

Candidate Name	Centre Number	Candidate Number
		2



GCE AS/A level

1211/01

**GEOLOGY - GL1
Foundation Unit**

P.M. WEDNESDAY, 12 January 2011

1 hour

		Examiner only
1.	15	
2.	17	
3.	15	
4.	13	
Total	60	

ADDITIONAL MATERIALS

In addition to this examination paper, you will need a copy of the **Mineral Data Sheet**.

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 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.

You are reminded that marking will take into account the use of examples and the quality of communication used in your answers.

GL1 – FOUNDATION GEOLOGY

Answer **all** questions.

1. **Figure 1a** is a graph showing the effects of climate on the weathering rate of rocks.

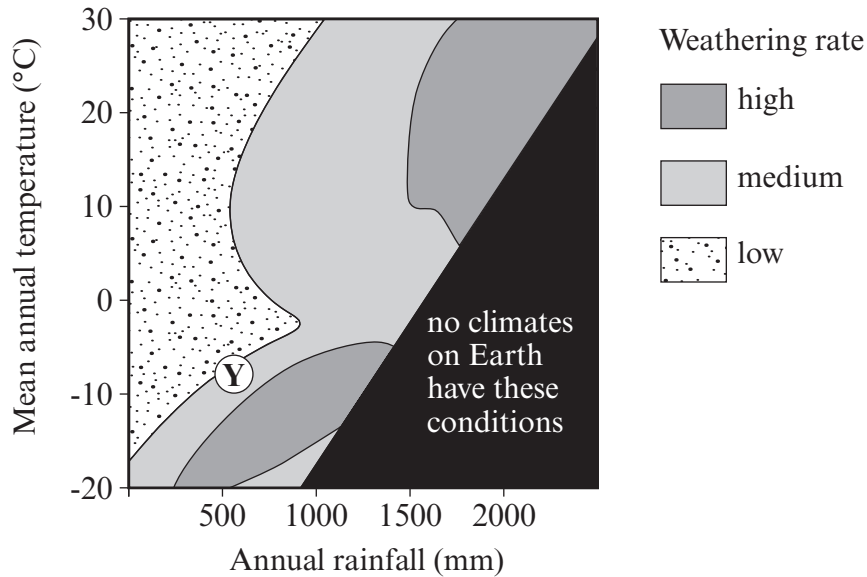


Figure 1a

- (a) (i) Chemical weathering occurs most rapidly where rainfall and temperature are high. Indicate on **Figure 1a** using an arrow labelled **X** (**X** →) an area of the graph showing the most rapid chemical weathering. [1]
- (ii) State a type of weathering most likely to be responsible for the weathering at point **Y** on **Figure 1a**. [1]
-
- (iii) State a source of energy responsible for weathering. [1]
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Figure 1b is a diagram of the rock cycle. Figure 1c shows a thin-section of a rock.

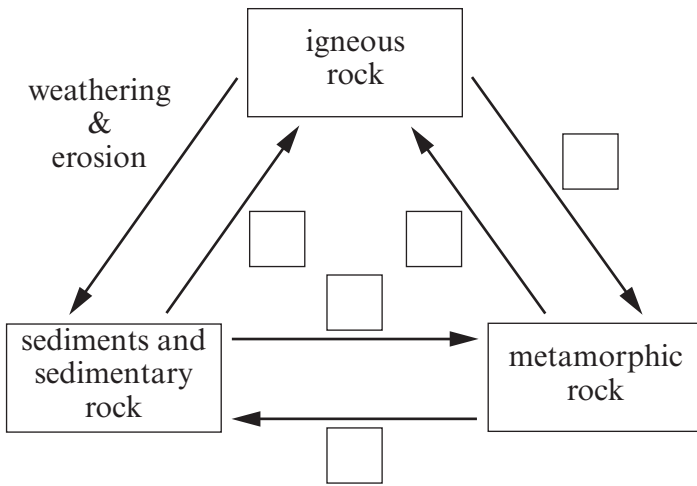


Figure 1b

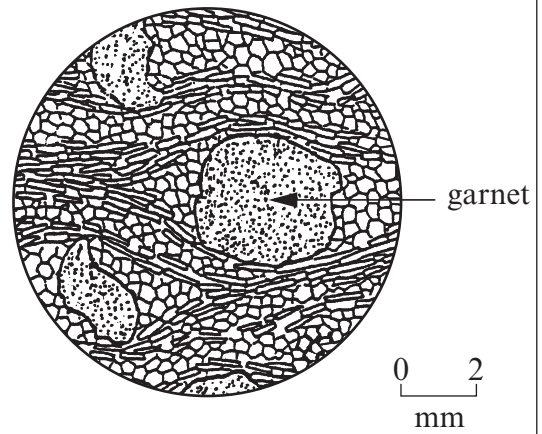


Figure 1c

(b) (i) State what is meant by the term *erosion*. [1]

.....

(ii) Indicate which other arrow in **Figure 1b** represents weathering and erosion by inserting the letter **W** in one of the empty boxes alongside the arrows in **Figure 1b**. [1]

(c) (i) Describe the texture of the rock in **Figure 1c**. [3]

.....

(ii) Identify which group of rocks (igneous, metamorphic or sedimentary) is represented by the rock shown in **Figure 1c**. Give reasons for your answer. [3]

Rock group

.....

- (d) Igneous rocks, sedimentary rocks and rocks formed by contact metamorphism each formed at different temperatures. Put these three in order of their temperature of formation by inserting the words **igneous**, **sedimentary** and **contact metamorphic** in **Table 1**. Explain your answer. [4]

Rock normally formed at highest temperature	•
Rock normally formed at intermediate temperature	•
Rock normally formed at lowest temperature	•

Table 1

Explanation

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Total 15 marks

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2. Figure 2a is a geological map. Graptolite Q was found in the rock at locality Q in Figure 2a.

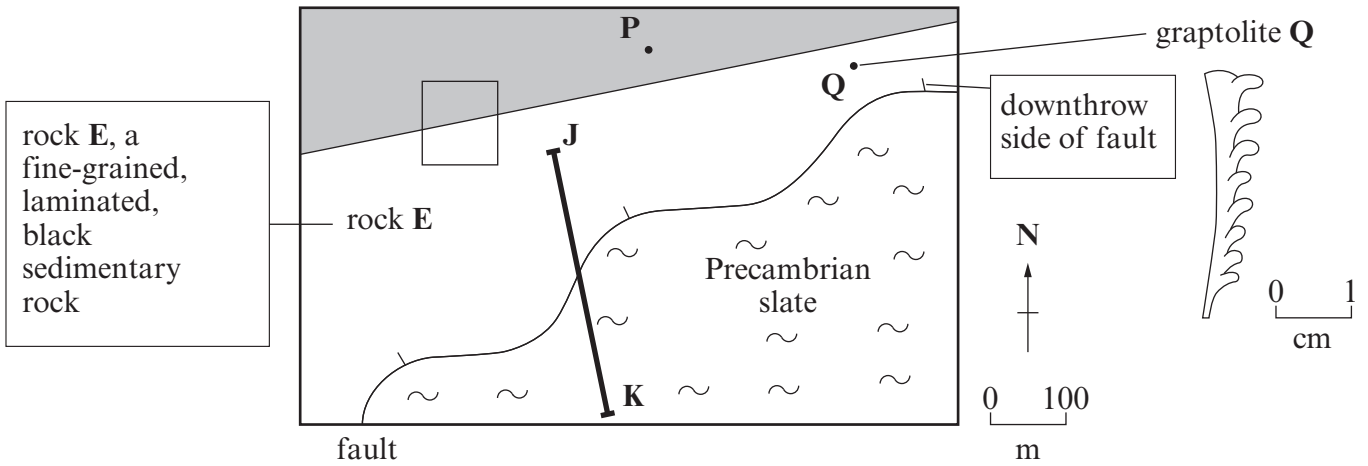


Figure 2a

Refer to Figure 2a.

(a) (i) Identify rock E described in Figure 2a. [1]

.....

(ii) Describe the environment of deposition of rock E. Give reasons for your answer. [3]

.....

(b) Fossil P was found in the rock at locality P in Figure 2a. Fossil P is described as “a graptolite with two stipes growing downwards. There are thecae present on one side of each stipe. Each stipe is 4 cm long.”

Draw below a scaled diagram of fossil P. [4]

- (c) With reference to fossils **P** and **Q**, draw an arrow in the empty box in **Figure 2a** to show the direction of dip of the bedding planes at that location, assuming that the beds have not been overturned. Give reasons for your answer. [3]

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- (d) **Figure 2b** shows 3 cross-sectional models of the geology along the line **J-K** on **Figure 2a**. State which of the 3 models, **1**, **2**, or **3**, is most likely to be the correct interpretation of **Figure 2a**. Give reasons for your choice. [3]

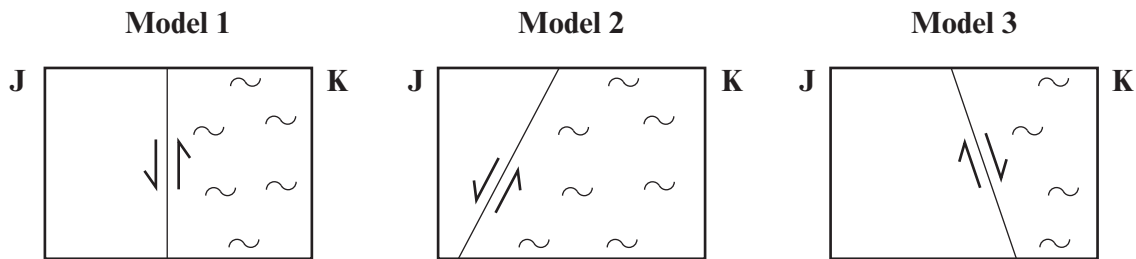


Figure 2b

Correct model

Reasons

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.....

- (e) A student has written that “the slate in **Figure 2a** is most likely to have been formed from rock **E**”. Evaluate this statement. [3]

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Total 17 marks

3. **Figure 3a** is a cross-section through a folded sequence of rocks. The strike directions of the beds are to the East and West. Bed 1 is older than bed 2.

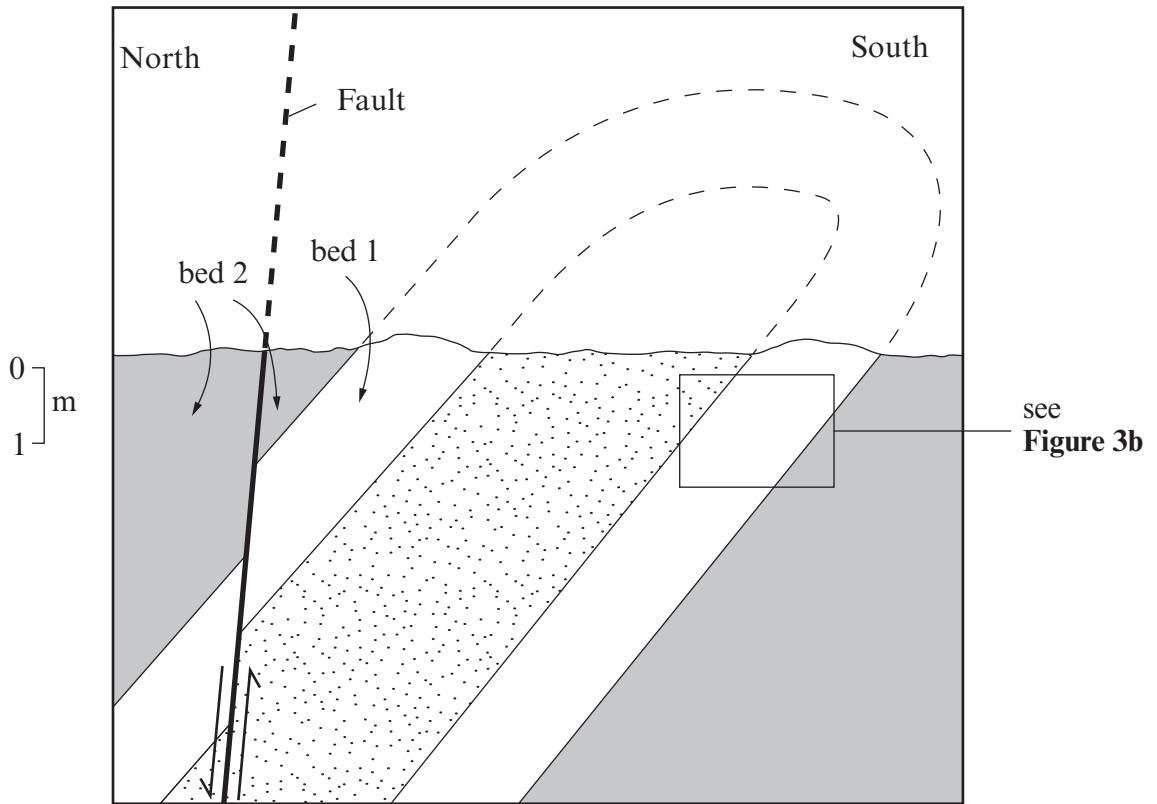


Figure 3a

- (a) (i) Draw a fold axis on **Figure 3a**. [1]
 (ii) Describe the fold shown in **Figure 3a**. [2]

.....

- (iii) Describe the tectonic stresses which produced this fold. [2]

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(b) (i) Measure the displacement on the fault. [1]

.....

(ii) The hanging-wall block alongside the fault in **Figure 3a** has moved down. A student suggested that “the fold and the fault were produced under the same tectonic stresses”. Evaluate this statement. [3]

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(c) (i) Name a sedimentary structure which can be used to determine the “way up” of a sedimentary rock. [1]

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(ii) Describe how your chosen sedimentary structure formed. [2]

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(iii) Show, by drawing on **Figure 3b**, how your chosen sedimentary structure would appear on the southern side of **Figure 3a**. [3]

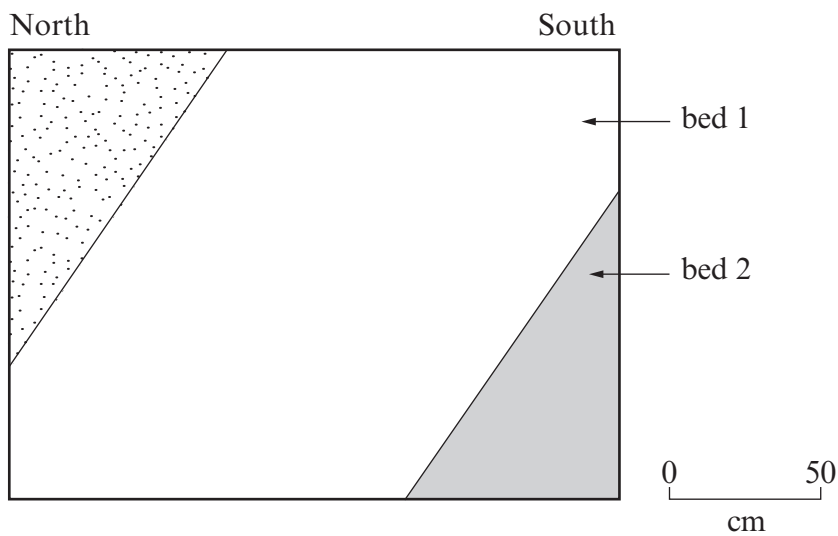


Figure 3b

Total 15 marks

4. **Figure 4a** shows a vertical cross-section through a continuous sequence of lava flows erupted on a continent.

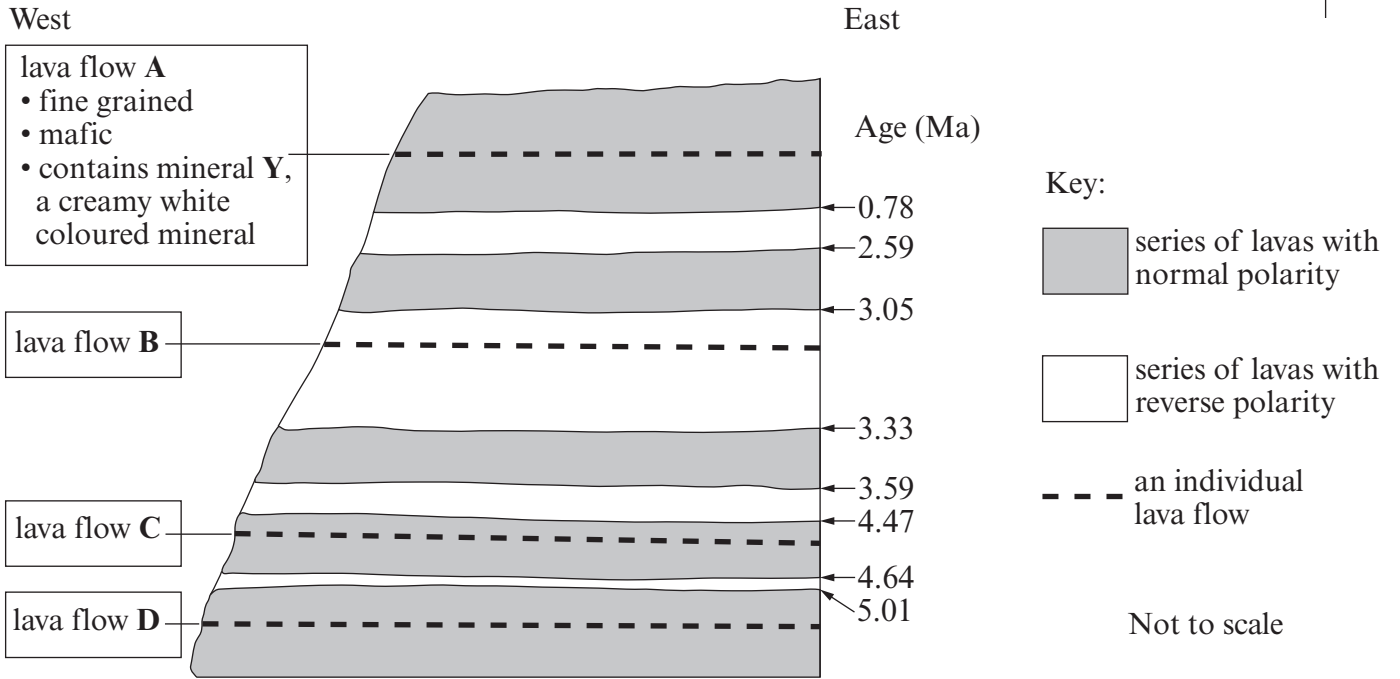


Figure 4a

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

(i) Name the rock forming lava flow A. [1]

.....

(ii) Identify mineral Y in lava flow A. You may wish to use the mineral data sheet. [1]

.....

(iii) Name another mineral most likely to be present in the mafic lava flow A. [1]

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(b) Some of the lava flows in **Figure 4a** have “normal polarity”. Explain what is meant by “normal polarity”. [2]

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.....

(c) The lava flows in **Figure 4a** have been dated by radiometric methods. State which of the lava flows A-D in **Figure 4a** would contain the highest proportion of daughter isotope. Explain your answer. [2]

Lava Flow

Explanation

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Figure 4b shows the magnetic polarity within igneous rocks on an ocean floor.

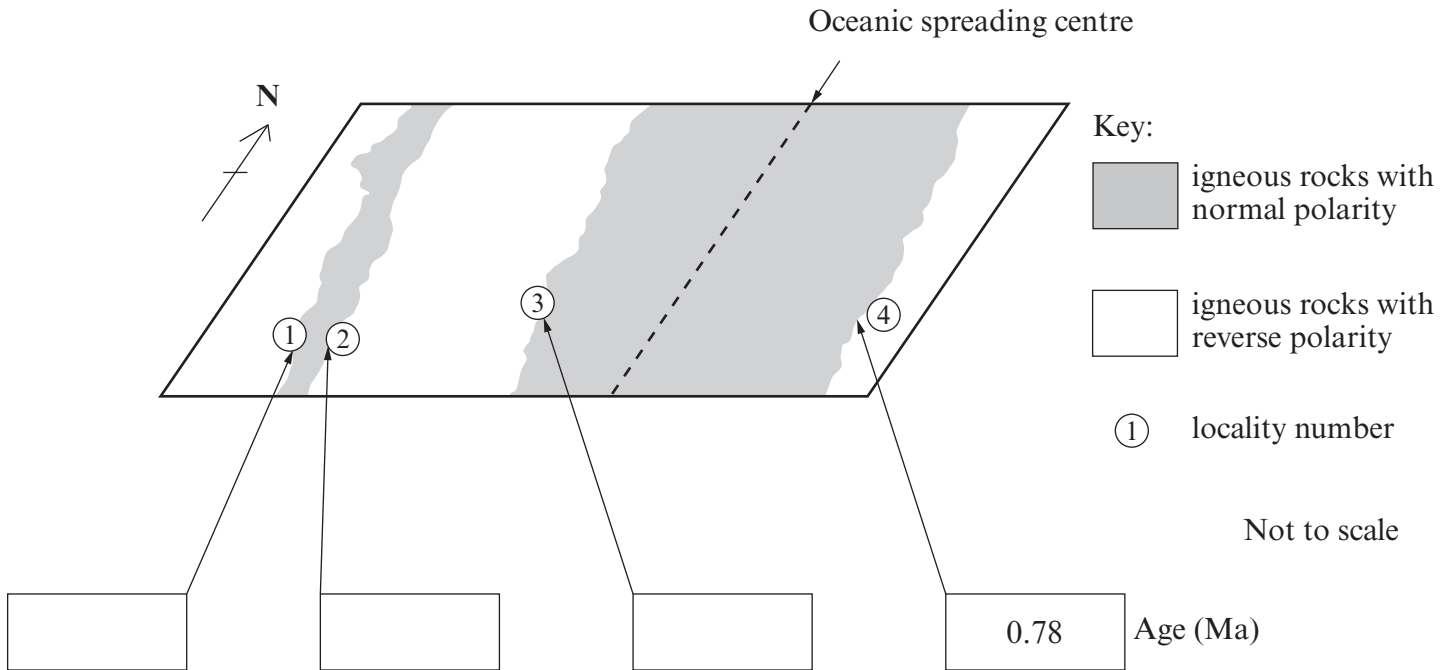


Figure 4b

(d) With reference to Figure 4a, state in the boxes in Figure 4b the age of the ocean floor at localities 1, 2, and 3. [2]

(e) Explain the pattern of magnetic polarity shown in Figure 4b. [4]

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Total 13 marks



GCE AS/A level

1211/01-A

GEOLOGY

MINERAL DATA SHEET FOR USE WITH GL1

January 2011

Name	Cleavage/Fracture	Hardness	Density g cm ⁻³	Streak	Lustre	Colour	Other diagnostic properties
Quartz	*none/conchoidal	7	2.65	scratches streak plate	vitreous	colourless, milky but variable	hexagonal prisms terminated by pyramids
Feldspar Orthoclase	*2 good, 90	*6	2.6	scratches streak plate	vitreous	flesh, pink, white	*simple twin
Feldspar Plagioclase	*2 good, 90	*6	2.7	scratches streak plate	vitreous	creamy-white, grey, colourless	*repeated multiple twin
Mica-muscovite	*1 perfect (basal)	*2.5	2.7-3.1	white	pearly	colourless or pale yellow, green or brown	*flaky
Mica-biotite	*1 perfect (basal)	*2.5-3	2.7-3.1	white	pearly	brown/black	*flaky
Hornblende	*2 good, 60/120	*5-6	3.0-3.5	scratches streak plate	vitreous	black, dark green	prismatic crystals
Augite	*2 good, 90	*5-6	3.2-3.5	scratches streak plate	vitreous	greenish black	prismatic crystals
Olivine	none/conchoidal	*6-7	3.2-4.3	scratches streak plate	vitreous	*olive green	
Chiaustolite/Andalusite	poor 1/ uneven fracture	7.5	3.1-3.3	scratches streak plate	vitreous	pearl 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
Chlorite	1 good (basal)	*2	2.6-2.9	white	pearly	green	fibrous/flaky as massive, tabular crystals
Calcite	*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	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
Gypsum	1 good (basal)	*1.5-2	2.3	white	silky, pearly	colourless, white, often stained	cubic crystals, often stained fibrous, or twinned crystals
Barites	2 good, 90	*3-3.5	*4.5	white	vitreous, resinous	white, pink	bladed crystals
Chalcocopyrite	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 skin/steel grey	kidney shaped masses, fibrous

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

This table should not be memorised.

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