineral forming **Rock Unit B**. [1]

.....

(ii) Describe the texture of **Rock Unit B**. [3]

.....

.....

.....

.....



- (b) **Figure 2b** is a photograph of a fossil found in **Rock Unit B** at **Locality 3** on **Map 1**.

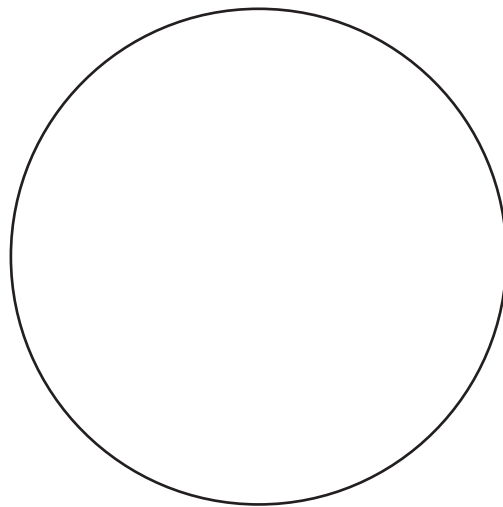


scale $\times 1$

Figure 2b

- (i) Complete **Figure 2c** by drawing the fossil shown in the circle in **Figure 2b**. Measure and draw the fossil using the scale provided.

[3]



scale $\times 2$

Figure 2c

- (ii) State the name of the fossil group shown in **Figure 2b**.

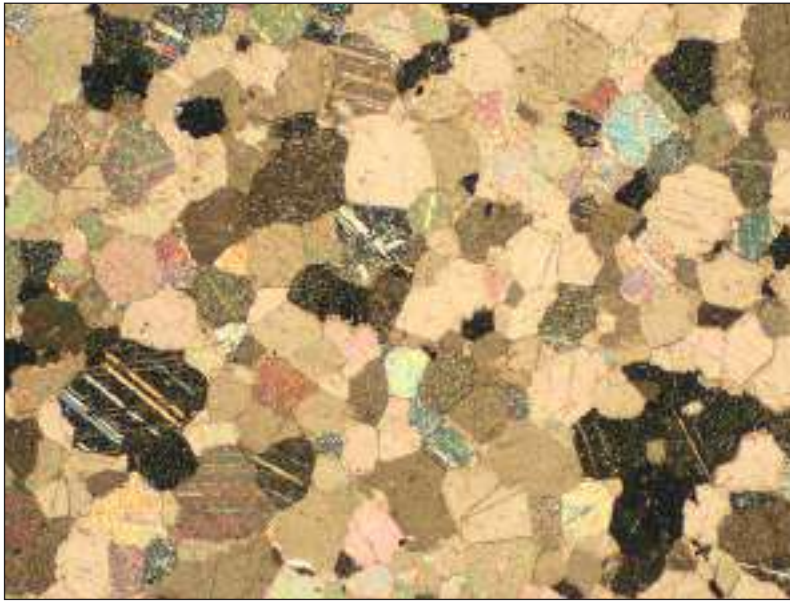
[1]

.....



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- (d) **Figure 2d** shows a microscope view of **Rock Unit B** at **Locality 4** on **Map 1**.



0 1
mm

Figure 2d

The rock in **Figure 2d** has the same composition as the rock in **Figure 2a** collected from **Locality 3** on **Map 1**. Explain how the rock in **Figure 2d** formed.

[2]

.....

.....

.....



3. **Figure 3** is a photograph of mineral **M**. It is red-brown in colour and was collected from the hydrothermal vein on **Map 1**.

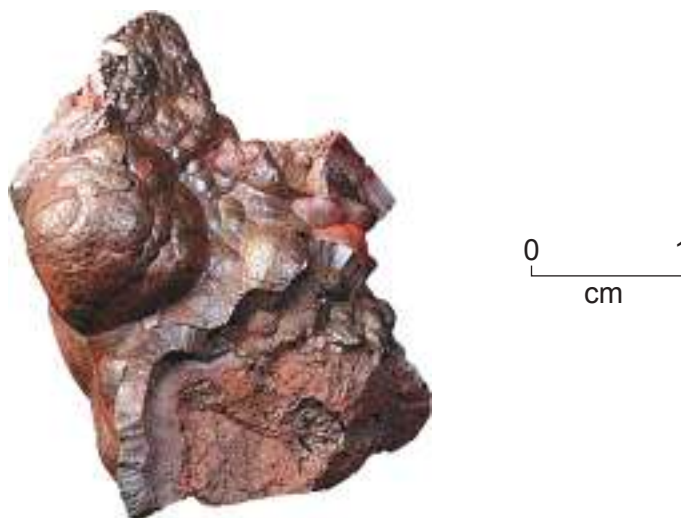


Figure 3

- (a) Refer to **Figure 3** and the Data Sheet.

- (i) Complete **Table 3** which refers to tests for identifying mineral **M**.

[5]

Test name	Description of test	Result of test
cleavage	look for regular planes of weakness	none
•	scratch the mineral with a steel pin	does not scratch with a steel pin
•	the way the mineral reflects light	•
•	rub mineral on unglazed tile	•

Table 3

- (ii) State the name of mineral **M**.

[1]

.....



- (b) **Table 4** shows the properties of a gangue mineral found in the hydrothermal vein.

Hardness	Streak	Cleavage
7	none	none

Table 4

Using the Data Sheet, state the name of the gangue mineral.

[1]

- (c) 6×10^3 tonnes of mineral deposit were extracted from the hydrothermal vein, from which 4×10^2 tonnes of the metal ore of mineral **M** were separated. Calculate the ratio of gangue to ore in the ore body.

Show your working.

[2]

Ratio =

- (d) Refer to **Map 1**.

- (i) Explain why the hydrothermal vein formed at the location shown on **Map 1**.

[2]

- (ii) Describe **one** geophysical technique that could be used to identify the presence of the hydrothermal vein.

[2]



(e) Draw a line from each resource to its most appropriate use.

[2]

limestone

energy generation

carbon sequestration

uranium

aggregate in construction

source rock for oil and gas

haematite

steel industry



4. **Figure 4a** is a photograph of **Rock Unit F** taken at **Locality 5** on **Map 1**.

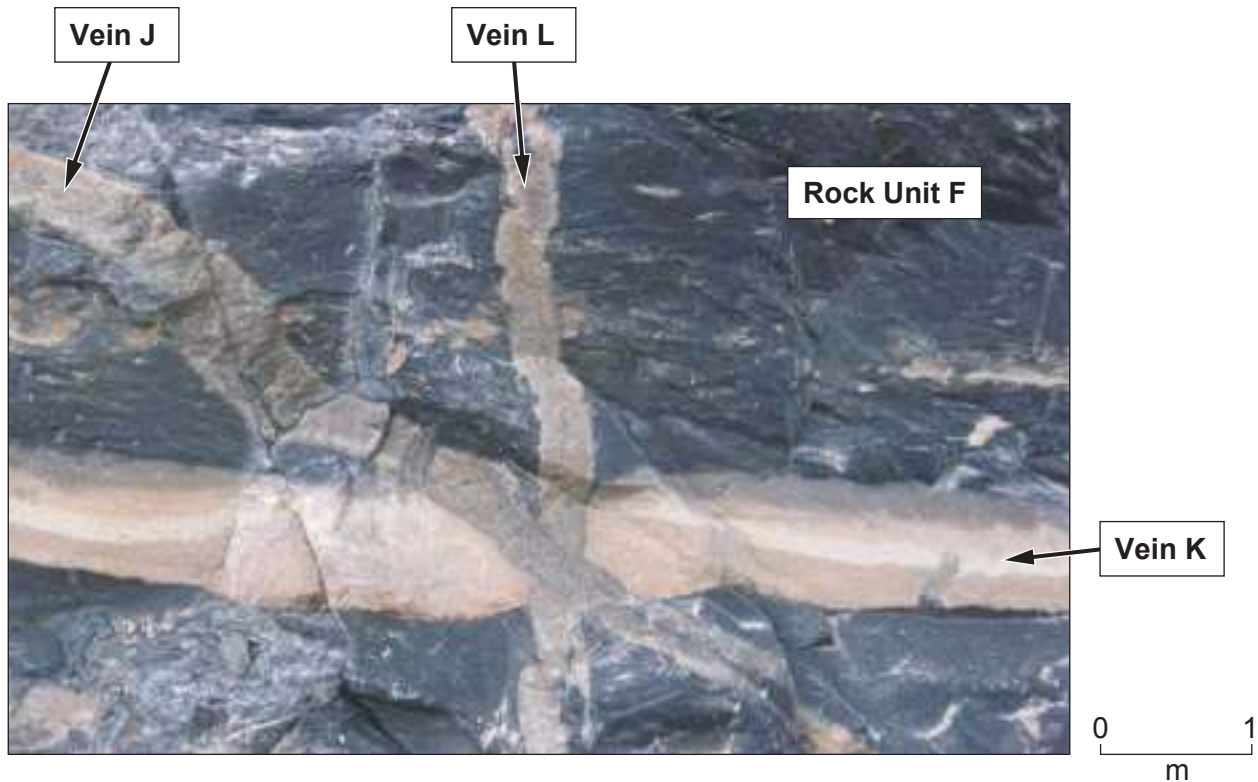


Figure 4a

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

In **Figure 4b**, draw to scale, the three veins showing their cross-cutting relationships. [3]



Figure 4b



(b) Refer to **Map 1** and **Figure 4a**.

In the boxes below, complete the sequence of geological events in order of age, oldest at the base. [4]

Rock Unit B

Rock Unit A

Rock Unit F

Vein J

Vein K

Vein L

YOUNGEST



OLDEST

7



5. Refer to **Map 1**. The area on **Map 1** is flat.

- (a) A dip and strike measurement was taken at **Locality 6** on **Map 1**.

Using **Map 1**, complete **Table 5**.

[2]

dip angle (°)	30
dip direction	•
strike direction	•

Table 5

- (b) Explain why the fold on **Map 1** has been correctly identified as a synform with an inclined fold axis.

[2]

.....

.....

.....

- (c) **Figure 5** is a geological blank cross-section along line **X–Y** on **Map 1**.

Complete the geological cross-section in **Figure 5** along the line **X–Y**.

[5]

Fault **F1** has a dip of 70° to the west.

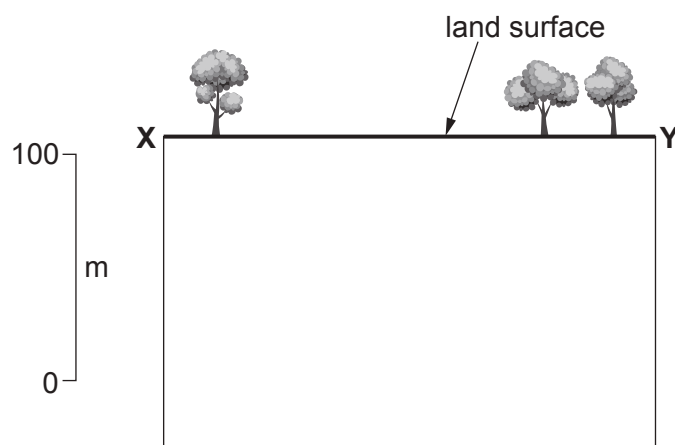


Figure 5



- (d) State the type of stress that formed **Fault F1**. Give **one** reason for your answer. [2]

Type of stress

Reason

.....

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only

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6. **Figure 6a** is a sedimentary log recorded within **Rock Unit C** on **Map 1**. **Figure 6b** is a photograph of bed 1.

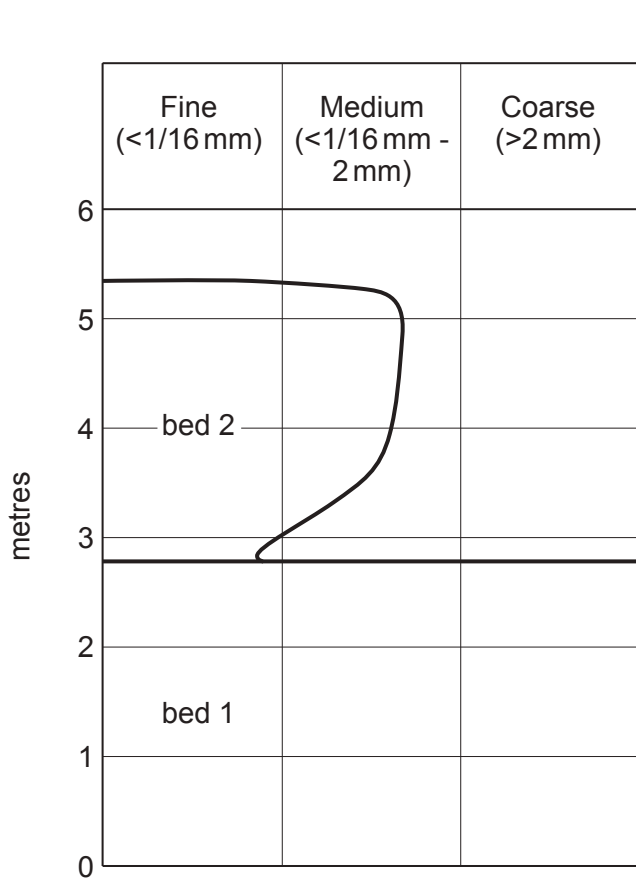


Figure 6a



Figure 6b

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

Complete **Table 6** which refers to the texture of bed 1.

[2]

grain sorting	poor
grain size	•
grain shape	•

Table 6



- (b) **Figure 6c** shows a rose diagram with the orientation of 37 grains in bed 1.

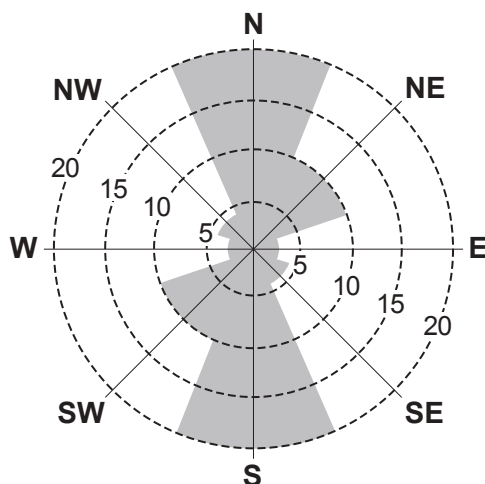


Figure 6c

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

- (i) State how many grains have a N-S orientation. [1]

- (ii) Evaluate the statement “the grains were deposited in a random orientation by a high energy river flowing from the south”. [4]

.....

.....

.....

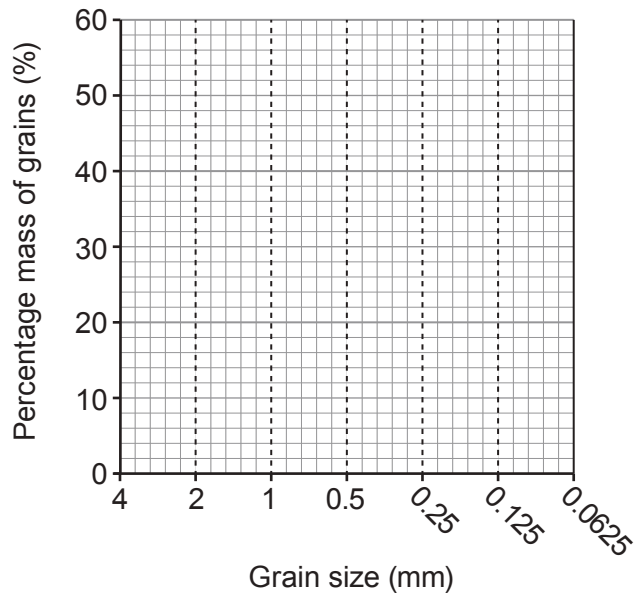
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(c) **Table 7** shows the grain size distribution of bed 2 in **Figure 6a**.

(i) Construct a bar chart in **Figure 6d** using the data in **Table 7**. [2]



Grain size (mm)	Percentage mass of grains (%)
2 – 4	0
1 – 2	0
0.5 – 1	60
0.25 – 0.5	35
0.125 – 0.25	5
0.0625 – 0.125	0

Table 7

Figure 6d

(ii) Describe the sorting of bed 2. [1]

.....

.....



- (d) **Figure 6e** shows a sedimentary structure found in bed 2. **Figure 6f** shows detail of the texture of bed 2.



Figure 6e

quartz grains 0.5 mm
in diameter cemented
by haematite



Figure 6f

Refer to **Table 7**, **Figure 6e** and **Figure 6f**.

Explain the evidence from bed 2 which suggests that it was deposited by wind.

[3]

.....

.....

.....

.....



7. Landfill sites are engineered sites that use an impermeable barrier. Using evidence from **Map 1** compare the potential risk of using site **S1** and site **S2** for landfill should the impermeable barrier fail. [4]

Site 1

Site 2

END OF PAPER

4

Acknowledgements

Figure 2a <https://www.earth.ox.ac.uk/~oesis/micro/>

Figure 3 https://flexiblelearning.auckland.ac.nz/rocks_minerals/minerals/

Figure 6b http://pages.mtu.edu/~raman/Silver/Boulder_Garden/



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