Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1211/01

S15-1211-01

GEOLOGY – GL1
Foundation Unit

A.M. MONDAY, 11 May 2015

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**15**	
2.	**14**	
3.	**15**	
4.	**16**	
Total	**60**	

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ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- the Mineral Data Sheet;
- a calculator.

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.

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Answer **all** *questions.*

1. **Figure 1a** is a map showing an igneous rock intruded into orthoquartzite. **Table 1b** shows how the average crystal size varies between **A** and **B** on **Figure 1a**.

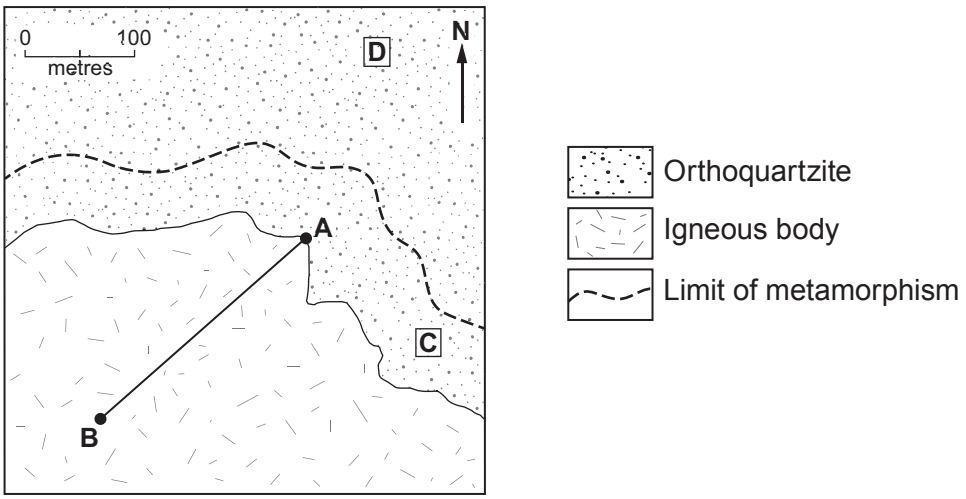

Figure 1a

Distance from **A** (metres)	0	50	100	150	200	250
Crystal size (millimetres)	0.5	5	6	7	7.5	8

Table 1b

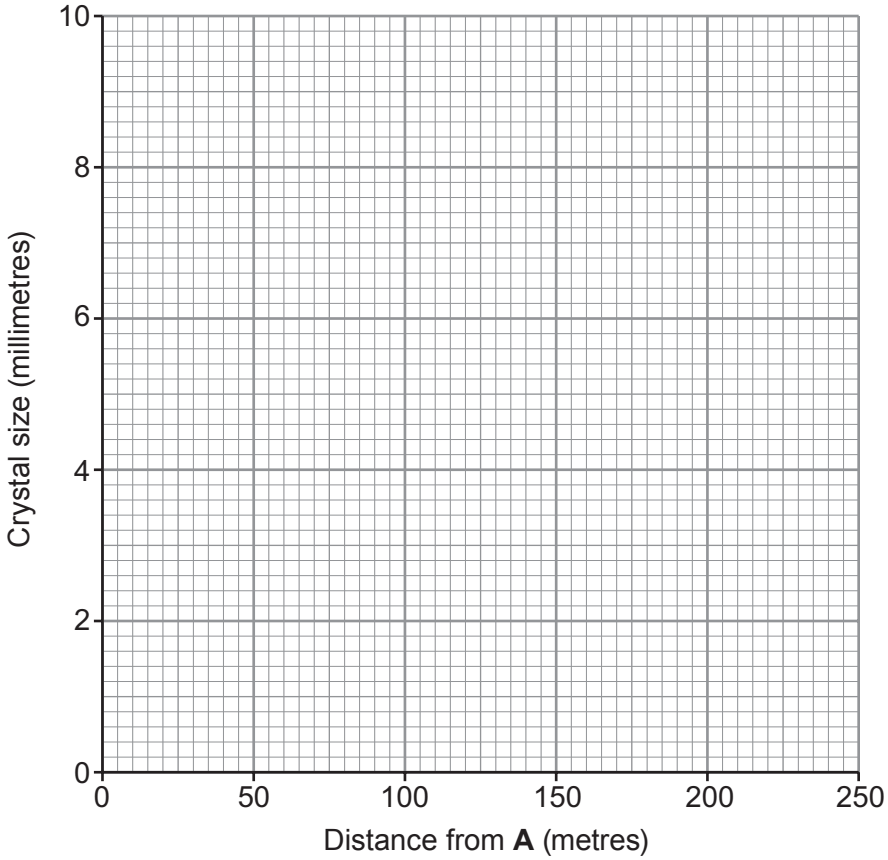

Figure 1c

Examiner only

(a) Refer to **Figure 1a** and **Table 1b**.

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

(ii) Explain the variation in crystal size between locations **A** and **B** in **Figure 1a**. [2]

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(b) **Figure 1d** shows a specimen from the igneous intrusion shown in **Figure 1a**. The specimen was collected at location **B** on **Figure 1a**.

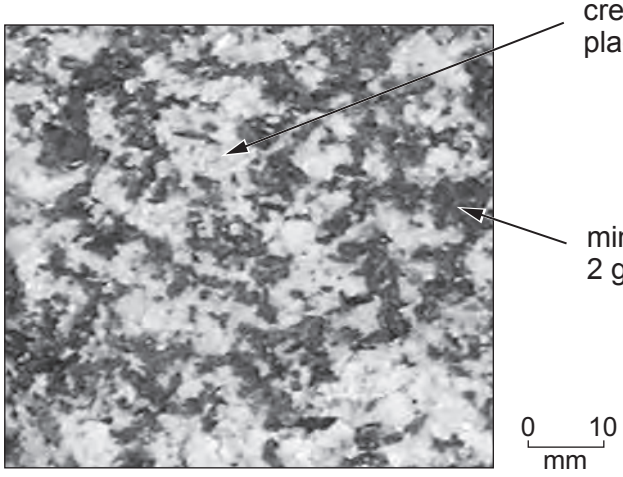

Figure 1d

(i) Using the Mineral Data Sheet, identify mineral **F**. [1]

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(ii) Which **three** terms below best describe the igneous rock shown in **Figure 1d**? Tick only **three** boxes. [2]

☐	☐	☐	☐	☐	☐
foliated	porphyritic	mafic	equigranular	crystalline	silicic

(iii) Name the igneous rock shown in **Figure 1d**. [1]

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(c) (i) Complete **Figure 1e** below to show the texture of a sample of metaquartzite with a mean crystal size of 1.5 mm representative of location **C** on **Figure 1a**. [3]

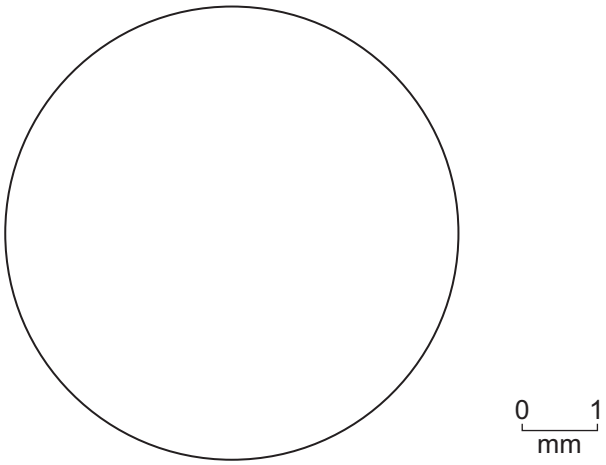

Figure 1e

(ii) Compare the mineral composition and texture of the rocks found at locations **C** and **D** on **Figure 1a**. Explain your answers. [4]

Mineral composition .....

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Texture .....

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2. **Figure 2** shows a roadside rock exposure with the fossils and structures contained in each of the sedimentary units.

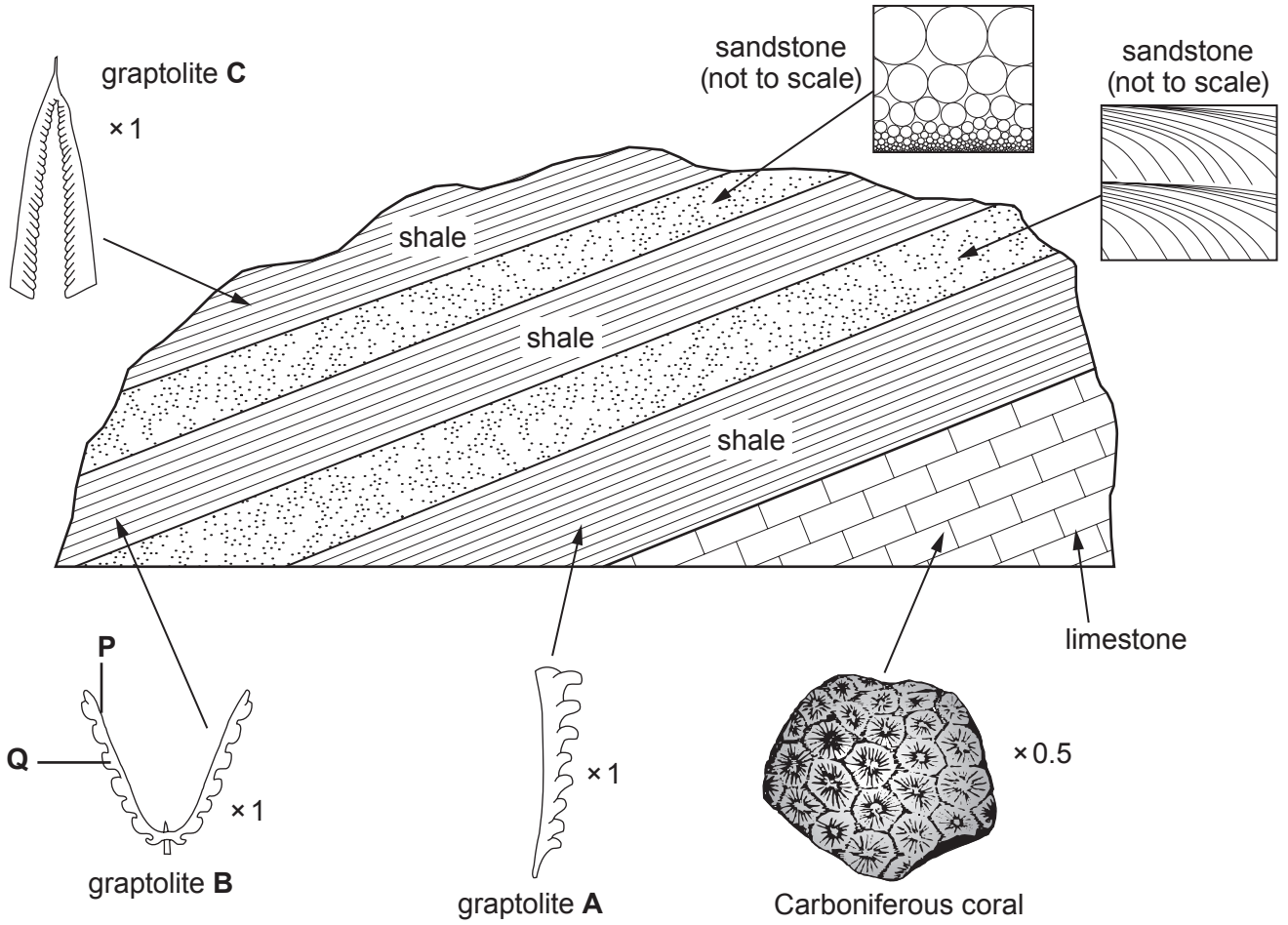

Figure 2

Refer to **Figure 2**.

(a) (i) Name the morphological features of graptolite **B** labelled **P** and **Q**. [2]

P ..... **Q** .....

(ii) Describe **two** differences in the morphological features of graptolites **A** and **C**. [2]

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(b) (i) The graptolites in **Figure 2** have been replaced by a *brass yellow coloured mineral with a metallic lustre*. Using the Mineral Data Sheet, identify the mineral most likely to have replaced the original organic matter of the graptolites. [1]

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(ii) All the graptolite fossils shown in **Figure 2** are casts. Describe the geological processes that have led to this type of preservation. [3]

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(iii) Graptolites are considered to be useful zone fossils in relative dating and correlation in the Palaeozoic. Using **Figure 2** and your knowledge, describe **three** factors that enable graptolites to be useful as zone fossils. [3]

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(c) The strata in **Figure 2** are overturned. Explain the reasons that would support this statement. [3]

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Turn over.

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3. **Figure 3a** shows an ocean ridge with a simplified pattern of magnetic reversals in the rocks of the oceanic crust. **Figure 3b** shows the actual pattern of magnetic reversals in the oceanic crust of the Atlantic Ocean and **Figure 3c** shows the time scale for magnetic reversals in the oceanic crust over the last 4.5 million years.

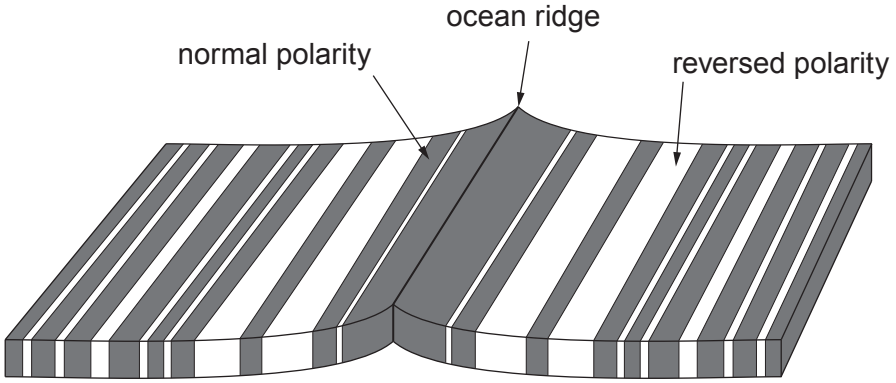

Figure 3a

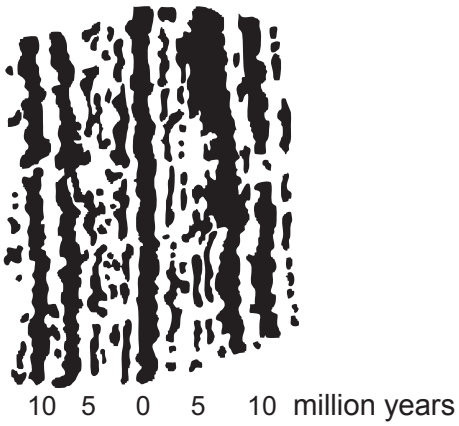

Figure 3b

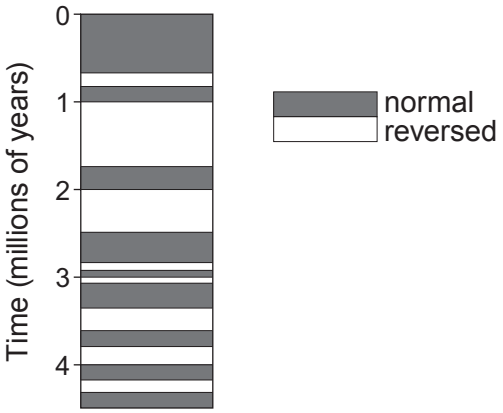

Figure 3c

(a) (i) Name the type of plate margin shown in **Figure 3a**. Tick only **one** box. [1]

☐ convergent ☐ conservative ☐ divergent

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(ii) Describe the pattern shown by the magnetic reversals in **Figure 3a**. [2]

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(iii) Explain how a record of the Earth's magnetic field may be preserved in the igneous rocks of the ocean floor. [3]

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(iv) Explain the age distribution of the rocks of the oceanic crust shown in **Figure 3b**. [3]

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(b) (i) With reference to **Figure 3c** state how long the current period of normal polarity has lasted. [1]

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(ii) Using **Figure 3c** state how many magnetic reversals have occurred during the last 2 million years. Calculate the mean time between magnetic reversals in years. [2]

Number of reversals ☐

Mean time between reversals ☐ years

(iii) Refer to **Figure 3b** and suggest **two** reasons to explain why the actual pattern of magnetic reversals on the sea floor is more complex than the simplified model shown in **Figure 3a**. [3]

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Turn over.

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4. **Figure 4** is a **geological map**. The land in the area is flat.

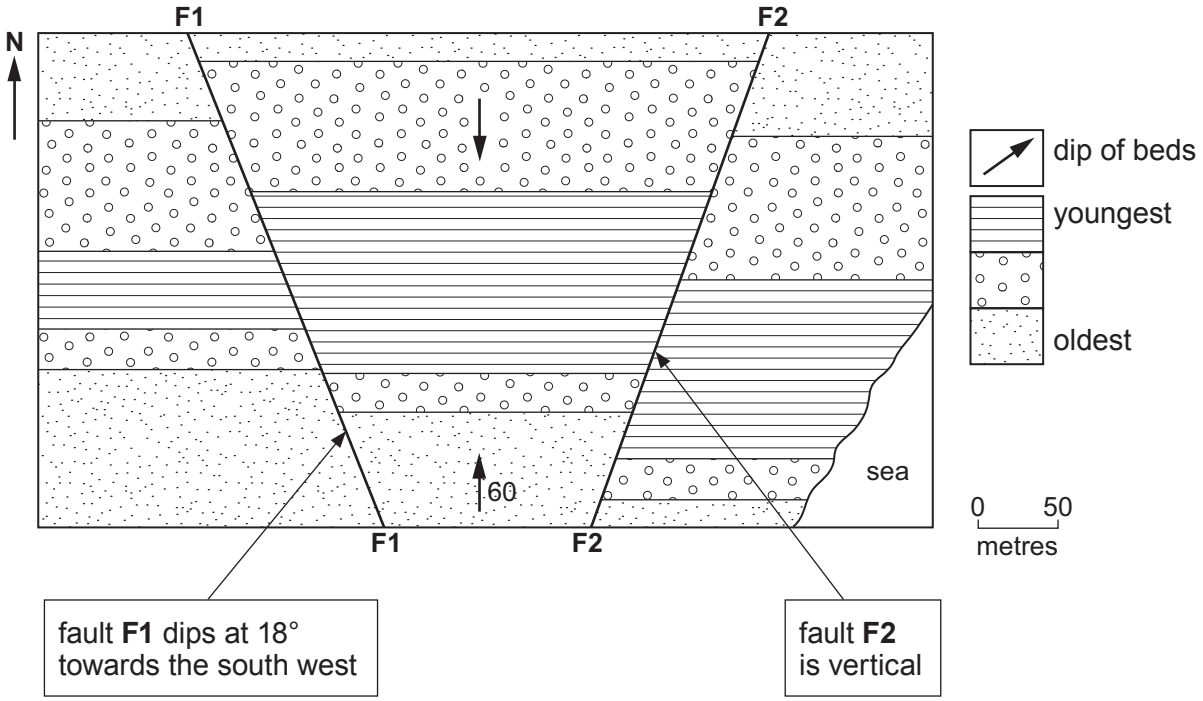

Figure 4

(a) (i) Refer to **Figure 4**. State which **two** of the following statements are **correct**. Tick only **two** boxes. [2]

- ☐ The fold is an anticline
- ☐ The fold has limbs of equal dips
- ☐ The fold is a syncline
- ☐ The fold is younger than the faults
- ☐ The fold has been overturned
- ☐ The northern limb of the fold dips at less than 60°

(ii) Draw in the axial plane trace of the fold to the east of fault **F1** on **Figure 4**. [2]

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(b) (i) Fault **F1** involves vertical movement with a downthrow to the east. State the evidence from **Figure 4** for **F1** being downthrown to the east. [2]

Evidence .....

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(ii) **F1** is a thrust fault. State the evidence for this from **Figure 4**. [2]

Evidence .....

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(c) (i) Fault **F2** shows only strike-slip movement (horizontal displacement). Describe **one** piece of evidence from **Figure 4** to support this statement. [2]

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(ii) Measure the amount of horizontal displacement that has occurred along fault **F2** in metres and state whether the movement has been to the left or right. [2]

Displacement ..... metres

Movement to the .....

(d) A student came to the following conclusions about the geological structures shown in **Figure 4**. State whether or not you agree with each conclusion and give reasons for your answers. [4]

The fold and fault **F1** were formed at the same time and by the same type of stress

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F2 is younger than **F1** .....

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END OF PAPER

GCE AS/A level

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GEOLOGY

MINERAL DATA SHEET FOR USE WITH GL1 AND GL2a

April/May 2015

Name		Cleavage/Fracture	Hardness	Density ($g\,cm^{-3}$)	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	flesh, pink, white	*simple twin
Plagioclase Feldspar	RF	*2 good, 90	*6	2.7	scratches streak plate	vitreous	creamy-white, grey, colourless	*repeated multiple twin
Muscovite Mica	RF	*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	
Chiastolite/ 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
Chlorite		1 good (basal)	*2	2.6-2.9	white	pearly	green	fibrous/flaky as massive, tabular crystals
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 or twinned crystals
Barites		2 good, 90	*3-3.5	*4.5	white	vitreous, resinous	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 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.