| Surname | Centre Number | Candidate Number |
|---|---|---|
| Other Names | | 2 |

# GCE AS/A level

1211/01

# GEOLOGY – GL1
## Foundation Unit

A.M. TUESDAY, 13 May 2014

1 hour

| For Examiner's use only | | |
|---|---|---|
| **Question** | **Maximum Mark** | **Mark Awarded** |
| **1.** | **17** | |
| **2.** | **14** | |
| **3.** | **14** | |
| **4.** | **15** | |
| **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 road cutting exposure showing the true dip of the sedimentary units.

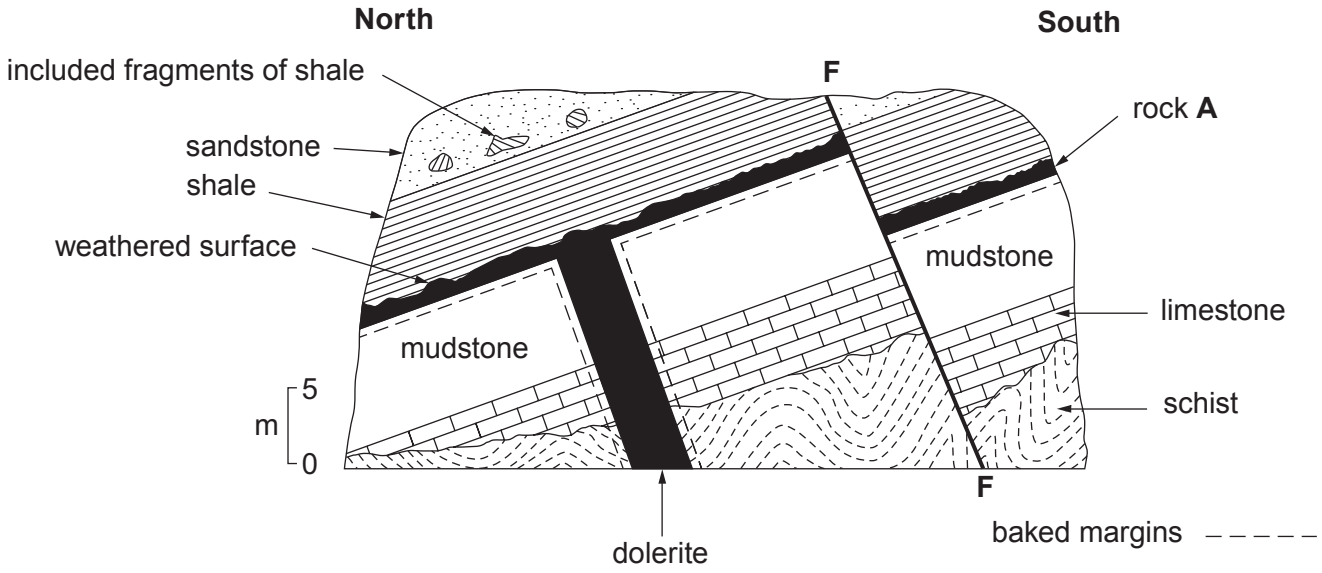


**Figure 1a**

*(a)* (i) State the dip direction of the limestone shown in **Figure 1a**. [1]

.....

(ii) State the youngest rock shown in **Figure 1a** and give **one** reason to explain your answer. [2]

.....

.....

*(b)* (i) A student **incorrectly** concluded that rock **A** on **Figure 1a** is a sill. Identify **two** pieces of evidence from **Figure 1a** which suggest that it is **not** a sill. [2]

1. .....

2. .....

(ii) Suggest **one** similarity and **one** difference in the texture and/or mineralogy you might expect to observe when comparing rock **A** and the dolerite shown on **Figure 1a**. [2]

*Similarity* .....

*Difference* .....

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*(c)* (i) Measure the throw (vertical displacement) of the fault shown in **Figure 1a**. [1]

..... metres

(ii) State the type of fault shown on **Figure 1a** and give a reason to support your answer. [2]

*Type of fault* .....

*Reason* .....

.....

*(d)* (i) Mark onto **Figure 1a** using the symbols below where you would expect to find examples of each of the following features. [2]

contact metamorphic rock **(C)** ⟶

regional metamorphic rock **(R)** ⟶

angular unconformity **(U)** ⟶

(ii) **Figure 1b** below shows a microscope thin-section view of the schist on **Figure 1a**. Using the mineral data sheet identify mineral **B** in **Figure 1b**. [1]

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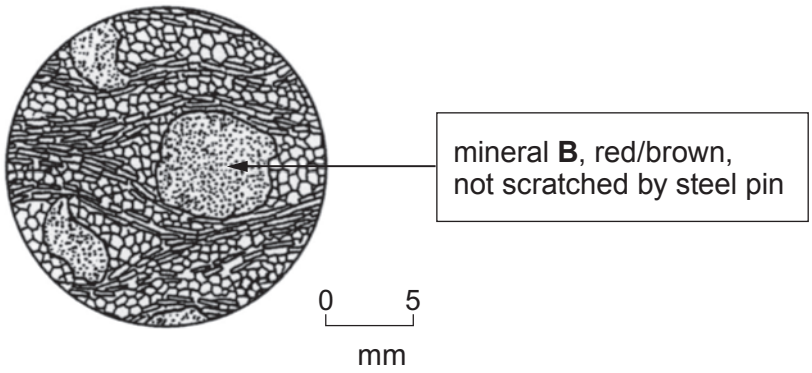


**Figure 1b**

(iii) Describe and explain the texture of the schist in **Figure 1b**. [4]

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**2.** **Figure 2a** shows the geological histories of the brachiopod and bivalve fossil groups.

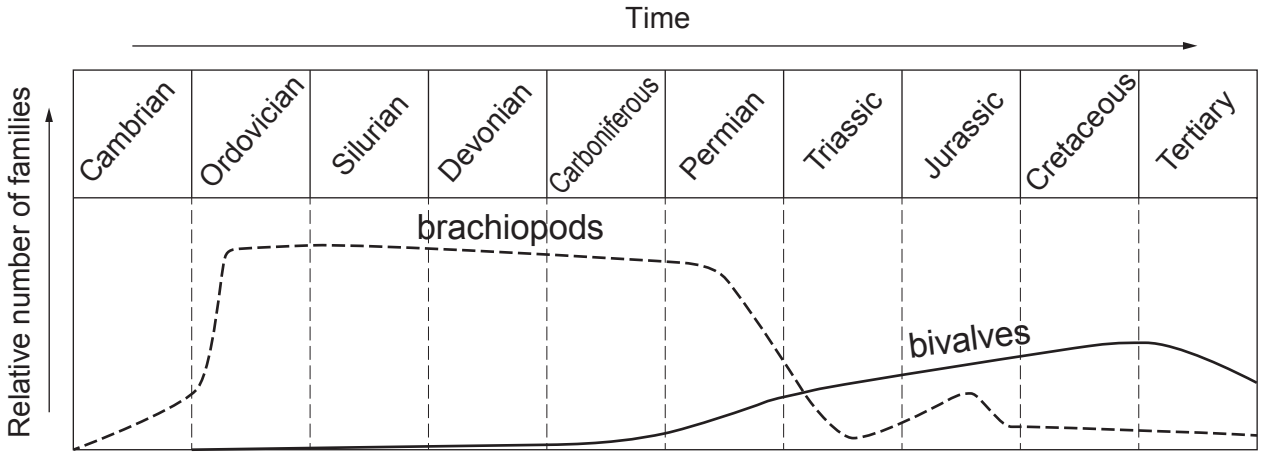


**Figure 2a**

*(a)* (i) With reference to **Figure 2a**, describe the changes in the relative numbers of bivalve families from the beginning of the Ordovician to the end of the Tertiary. [3]

.....

.....

.....

.....

(ii) State the geological period during which brachiopods and bivalves were both declining in numbers of families? [1]

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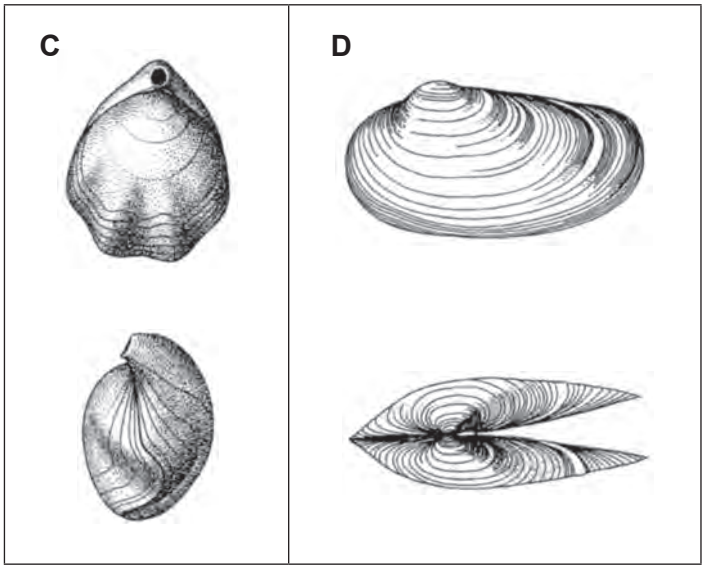
*(b)* **Figure 2b** shows two fossil specimens (**C** and **D**) from different fossil groups.




(actual sizes)

**Figure 2b**

(i) With reference to **Figure 2b**, complete **Table 2** using the appropriate letters (**C** or **D**) to indicate to which fossil group the description applies. [3]

| Fossil Characteristics | Fossil |
|---|---|
| formed of two valves | **C** and **D** |
| one valve is larger than the other valve | |
| a plane of symmetry runs between the valves | |
| each valve has a plane of symmetry | |

**Table 2**

(ii) Name the fossil group represented by **C**. [1]

.....

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*(c)* (i) **Figure 2c** is a scatter graph showing the size of 26 specimens of fossil **D** preserved on a bedding plane surface. The outline of an additional sample is shown in **Figure 2d**.

Measure the dimensions of this shell as indicated and plot onto **Figure 2c**. [2]

*Length* ..... mm *Width* ..... mm

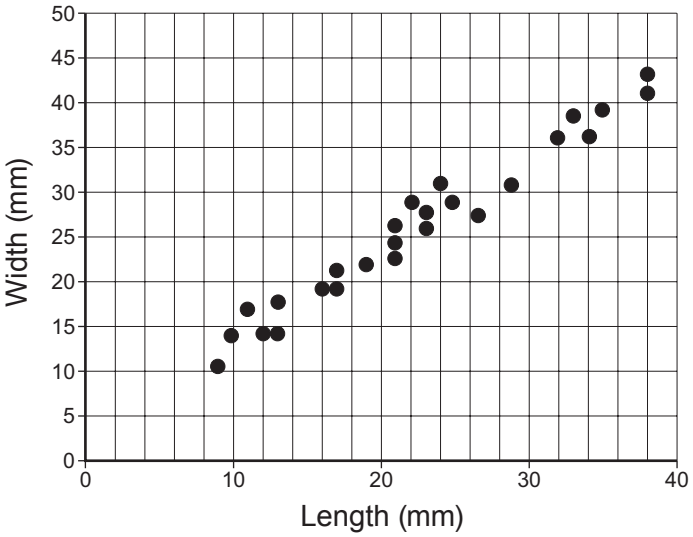


**Figure 2c**

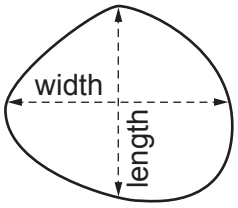


**Figure 2d** (actual size)

(ii) With reference to **Figure 2c**, suggest, giving reasons, whether the fossil specimens of fossil group **D** are likely to represent a life or death assemblage. [4]

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**3.** **Figure 3a** is a simplified map showing plate tectonic features of part of the western Pacific.

**Figure 3b** shows the depth of earthquake foci along line **X**–**Y** on **Figure 3a**.

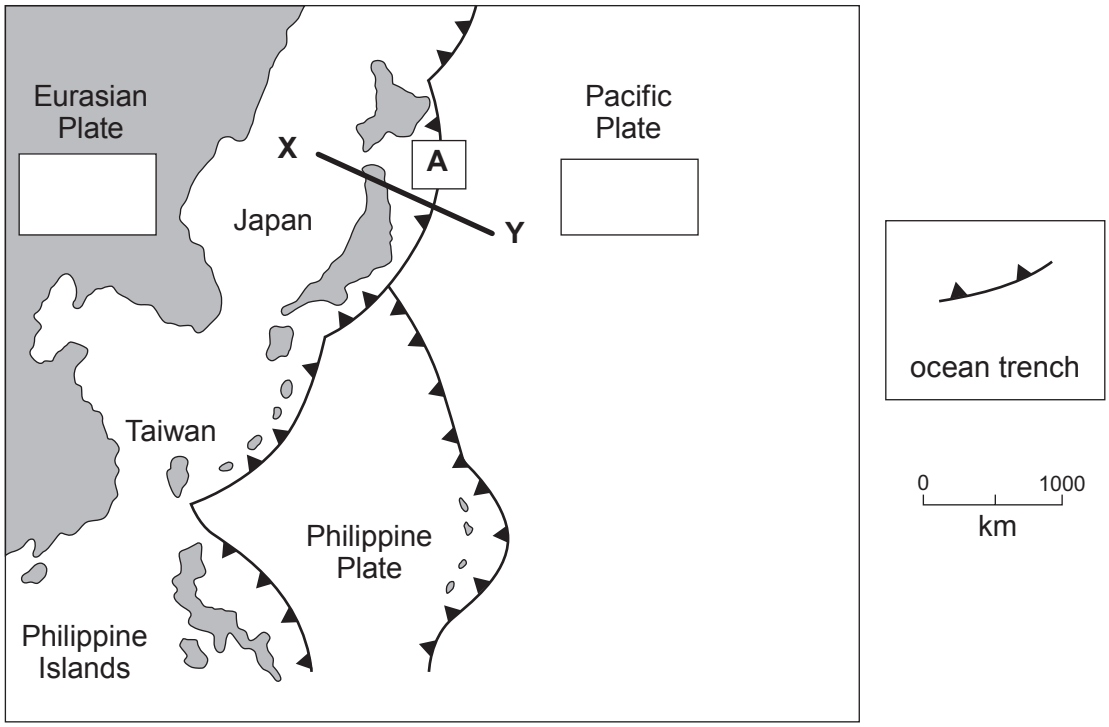


**Figure 3a**

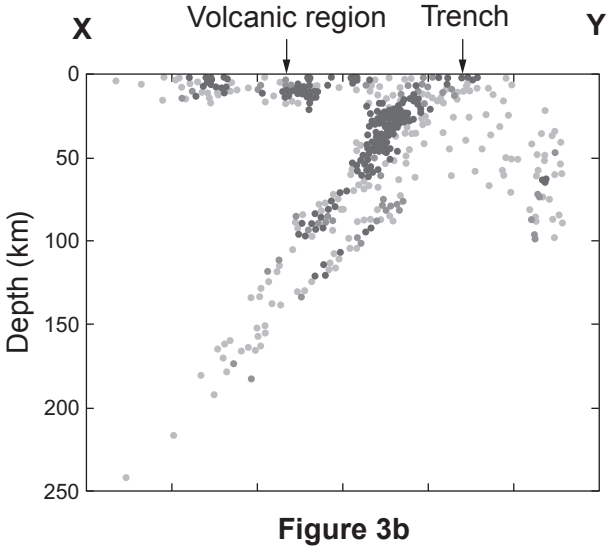


**Figure 3b**

*(a)* (i) Refer to **Figure 3a** and **Figure 3b**. Draw an arrow in each of the **two** blank boxes in **Figure 3a** to show the relative direction of movement of the Eurasian and Pacific plates. [2]

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(ii) State the type of plate boundary present at locality **A** on **Figure 3a** by placing a tick in **one** of the boxes below. [1]

Convergent ☐ Divergent ☐ Conservative ☐

*(b)* (i) Describe the pattern of earthquake foci shown in **Figure 3b**. [3]

.....

.....

.....

.....

(ii) State and explain **two** reasons for the occurrence and distribution of earthquakes in **Figure 3b**. [4]

1. .....

.....

.....

2. .....

.....

.....

*(c)* (i) Magma generated beneath the Japanese Islands is **andesitic** in composition. Explain why **andesitic** magma forms at this plate tectonic setting. [2]

.....

.....

.....

(ii) Explain why andesitic magma results in more explosive volcanic eruptions than basaltic magma. [2]

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Examiner only

**4.** **Table 4** shows the grain size distribution of three sediments (**F**, **G** and **H**) collected from a river.

| Grain size (mm) | 64 to 128 | 32 to 64 | 16 to 32 | 8 to 16 | 4 to 8 | 2 to 4 | 1 to 2 | 0.5 to 1 | 0.25 to 0.5 | 0.125 to 0.25 | 0.0625 to 0.125 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Weight % sediment F** | 15 | 35 | 25 | 15 | 5 | 5 | | | | | |
| **Weight % sediment G** | | | | | 5 | 22 | 58 | 15 | | | |
| **Weight % sediment H** | | | | | | | | | 5 | 35 | 60 |

**Table 4**

*(a)* (i) Use the data from **Table 4** to construct a bar graph for sediment **H** in **Figure 4a**. [2]

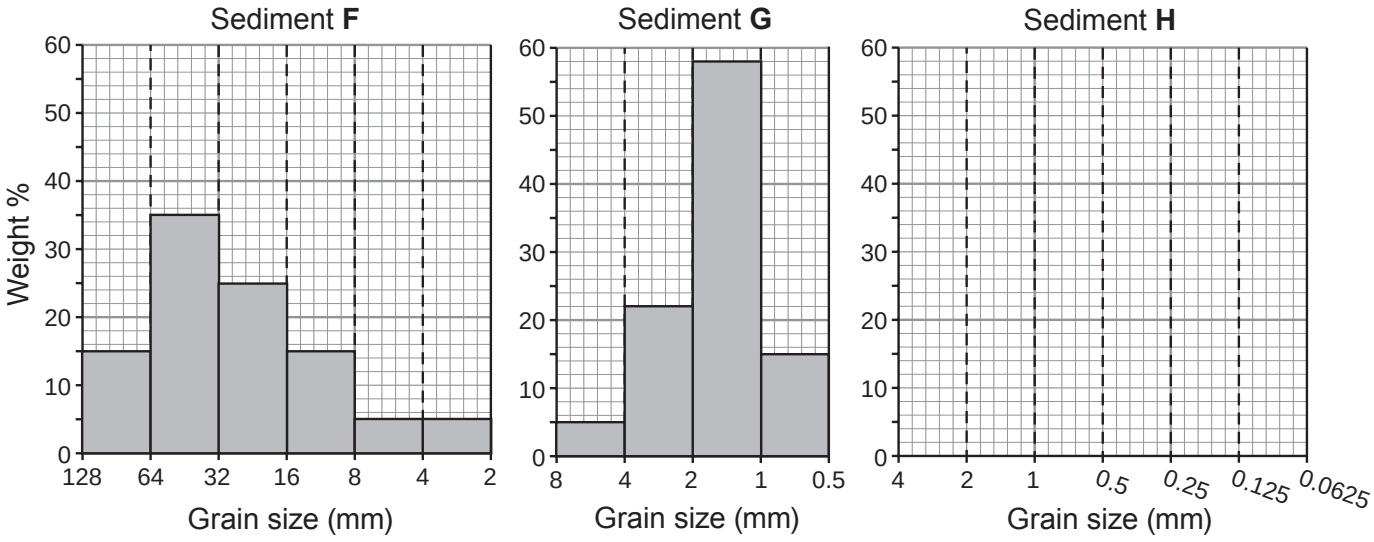


**Figure 4a**

(ii) State which of the three sediments (**F**, **G** or **H**) could be described as: [3]

| | |
|---|---|
| | most coarse grained |
| | most poorly sorted |
| | most likely to be located furthest downstream |

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(iii) Suggest why there is an absence of silt and clay sized particles (<0.0625 mm) in sediments **F**, **G** and **H**. [2]

.....

.....

.....

(iv) Describe how grain size and shape are likely to change as a sediment is transported down a river towards the sea. Explain your answer. [3]

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*(b)* **Figure 4b** shows a structure commonly found in sediments deposited by a current.

**Figure 4c** shows detail of the texture of the rock shown in **Figure 4b**.

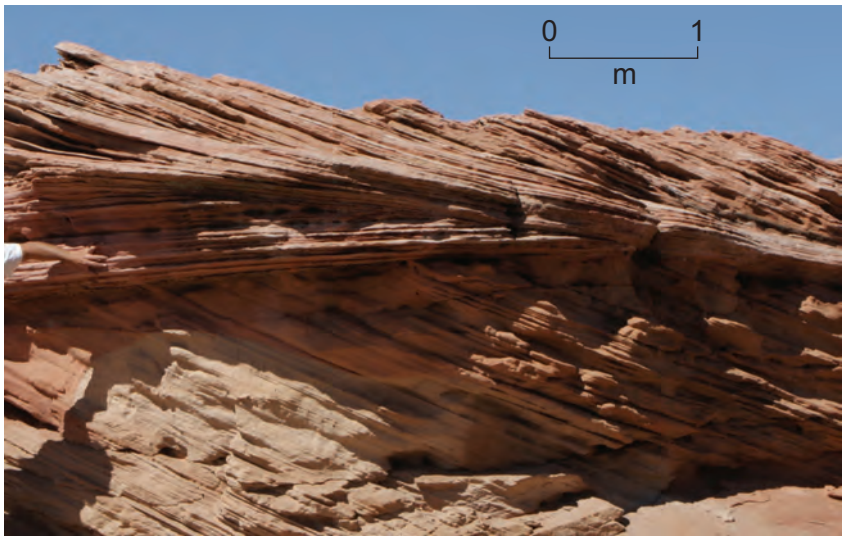


**Figure 4b**

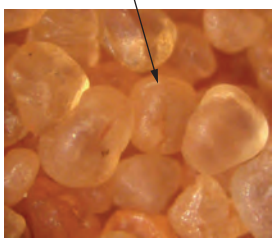


**Figure 4c**

(i) Name the sedimentary structure shown in **Figure 4b**. [1]

.....

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(ii) Explain why the sediment and sedimentary structure shown in **Figure 4b** and **Figure 4c** are **unlikely** to have been formed in a high energy fluvial environment like sediment **F** in **Figure 4a**. [4]

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**END OF PAPER**

# GCE AS/A level

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1212/01-A

# GEOLOGY

## MINERAL DATA SHEET FOR USE WITH GL1 AND GL2a

**May 2014**

| 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.