Candidate Name	Centre Number	Candidate Number
		2

GCE AS/A level

1211/01

GEOLOGY - GL1
FOUNDATION UNIT

A.M. THURSDAY, 19 May 2011

1 hour

		Examiner only
1.	**17**	
2.	**15**	
3.	**15**	
4.	**13**	
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.

GL1 – FOUNDATION GEOLOGY

Answer **all** *questions.*

1. **Figure 1** shows some of the plate tectonic features of northwest America.

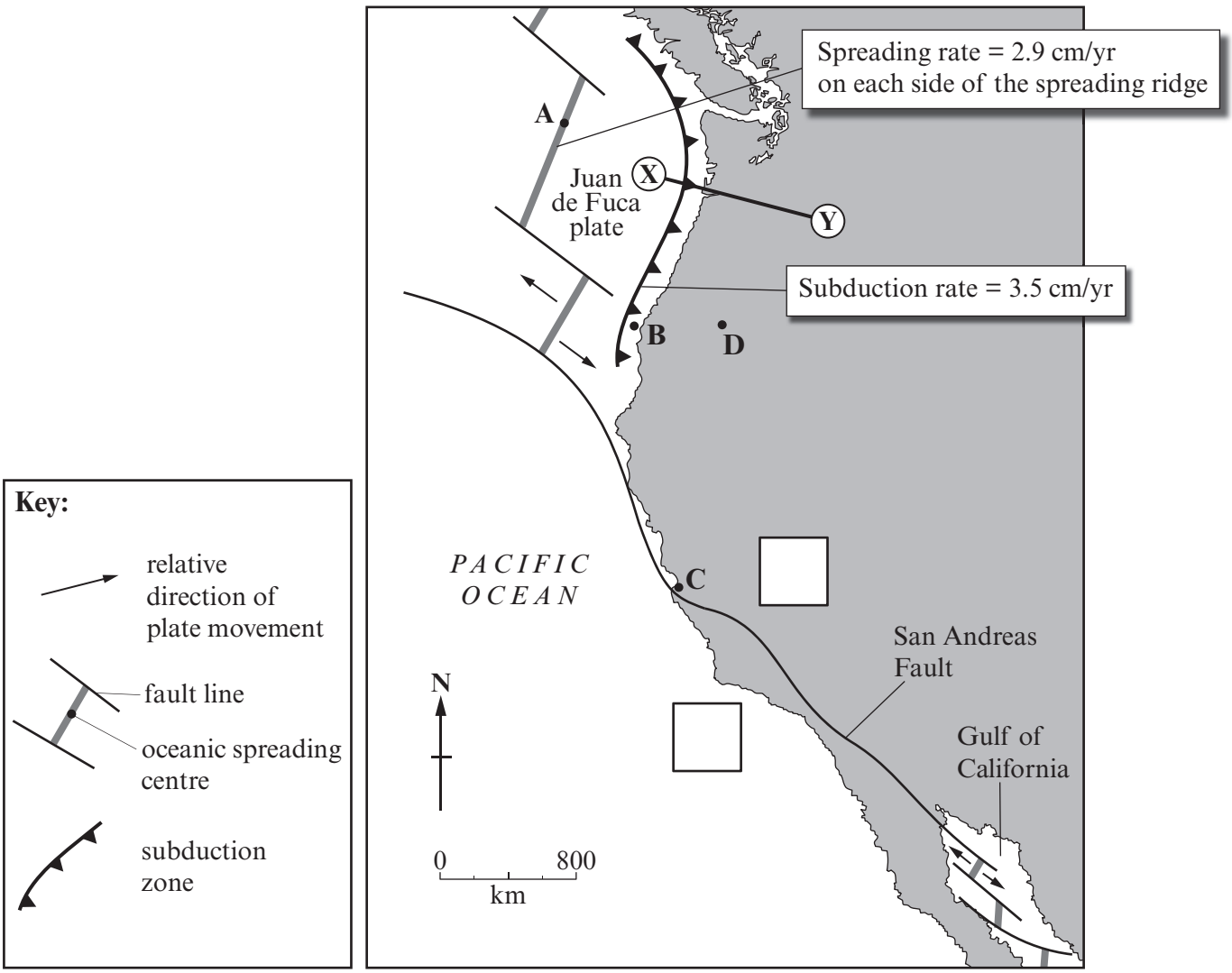

Figure 1

Refer to **Figure 1**.

(a) (i) Indicate with an arrow in each of the blank boxes on **Figure 1** the relative direction of plate movement either side of the San Andreas Fault. [1]

(ii) **Figure 1** shows 3 types of plate boundary:

Convergent Divergent Conservative

Indicate which type of plate boundary is present at localities **A**, **B** and **C** by completing **Table 1**. [2]

Locality	**Plate Boundary** Convergent, Divergent, Conservative
A	•
B	•
C	•

Table 1

(b) (i) Explain why earthquakes occur along the San Andreas Fault. [3]

.....

.....

.....

.....

(ii) Describe how the depth of focus of earthquakes changes along the line from **X** to **Y**. Explain your answer. [3]

Description .....

.....

Explanation .....

.....

.....

Examiner only

(c) (i) State beneath which locality **A**, **B**, **C** or **D**, magma of basaltic composition is most likely to originate. [1]

Locality .....

(ii) Explain the origin of this basaltic magma. [2]

.....

.....

.....

(d) Describe how the width of the Gulf of California is most likely to change over the next 10 million years. Give reasons for your answer. [3]

.....

.....

.....

.....

(e) Describe how the size of the Juan de Fuca plate is most likely to change over the next 10 million years. Give a reason for your answer. [2]

.....

.....

.....

Total 17 marks

2. **Figure 2a** shows the simplified features of a polished surface containing two rocks, rock **E** which is igneous, and rock **F**. A student has measured the maximum dimension of 100 crystals in rock **E**. The results have been recorded in **Table 2**.

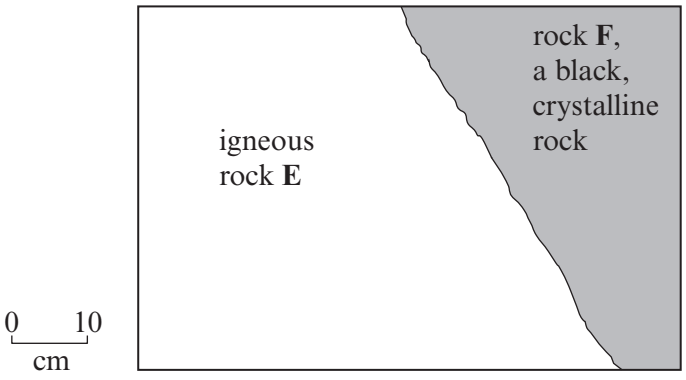

Figure 2a

Crystal size (x) (mm)	Frequency
$0 < x \leqslant 2$	0
$2 < x \leqslant 4$	9
$4 < x \leqslant 6$	69
$6 < x \leqslant 8$	0
$8 < x \leqslant 10$	0
$10 < x \leqslant 12$	3
$12 < x \leqslant 14$	12
$14 < x \leqslant 16$	7

Table 2

(a) (i) Complete the histogram **Figure 2b** using the data in **Table 2**. [2]

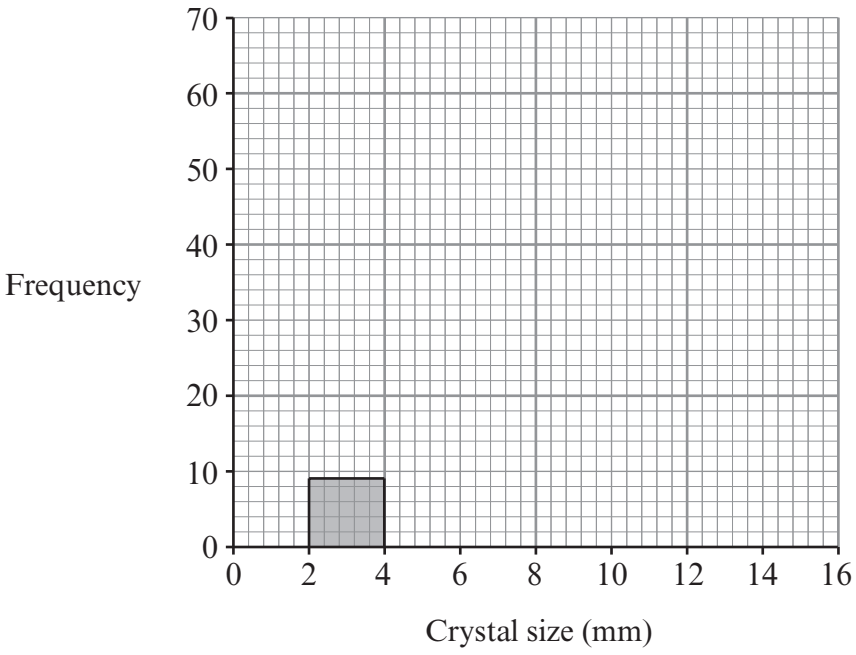

Figure 2b

(ii) Draw in **Figure 2c**, making use of the scale, the texture of igneous rock **E**. [3]

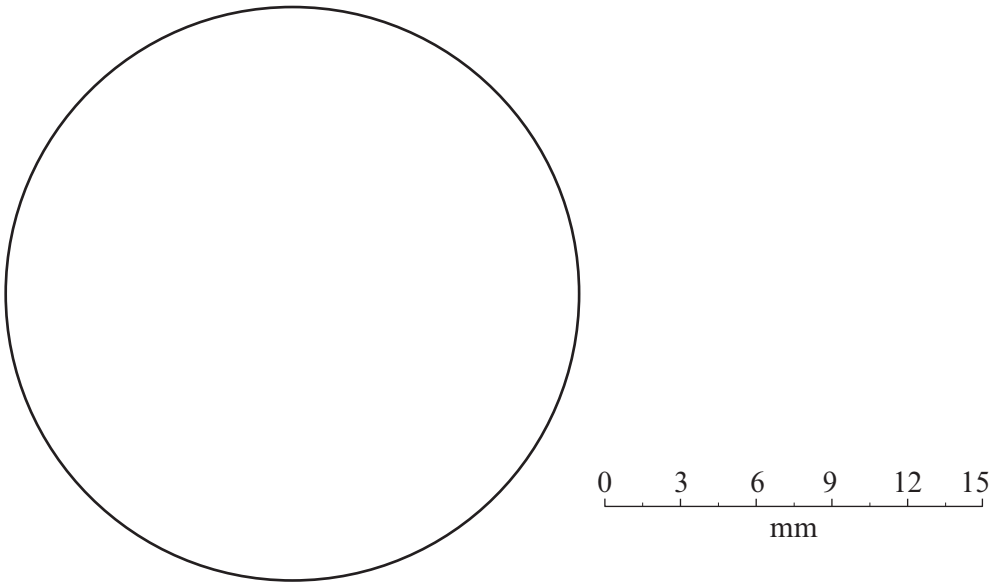

Figure 2c

(iii) Explain the origin of the texture of igneous rock **E**. [3]

.....

.....

.....

.....

(b) The student also measured and recorded the percentages of different minerals in rock **E**. These data are presented in the pie chart **Figure 2d**.

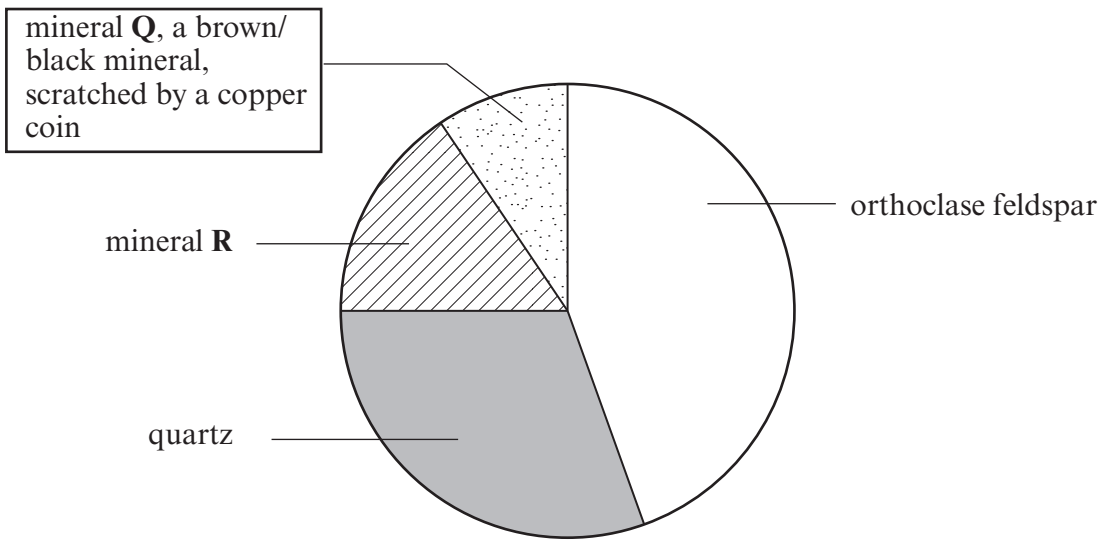

Figure 2d

(i) State the name of mineral **Q** in **Figure 2d**. You may wish to make use of the **Mineral Data Sheet**. [1]

.....

(ii) Using your knowledge, name the mineral most likely to be represented by mineral **R** in **Figure 2d**. [1]

.....

(iii) With reference to **Table 2** and **Figure 2d**, name igneous rock **E**. Give reasons for your answer. [3]

Name .....

Reasons .....

.....

.....

(c) Rock **F** in **Figure 2a** is a black, crystalline rock with a very different composition from rock **E**. Using your knowledge and the information in **Figure 2a**, suggest a possible reason for the presence of rock **F** alongside rock **E**. [2]

.....

.....

.....

Total 15 marks

Examiner only

3. **Figures 3a** and **3b** are thin sections of two sandstones **G** and **H**.

Sandstone **G**

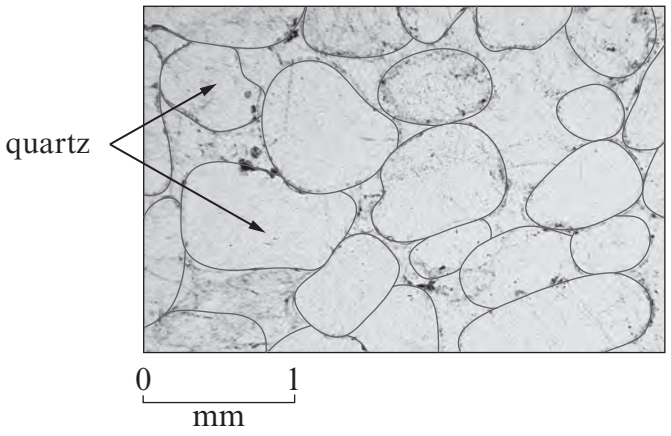

Figure 3a

Sandstone **H**

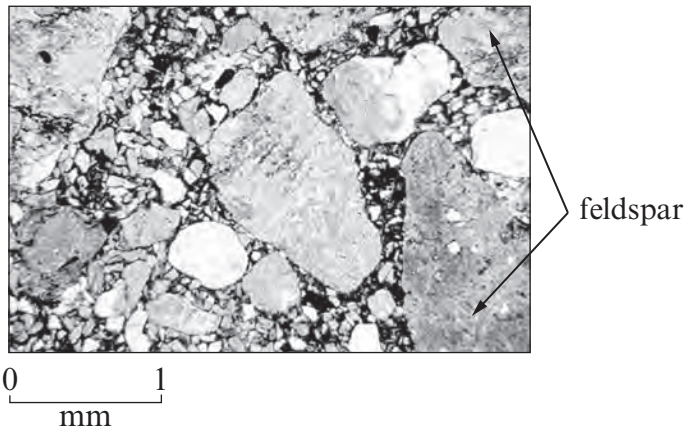

Figure 3b

(a) Describe the texture of sandstone **G** shown in **Figure 3a**. [3]

.....

.....

.....

.....

(b) Sandstone **G** is composed mostly of quartz. Assuming that both sandstones **G** and **H** originated from erosion of the **same** original rock, explain why quartz has survived to form sandstone **G** whereas feldspar has not. You may wish to refer to the **Mineral Data Sheet**.

[3]

.....

.....

.....

.....

(c) Select from the list below the most appropriate name for sandstones **G** and **H**. [2]

orthoquartzite **breccia** **metaquartzite** **arkose**

Sandstone **G** .....

Sandstone **H** .....

Examiner only

Figure 3c shows fragments of organisms typically found as fossils in sandstone **G**. **Figure 3d** is a sedimentary structure typically seen on the top surface of a bed in sandstone **G**.

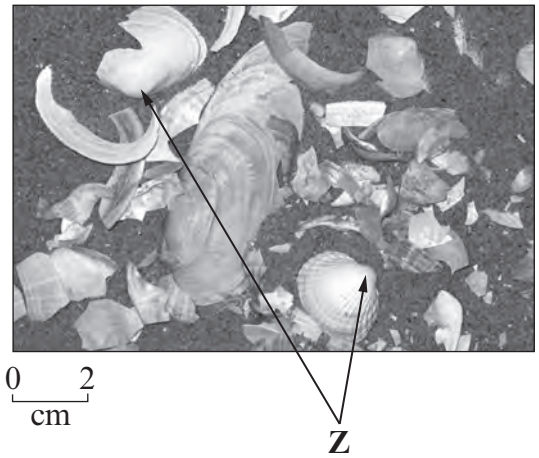

Figure 3c

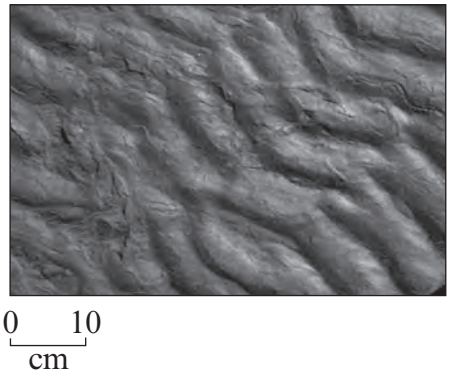

Figure 3d

(d) (i) Name feature **Z** in **Figure 3c**. [1]

.....

(ii) Name the fossil group found in sandstone **G**, represented in **Figure 3c**. [1]

.....

(iii) Name the sedimentary structure shown in **Figure 3d**. [1]

.....

(e) With reference to **Figures 3a**, **3c** and **3d** describe the most likely environment of deposition of sandstone **G**. Give reasons for your answers. [4]

.....

.....

.....

.....

.....

Total 15 marks

1211 010009

4. **Table 4** shows information about radioactive isotopes and their relationship to the number of half-lives elapsed.

Number of half-lives elapsed	% parent isotope	% daughter isotope
0	100	0
1	•	50
2	•	•

Table 4

(a) State what is meant by a *half-life*. [1]

.....

.....

(b) Complete **Table 4** to show the percentage of parent and daughter isotopes. [2]

(c) A rock contains a radioactive mineral with a percentage of parent isotopes of 6.25%. Calculate the number of half-lives which have elapsed since the mineral formed. Show your working. [2]

Number of half-lives .....

(d) **Figure 4** is a geological map with the geology in the northeast corner of the area not completed.

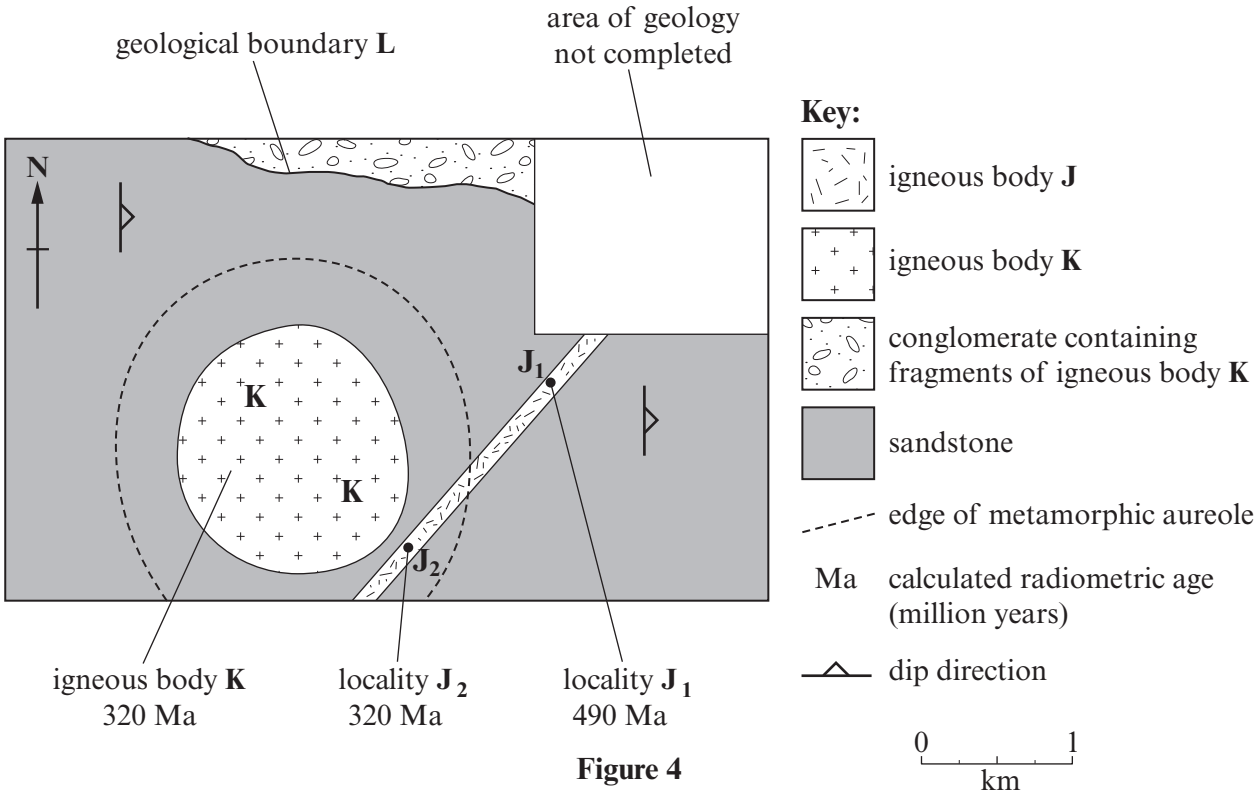

Figure 4

(i) State the type of igneous body (pluton, dyke, sill, lava flow) represented by igneous body **J** in **Figure 4**. Give reasons for your answer. [3]

Type of igneous body .....

Reasons .....

.....

.....

(ii) With reference to **Figure 4** state the most likely reason why the calculated radiometric age of igneous body **J** is younger at locality J_2 than at locality J_1. [1]

.....

.....

(iii) Complete **Figure 4** by drawing the likely positions of igneous body **J** and geological boundary **L** to show their relative ages within the blank area in the northeast corner. Give reasons for your answer. [4]

Reasons .....

.....

.....

.....

Total 13 marks

GCE AS/A level

1211/01-A
1212/01-A

GEOLOGY

MINERAL DATA SHEET FOR USE WITH GL1 and GL2a

May 2011

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
Feldspar Orthoclase RF	*2 good, 90	*6	2.6	scratches streak plate	vitreous	flesh, pink, white	*simple twin
Feldspar Plagioclase RF	*2 good, 90	*6	2.7	scratches streak plate	vitreous	creamy-white, grey, colourless	*repeated multiple twin
Mica-muscovite RF	*1 perfect (basal)	*2.5	2.7-3.1	white	pearly	colourless or pale yellow, green or brown	*flaky
Mica-biotite 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	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 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.