



GCE AS

B480U10-1

MONDAY, 16 MAY 2022 - MORNING

**GEOLOGY – AS COMPONENT 1
GEOLOGICAL ENQUIRIES**

1 hour 30 minutes plus your additional time allowance

Surname

First name(s)

Centre Number

Candidate Number

2

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- **the Resource Sheet**
- **Specimens A, D and E**
- **geological equipment for testing specimens**
- **the Mineral Data Sheet**
- **a calculator**
- **a ruler**
- **a protractor**

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball-point pen or your usual method.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces on the previous 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.

(Turn over)

INFORMATION FOR CANDIDATES

The geology is NOT designed to represent any particular area.

The Mineral Data Sheet, MAP 1 and PHOTOGRAPHS 1 and 2 are provided on separate resource sheets.

Three specimens, A, D and E, 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 4(c).

Answer ALL questions in the spaces provided.

Study MAP 1 on the Resource Sheet carefully before answering QUESTIONS 1–6.

1 ROCK UNITS A and B on MAP 1 are igneous bodies.

(a) (i) State ONE piece of evidence from MAP 1 which confirms that ROCK UNIT A is a pluton. [1 mark]

(ii) Suggest ONE other piece of evidence you might expect to investigate in the field, which could support that ROCK UNIT A is a pluton. [1 mark]

(Turn over)

1 (b) **SPECIMEN A contains quartz, feldspar and mica.**

Complete TABLE 1 opposite to explain how you would distinguish between the following minerals found in SPECIMEN A.

You may only use a test/observation once.

You may wish to refer to the Mineral Data Sheet.

[4 marks]

(Turn over)

1 (c) (i) State TWO pieces of evidence from MAP 1 which confirm that ROCK UNIT B is a dyke. [2 marks]

(ii) ROCK UNIT B is a mafic rock. Name ONE mineral which would support this statement. [1 mark]

1 (c) (iii) Explain why ROCK UNIT B may have originated from the partial melting of peridotite. [2 marks]

1 (d) TABLE 2 opposite contains measurements of crystals within ROCK UNIT A.

(i) Calculate the interquartile range of ROCK UNIT A. Show your working and insert the interquartile range calculated in the relevant row opposite. [3 marks]

(ii) A student stated that ROCK UNIT A has undergone two stages of cooling. Using TABLE 2, explain the evidence that might suggest that this is correct. [2 marks]

1 (d) (iii) Evaluate the effectiveness of using the interquartile range and standard deviation to describe the crystal size distribution in ROCK UNIT A. [2 marks]

18

2 SPECIMEN D is representative of ROCK UNIT D on MAP 1.

(a) Complete FIGURE 2 opposite by drawing the texture of SPECIMEN D to the scale provided. [3 marks]

(b) State the name of the rock forming SPECIMEN D. Give TWO pieces of evidence for your answer. [3 marks]

Name _____

Evidence 1 _____

Name _____

Evidence 2 _____

6

(Turn over)

3 SPECIMEN E is a plaster cast of a fossil found in ROCK UNIT E on MAP 1.

(a) (i) Draw in FIGURE 3a opposite the cephalon of SPECIMEN E to the scale provided. [3 marks]

(ii) Label the glabella. [1 mark]

3 (b) FIGURE 3b opposite and Figures 3c and 3d opposite the following page show structures found within ROCK UNIT E.

TICK (✓) ONE of the boxes below to indicate the structure most likely to have been formed by the activity of the fossil represented by SPECIMEN E. [4 marks]

FIGURE 3b

FIGURE 3c

FIGURE 3d

Justify your answer.

8

(Turn over)

4 MAP 2 opposite shows the geology in BOX J on MAP 1. The key for the rock units is the same as for MAP 1.

(a) Label an unconformity on MAP 2 using an arrow labelled U (← U). [1 mark]

4 (b) **PHOTOGRAPH 1** on the Resource Sheet shows a clast collected from Location W within **ROCK UNIT C** on **MAP 2**. **PHOTOGRAPH 2** on the Resource Sheet is a photomicrograph of the rock shown in **PHOTOGRAPH 1**.

State the name of the rock shown in PHOTOGRAPHS 1 and 2. Give TWO pieces of evidence for your answer. [3 marks]

Name _____

Evidence 1 _____

Evidence 2 _____

- 5 Refer to faults F1, F2 and F3 on MAP 1.
Complete TABLE 3 opposite to compare
Faults F1, F2 and F3. [5 marks]

5

- 6 The topographic profile opposite 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, for those as on MAP 1
- boundaries of ROCK UNIT D have been added
- draw and label any FOLD AXES, with the correct symbol
- mark on the extent of any metamorphic aureoles
- PROJECT the rock units and structures ABOVE the ground surface to illustrate any cross-cutting relationships. [13 marks]

13

END OF PAPER

(Turn over)

Question number	ADDITIONAL PAGE, IF REQUIRED. WRITE THE QUESTION NUMBER(S) IN THE LEFT-HAND MARGIN.

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(Turn over)

ACKNOWLEDGEMENTS:

FIGURE 3b: R. Humphreys

FIGURE 3c: <http://www.wildsingapore.com//wildfacts/>

FIGURE 3d: http://www.thisoldearth.net/Geology_Online-1_Subchapters.cfm?Chapter=5&Row=3

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	18	
2	6	
3	8	
4	10	
5	5	
6	13	
Total	60	

TABLE 1

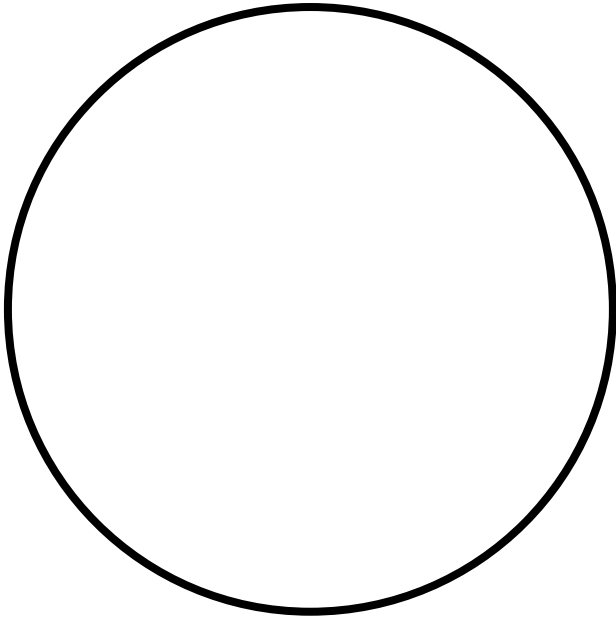
	Test/observation	Result
Quartz and feldspar	•	•
Feldspar and mica	•	•

TABLE 2

Crystal Size (mm)
3
5
24
45
6
6
27
5
28
7

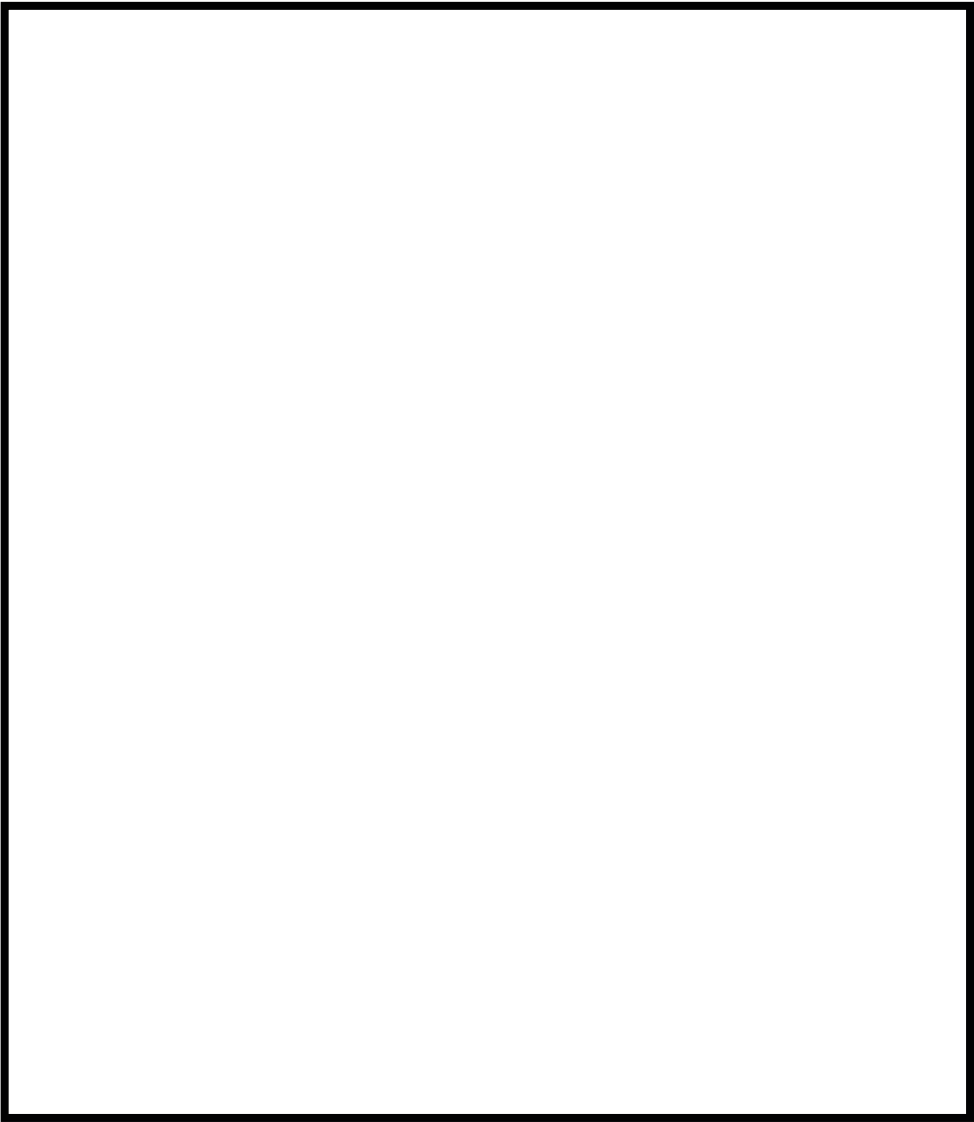
Interquartile range	•
Standard deviation	14.38

FIGURE 2



x20

FIGURE 3a



0 | 2
cm

FIGURE 3b



2 cm

FIGURE 3c



4 cm

FIGURE 3d



5 cm

MAP 2

Location W

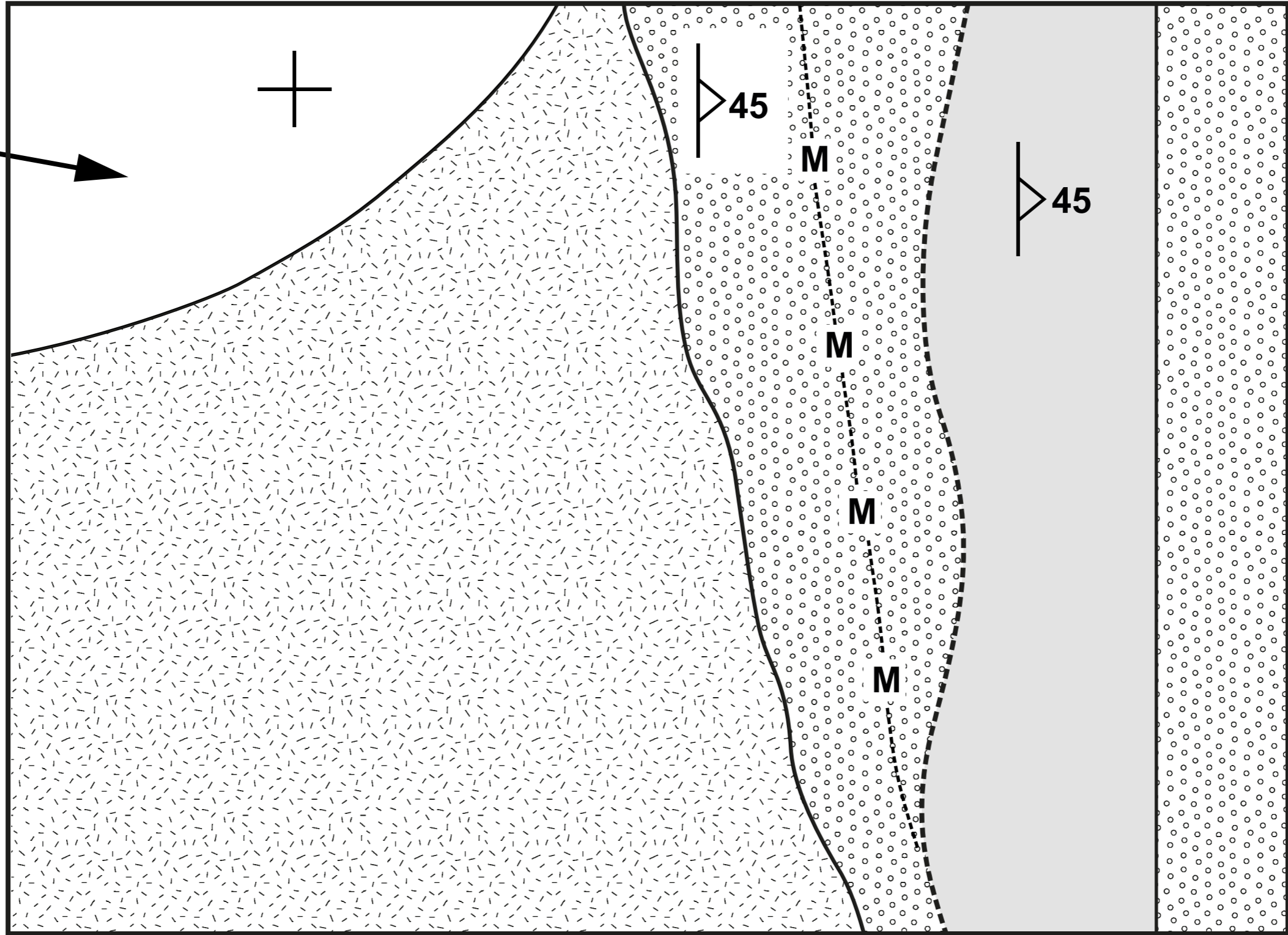
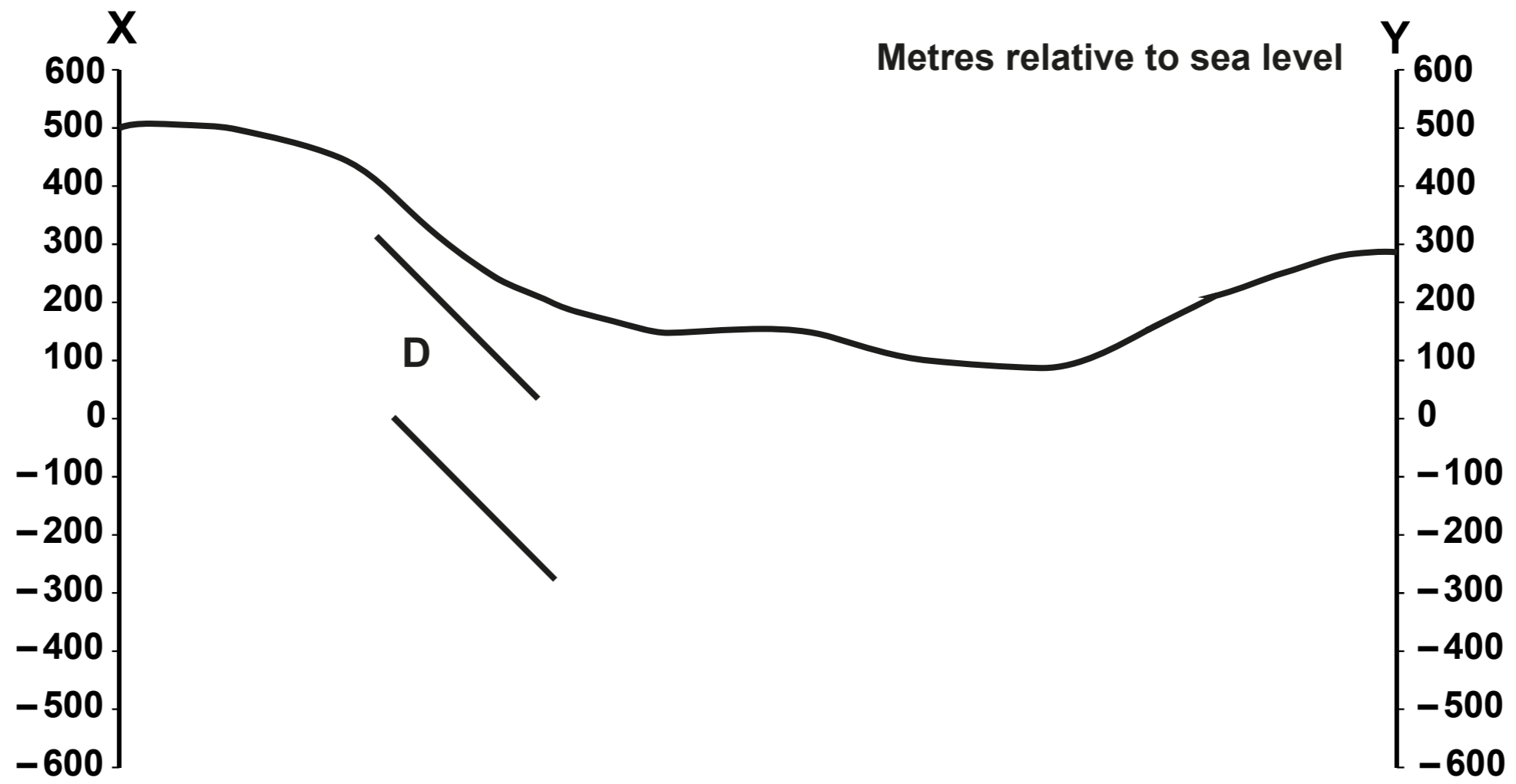


TABLE 3

	F1	F2	F3
Direction of dip of fault plane	east	•	southeast
Relative movement of hanging wall	•	upwards	upwards
Estimated dip angle of fault plane	80°	70°	•
Fault type [normal, reverse, thrust, strike-slip]	•	reverse	•



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**GEOLOGY – AS COMPONENT 1
GEOLOGICAL ENQUIRIES**

RESOURCE SHEET

ACKNOWLEDGEMENTS

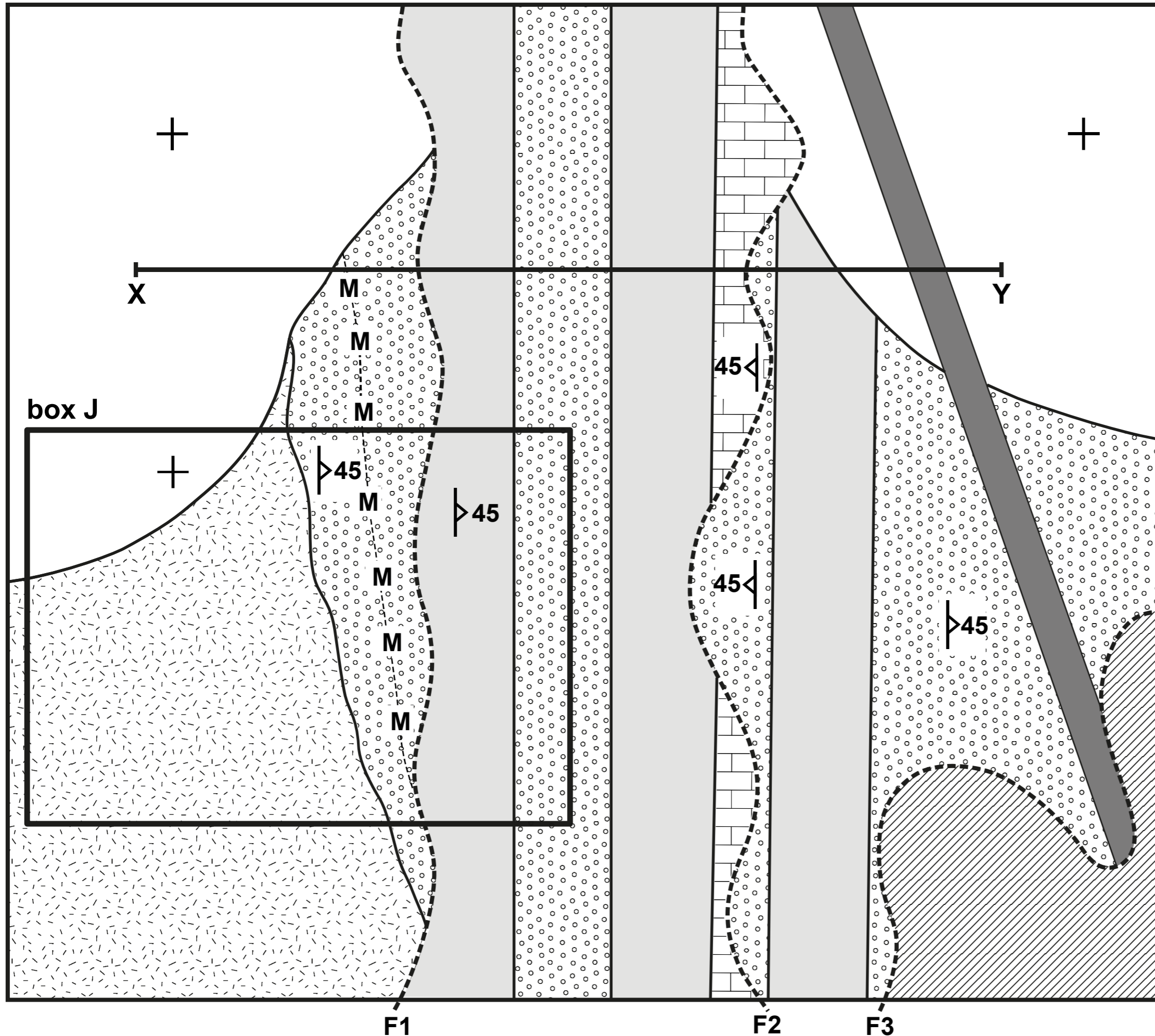
PHOTOGRAPH 1:





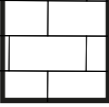
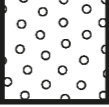
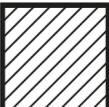


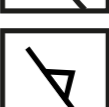
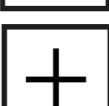
<https://www.haikudeck.com/sci-ch-2-5-and-2-6-education-presentation-Y3Rlz4c5az>

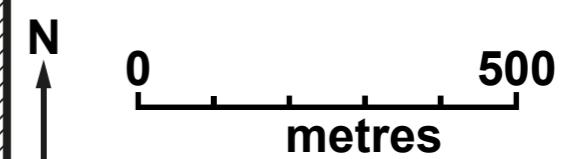
PHOTOGRAPH 2: R. Humphreys

MAP 1

The rock units are not in order of age. Their ornament is not necessarily representative of rock type.



-  Rock Unit A (Specimen A)
-  Rock Unit B
-  Rock Unit C
(Photographs 1 & 2)
-  Rock Unit D (Specimen D)
-  Rock Unit E (Specimen E)
-  Rock Unit F
-  Rock Unit G
-  Limit of metamorphism
-  Fault
-  Direction of dip of bed
-  Horizontal bed

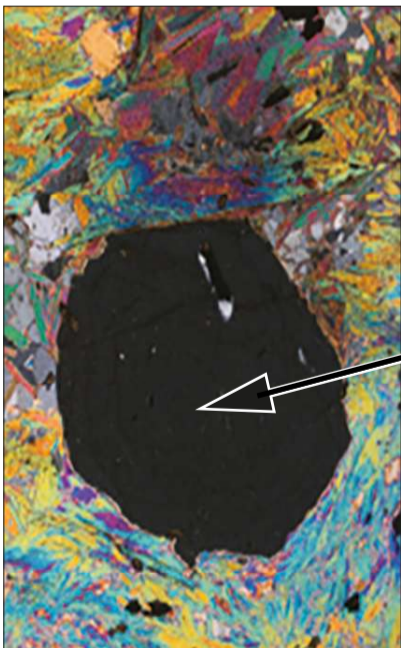


PHOTOGRAPH 1 For use in Question 4



5 mm

PHOTOGRAPH 2 For use in Question 4



5 mm

Mineral T
• no cleavage
• red/ brown
colour



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GEOLOGY

**MINERAL DATA SHEET FOR USE WITH AS
COMPONENT 1**

NAME	CLEAVAGE/ FRACTURE	HARDNESS	RELATIVE DENSITY	STREAK	LUSTRE	COLOUR	OTHER DIAGNOSTIC PROPERTIES
Quartz RF	*none/conchoidal	7	2.65	scratches streak plate	vitreous	colourless, milky but variable	hexagonal prisms terminated by pyramids
Orthoclase Feldspar RF	*2 good, 90	*6	2.6	scratches streak plate	vitreous	pink, white	
Plagioclase Feldspar RF	*2 good, 90	*6	2.7	scratches streak plate	vitreous	creamy-white, grey, colourless	
Muscovite RF Mica	*1 perfect (basal)	*2.5	2.7-3.1	white	pearly	colourless or pale yellow, green or brown	*flaky
Biotite Mica RF	*1 perfect (basal)	*2.5-3	2.7-3.1	white	pearly	brown/black	*flaky
Hornblende RF	*2 good, 60/120	*5-6	3.0-3.5	scratches streak plate	vitreous	black, dark green	prismatic crystals
Augite RF	*2 good, 90	*5-6	3.2-3.5	scratches streak plate	vitreous	greenish-black	prismatic crystals
Olivine RF	none/conchoidal	*6-7	3.2-4.3	scratches streak plate	vitreous	*olive green	
Chialstolite/ Andalusite	poor 1/ uneven fracture	*7.5	3.1-3.3	scratches streak plate	vitreous	pearly grey/pink	needle crystals with square x-sections, black centre
Garnet	none	*6.5-7.5	3.5-4.3	scratches streak plate	vitreous	red/brown	*12 sided crystals - each face rhomb shaped
Calcite RF	*3 good, not at 90, perfect rhombs	*3	2.71	white	vitreous	colourless, white, tints	*effervesces with 0.5M HCl, rhombic shape
Fluorite	*4 good, parallel to octahedron	*4	3.0-3.2	white	vitreous	colourless purple/ green/yellow	fluoresces in uv light, cubic or octahedral crystals
Halite	3 good, 90 cubic	*2.5	2.2	white	vitreous	colourless, white, often stained	*salty taste cubic crystals, often stained
Gypsum	1 good (basal)	*1.5-2	2.3	white	silky, pearly	colourless, white often stained	fibrous
Barite	2 good, 90	*3-3.5	*4.5	white	vitreous, pearly	white, pink	bladed crystals
Chalcopyrite	poor/conchoidal	*4	4.2	*black	metallic	bronze yellow	*tarnished to peacock colours
Pyrite	none/conchoidal	*6	5.0	*greenish black	metallic	brass yellow	crystals often striated cubes
Galena	*3 good, 90 cubic	*2.5	*7.5	*lead grey	metallic	lead grey	cubic crystals
Haematite	poor/ subconchoidal	*5.5-6.5	4.9-5.3	*cherry red	metallic-dull	red/black/ steel grey	kidney shaped masses, fibrous

* - Useful property for diagnosis RF - Common rock-forming mineral

This table should NOT be memorised.

Marks in the examination will be awarded for description of the outcomes of tests on minerals and, on some occasions, identification from test results.