Surname	Centre Number	Candidate Number
First name(s)		2

GCE AS

B480U10-1

S24-B480U10-1

MONDAY, 13 MAY 2024 – MORNING

GEOLOGY – AS component 1

Geological Enquiries

1 hour 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**10**	
2.	**10**	
3.	**8**	
4.	**6**	
5.	**9**	
6.	**4**	
7.	**13**	
Total	**60**	

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ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- the Resource Sheet
- **Specimens C, E, H** and **L**
- the Photographs of Specimens Sheet
- geological equipment for testing specimens
- the Mineral Data Sheet
- a calculator
- a protractor
- a ruler

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 geology is **not** designed to represent any particular area.

The Mineral Data Sheet and **Map 1** and **Photographs 1–4** are provided on separate resource sheets.

Strips of plain paper may be obtained from the supervisor on request.

Four specimens, **C**, **E**, **H** and **L**, are provided for use.

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

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

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Answer **all** questions.

Study **Map 1** on the Resource Sheet before answering **Questions 1–7**.

1. **Photograph 1** on the Resource Sheet is representative of **Rock Unit A** on **Map 1**.

(a) The list below contains statements about the origin of the texture of **Rock Unit A** shown in **Photograph 1**.

Indicate the **two** statements which best apply to **Rock Unit A**. Tick (✓) **two** boxes. [2]

- ☐ It formed by cooling at a constant rate.
- ☐ It formed by eruption at the Earth's surface.
- ☐ It formed by deposition in a high energy sedimentary environment.
- ☐ It formed by cooling at two different rates.
- ☐ It formed by cooling rapidly.
- ☐ It formed by cooling beneath the Earth's surface.
- ☐ It formed by contact metamorphism.

(b) Refer to **Photograph 1** and the Mineral Data Sheet.

(i) State the name of **Mineral P**. [1]

.....

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(ii) Complete **Table 1**, stating in the evaluation column whether the student's conclusion about **Mineral Q** is true or false. Explain your answer with reference to **one** physical property of **Mineral Q**. [1]

Student's conclusion	Evaluation (true/false)	Explanation
Mineral Q is augite	•	•

Table 1

(c) **Specimen H** is representative of **Rock Unit H** on **Map 1**.
Describe **one** similarity and **one** difference in the crystalline textures of **Rock Unit A** and **Specimen H**. [2]

Similarity .....

.....

.....

Difference .....

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.....

(d) (i) State the name of **Specimen H**. [1]

.....

(ii) Describe the conditions of formation of **Specimen H**. [3]

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2. **Specimen E** is representative of **Rock Unit E** on **Map 1**.

(a) Complete **Figure 2a** by drawing the texture of **Specimen E** to the scale provided. [3]

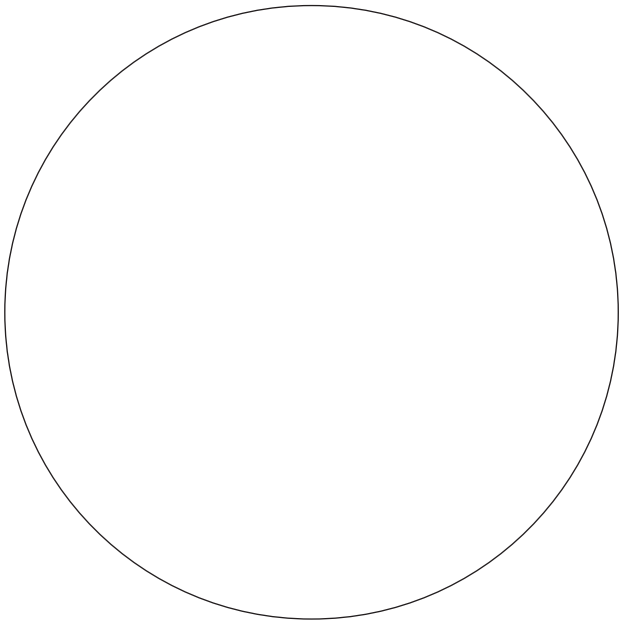

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Figure 2a

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(b) **Figure 2b** is a graphic log of the facies recorded in **Rock Unit E**.

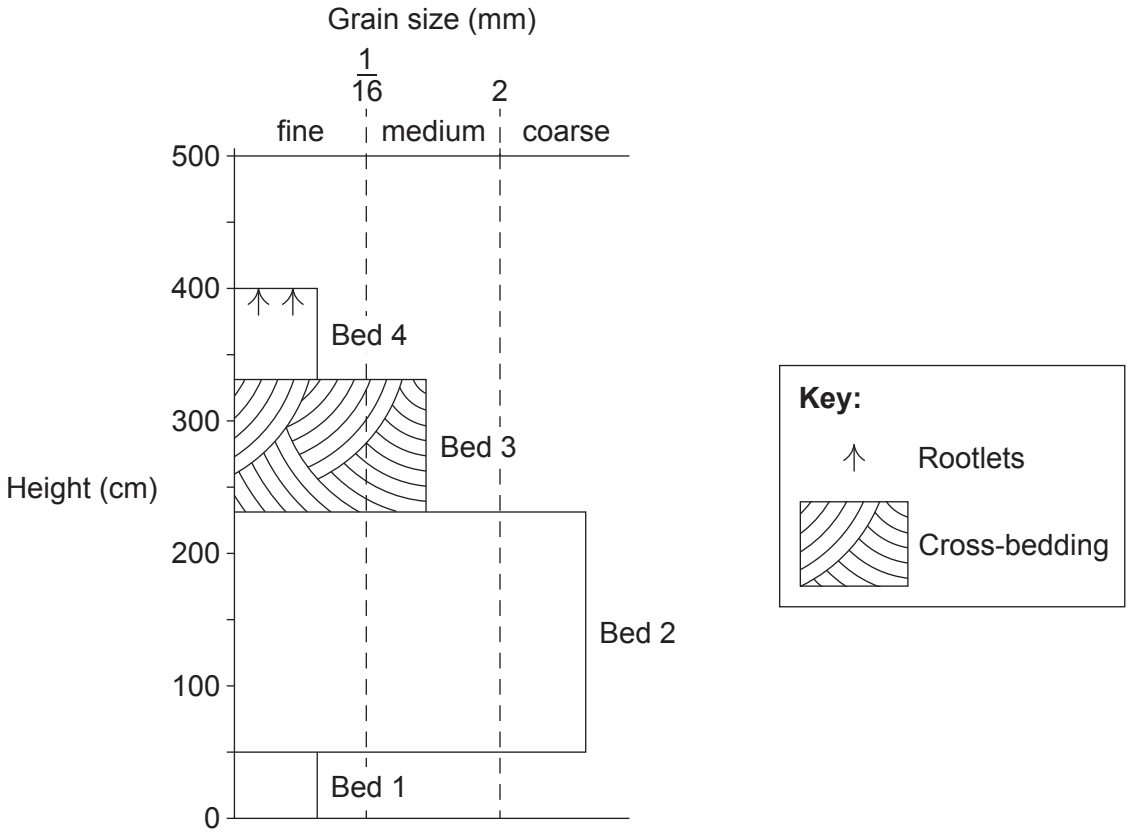

Figure 2b

(i) **Specimen E** is representative of Bed 5 on **Figure 2b**. Bed 5 is 1 metre thick. Complete **Figure 2b** by adding Bed 5. [1]

(ii) A student has concluded that the beds in **Figure 2b** were all deposited in the same environment of deposition under very similar energy levels.

Using the evidence from **Specimen E**, **Figure 2b** and **Photographs 2** and **3**, evaluate this conclusion. [6 QER]

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3. **Specimen L** was collected from a vein in **Rock Unit F**.

(a) (i) **Specimen L** can be identified by diagnostic tests and/or observations. Complete **Table 2** by:

- describing the result of the relative density test
- describing one other test/observation which is a useful property for diagnosis and stating the result. [3]

Description of test/observation	Result of the test/observation described
Hold mineral in hand to determine relative density	•
•	•

Table 2

(ii) State the name of **Specimen L**. [1]

.....

(b) **Figure 3** shows the equipment used to investigate the density of a mineral.

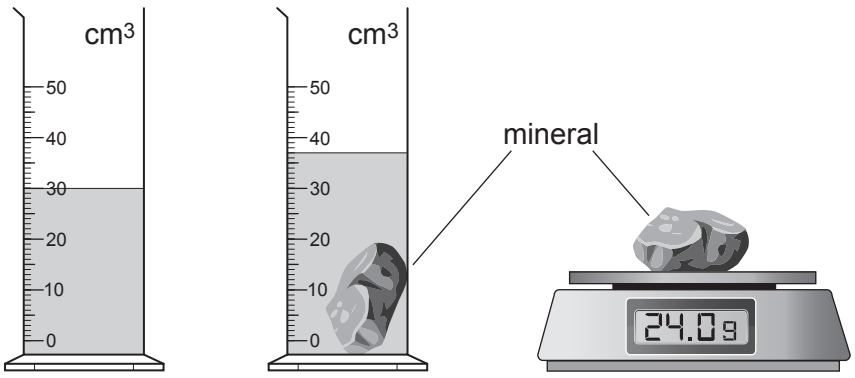

Figure 3

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Use the data in **Figure 3** to calculate the density of the mineral. Show your working. [2]

Answer	Units
•	•

(c) **Table 3** shows the relative density values gathered from seven students for different samples of the same mineral. The students used the equipment in **Figure 3**.

Sample number	Relative density
1	3.0
2	3.2
3	3.6
4	2.4
5	2.3
6	3.1
7	3.3

Table 3

Explain **two** possible reasons for the wide variation in the density data in **Table 3**. [2]

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4. **Specimen C** is a fossil found in **Rock Unit C** on **Map 1**.

(a) Draw in **Figure 4** a view of **Specimen C** to the scale provided. Label the foramen and draw a line to show the fossil's plane of symmetry. [5]

Figure 4

(b) Identify the fossil group to which **Specimen C** belongs. [1]

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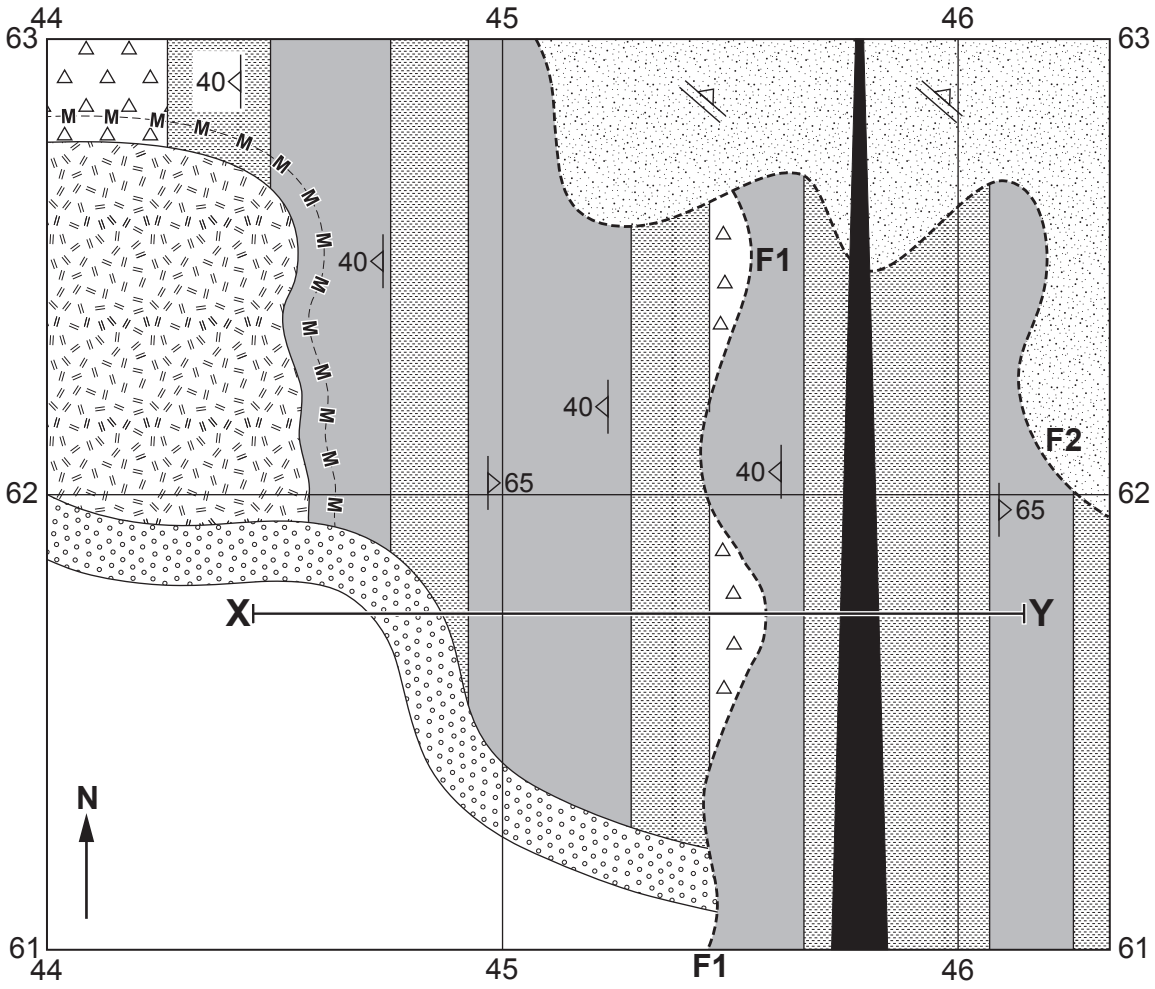
5. **Map 2** shows a reduction of **Map 1** with grid lines. The key for the rock units is the same as for **Map 1**.



Map 2

(a) **Photograph 4** was taken looking towards the west at 448616, showing the true dip of bedding.

(i) State the angle of dip of the bedding at 448616 shown in **Photograph 4**. [1]

..... °

(ii) Plot the angle and direction of dip of the bedding shown in **Photograph 4** onto **Map 2** at the appropriate location, using the symbol in the key for **Map 1**. [2]

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(iii) Explain how the difference in dip of the sedimentary rocks at 445615 and 453622, and other map evidence, indicates that they were folded at different times. [3]

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(b) **Table 4** shows the dip data for bedding planes gathered from a class of students at the same locality.

Dip angle (°)	Dip direction (°)
40	135
34	141
54	127
44	138
43	123
38	133
39	144
41	137
45	121

Table 4

(i) Calculate the mean dip angle, using the data shown in **Table 4**. [1]

..... °

(ii) Account for the variation in the data shown in **Table 4**. [2]

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6. Refer to **Fault F1** and **Fault F2** on **Map 1**.

Complete **Table 5** to compare **Fault F1** and **Fault F2**. [4]

	Fault F1	**Fault F2**
Direction of dip of fault plane	west	•
Relative movement of hanging wall	•	upwards
Dip angle of fault plane	65°	20°
Fault type (normal, reverse, thrust, strike-slip)	•	•

Table 5

4

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7. The topographic profile below was taken along the line **X–Y** on **Map 1**.

Complete the sketch of the geological cross-section along this line using **Map 1**.

- Draw the rock units. Use similar ornament, or letters, to those on **Map 1**.
- Draw and label any **fold axes**, with the correct symbol.
- Mark on the extent of any metamorphic aureoles.
- Draw and label any **faults**. Draw **arrows** alongside faults to show relative movement.
- **Project** the rock units and structures **above** the ground surface to illustrate any cross-cutting relationships.

[13]

Metres relative to sea level

13

END OF PAPER

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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