Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1211/01

GEOLOGY - GL1
FOUNDATION UNIT

P.M. FRIDAY, 18 May 2012

1 hour

		Examiner only
1.	**14**	
2.	**17**	
3.	**17**	
4.	**12**	
Total	**60**	

1211
010001

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.

Examiner only

GL1 – FOUNDATION GEOLOGY

Answer **all** *questions.*

1. **Figure 1a** shows an assemblage of fossils on a bedding surface of rock **R**.

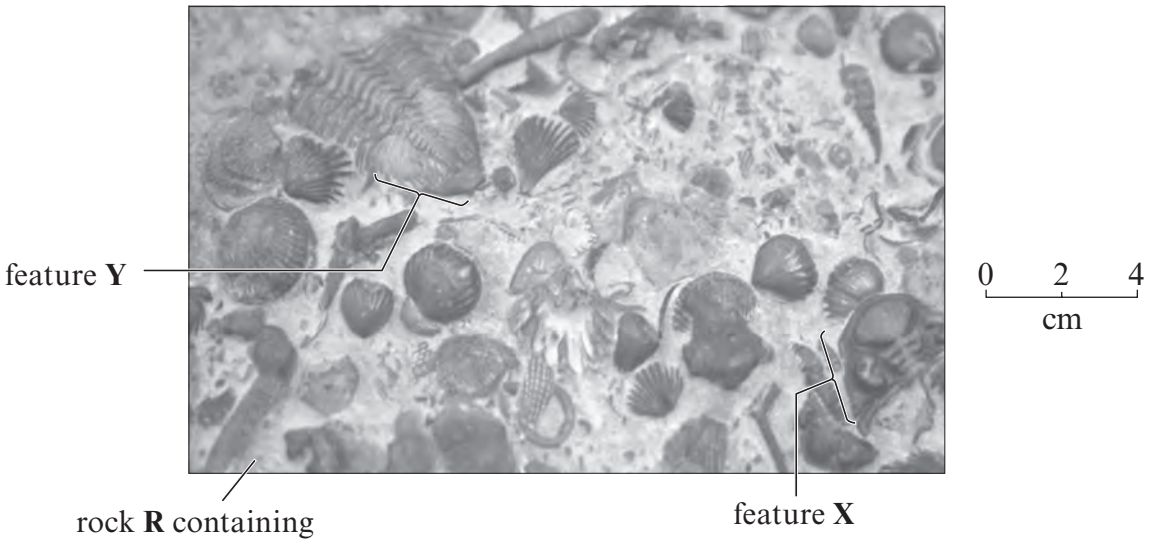

Figure 1a

Source: www.britainloveswikipedia.org
Author: Mike Peel

(a) Refer to **Figure 1a**.

(i) Name the hard parts labelled **X** and **Y**. [2]

Hard part **X** .....

Hard part **Y** .....

(ii) State which of the following rocks is most likely to be rock **R**. [1]

Limestone Shale Conglomerate Granite

Rock **R** .....

(b) With reference to **Figure 1a** describe the environment in which rock **R** was deposited. Give reasons for your answer. [3]

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(c) A student has concluded that the fossils in **Figure 1a** are preserved as a *life assemblage*. Evaluate this statement, giving your reasons. [3]

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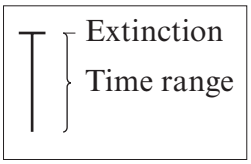
Figure 1b shows the time ranges of selected trilobite species (**A-E**).



Time zone	Trilobite species A	B	C	D	E
4					
3					
2					
1					

Figure 1b

(d) Refer to **Figure 1b**.

(i) A bedding surface contains specimens of species **A** and **C**. State during which time zone (**1-4**) it is most likely to have been deposited. Give a reason for your answer. [2]

Time Zone .....

Reason .....

.....

(ii) A bedding surface contains specimens of species **B**, **D** and **E**. One of these is a derived fossil. State during which time zone (**1-4**) the bedding surface was deposited. Explain your reasoning. [3]

Time Zone .....

Explanation .....

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.....

Total 14 marks

Examiner only

2. **Figure 2a** shows the travel paths of P-waves and S-waves for an earthquake. **Figure 2b** shows a seismogram for the earthquake shown in **Figure 2a**.

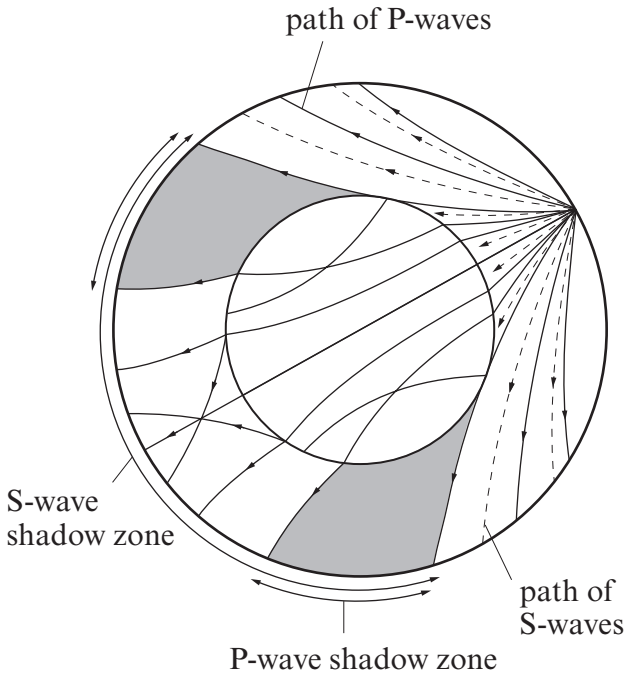

Figure 2a

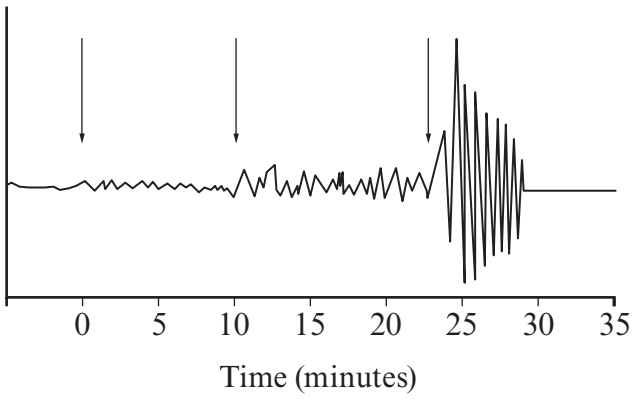

Figure 2b

(a) (i) Show the epicentre of this earthquake on **Figure 2a**, with an arrow labelled **E** (**E** ⟶). [1]

(ii) Explain why no S-waves are recorded in the S-wave shadow zone. [2]

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(b) (i) Label **each** of the three arrows on **Figure 2b** to indicate the first arrival of the following seismic waves. [2]

Surface **P** **S**

(ii) Explain why the three different types of seismic waves first arrive at different times on the seismogram. [2]

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(iii) Indicate on **Figure 2a** with an arrow labelled **N** (**N** →), a likely location on the Earth's surface where a seismic station could have recorded the seismogram shown in **Figure 2b**. Give a reason for your answer. [2]

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(c) **Figure 2c** shows the travel times (in minutes) for one of the types of seismic wave generated by an earthquake in New Zealand. The wave was not recorded in the shaded area.

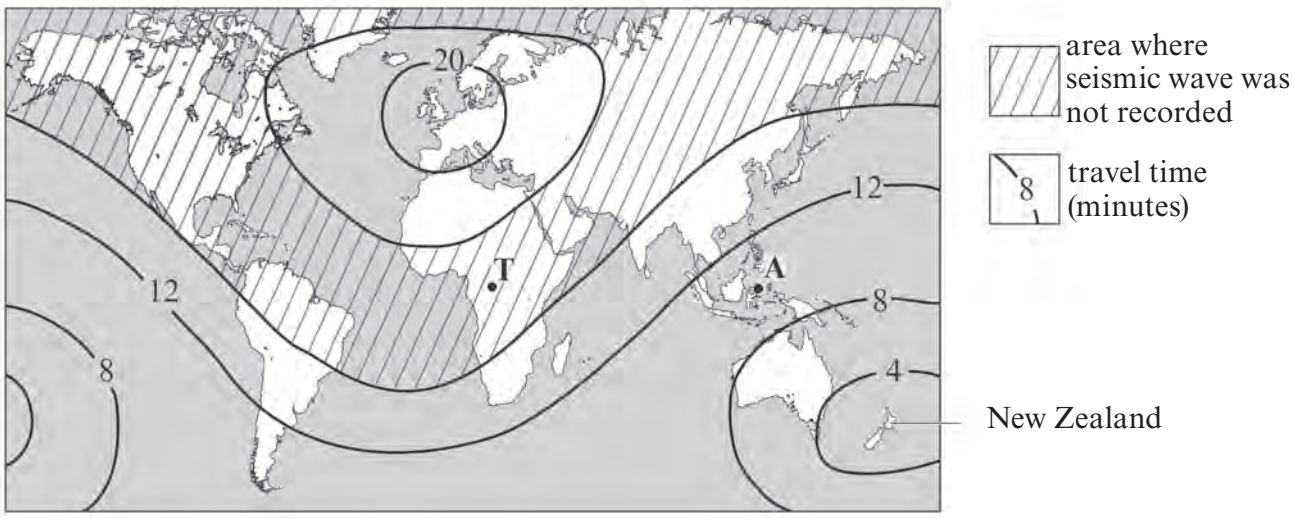

Figure 2c

Refer to **Figure 2c.**

(i) The seismic wave travel path from the epicentre in New Zealand to seismic station **A** is 6600 km long. Calculate the mean velocity of these seismic waves (in km/second) reaching station **A**. Show your working. [3]

..... km/second

(ii) With reference to **Figure 2a** state for which type of seismic wave (**P**, **S** or **Surface**) the travel times are shown on **Figure 2c**. Give reasons for your answer. [3]

Type of seismic wave .....

Reasons .....

.....

.....

Examiner only

(iii) State which type of seismic wave (**P**, **S** or **Surface**) might be recorded at location **T** on **Figure 2c**. Explain your answer. [2]

Type of seismic wave .....

Explanation .....

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Total 17 marks

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QUESTION 3 ON NEXT PAGE

Examiner only

3. **Figure 3** is a student's field sketch showing the geology in the floor and vertical face of a quarry.

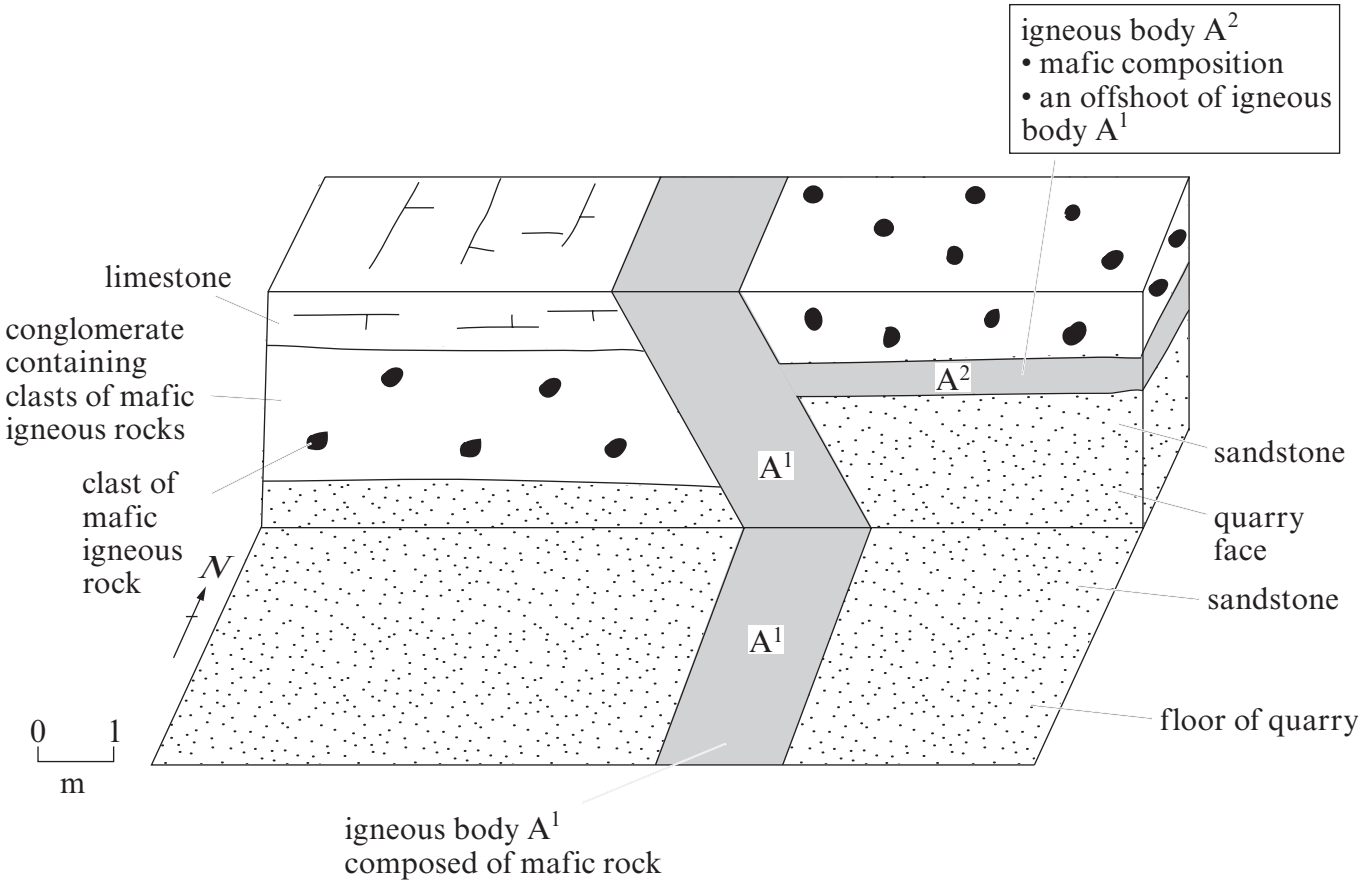

Figure 3

(a) (i) Complete **Table 3** to describe the orientation of igneous body **A[1]** in **Figure 3**. [3]

Strike	•
Angle of dip	•
Direction of dip	•

(ii) Identify the type of igneous body (dyke, sill, pluton, lava flow) represented by igneous body **A[1]**. Give reasons for your answer. [3]

Type .....

Reasons .....

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Examiner only

(b) The student concluded that igneous body **A[1]** formed along the line of a fault showing normal movement. Evaluate, with reasons, the student's conclusion. [3]

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(c) The *principle of superposition* and the *law of included fragments* can be used as relative dating techniques.

(i) Using an example from **Figure 3**, state and explain what is meant by the *principle of superposition*. [3]

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(ii) Using an example from **Figure 3**, explain what is meant by the *law of included fragments.* [2]

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(iii) State the relative age (older, younger, same age) of the **clasts** of mafic igneous rock in the conglomerate and **igneous body A[2]**. Give reasons for your answer. [3]

Relative age of the clasts .....

Reasons .....

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Total 17 marks

Examiner only

4. **Figure 4a** is a cross-section showing the geological features associated with a fold with limbs dipping towards the east and west. **Figure 4b** shows the detail of feature **M** in **Figure 4a**. **Figure 4c** shows the detail of load casts and flame structures on an original bedding plane between the slate and metaquartzite layers.

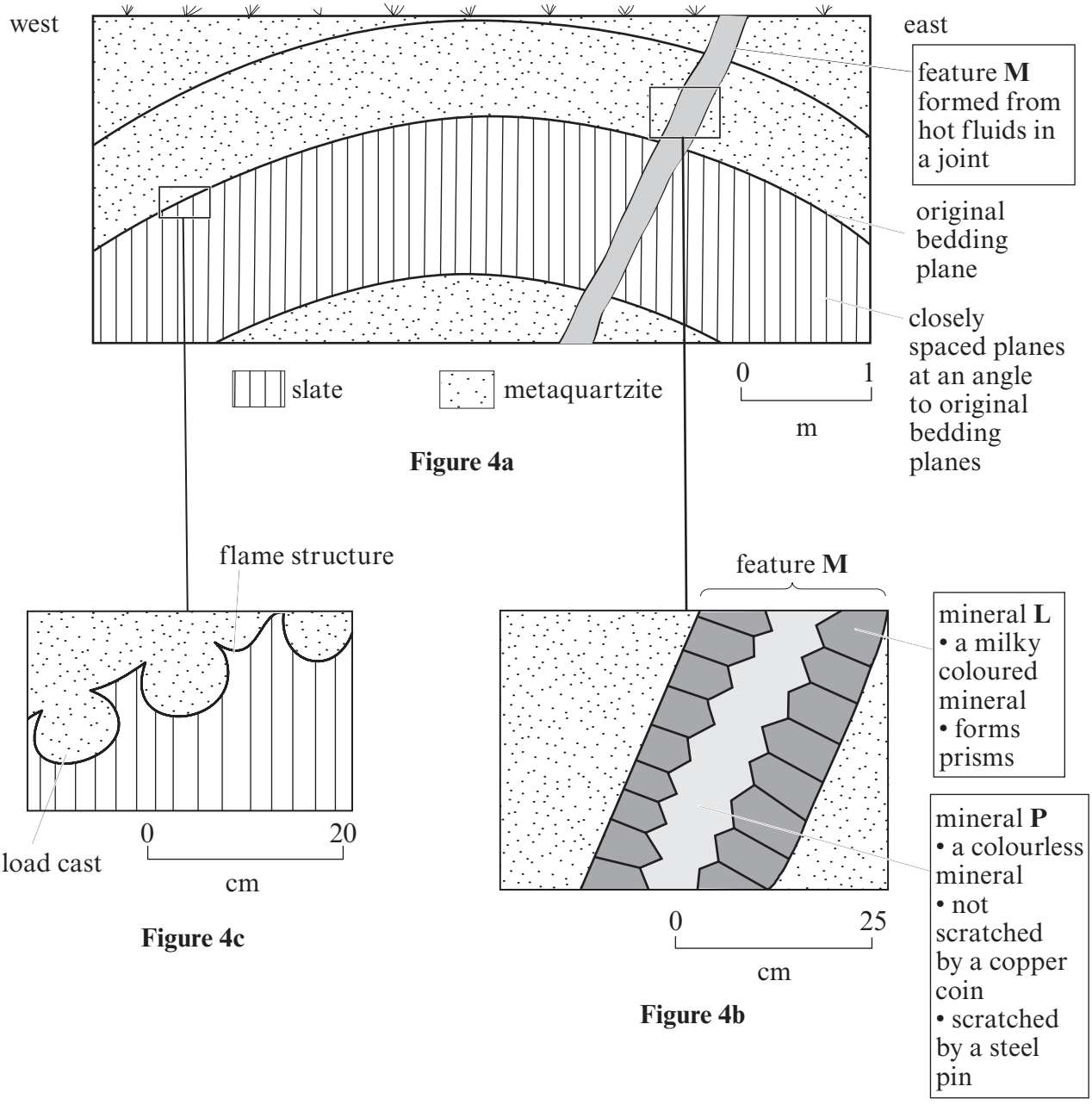

Figure 4a

Figure 4c

Figure 4b

(a) (i) Name feature **M** in **Figures 4a** and **4b**. [1]

Name .....

(ii) With reference to the **Mineral Data Sheet** identify minerals **L** and **P** in **Figure 4b**. [2]

Mineral **L** .....

Mineral **P** .....

Examiner only

(b) Refer to **Figure 4c**.

(i) Describe how the load casts and flame structures were formed. [2]

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(ii) Explain how the load casts and flame structures can be used to confirm that the fold in **Figure 4a** is an anticline. [3]

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(c) The rocks in **Figure 4a** were originally sedimentary rocks which have since been altered. Describe the conditions which resulted in the alteration of these rocks. Give reasons for your answer. [4]

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Total 12 marks

GCE AS/A level

1211/01-A
1212/01-A

GEOLOGY

MINERAL DATA SHEET FOR USE WITH GL1 and GL2a

May 2012

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 <u>not</u> 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.

GCE AS/A level

1211/01-A
1212/01-A

GEOLOGY

MINERAL DATA SHEET FOR USE WITH GL1 AND GL2a

May 2012

CJ*(S12-1211-01A)MLP

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
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