

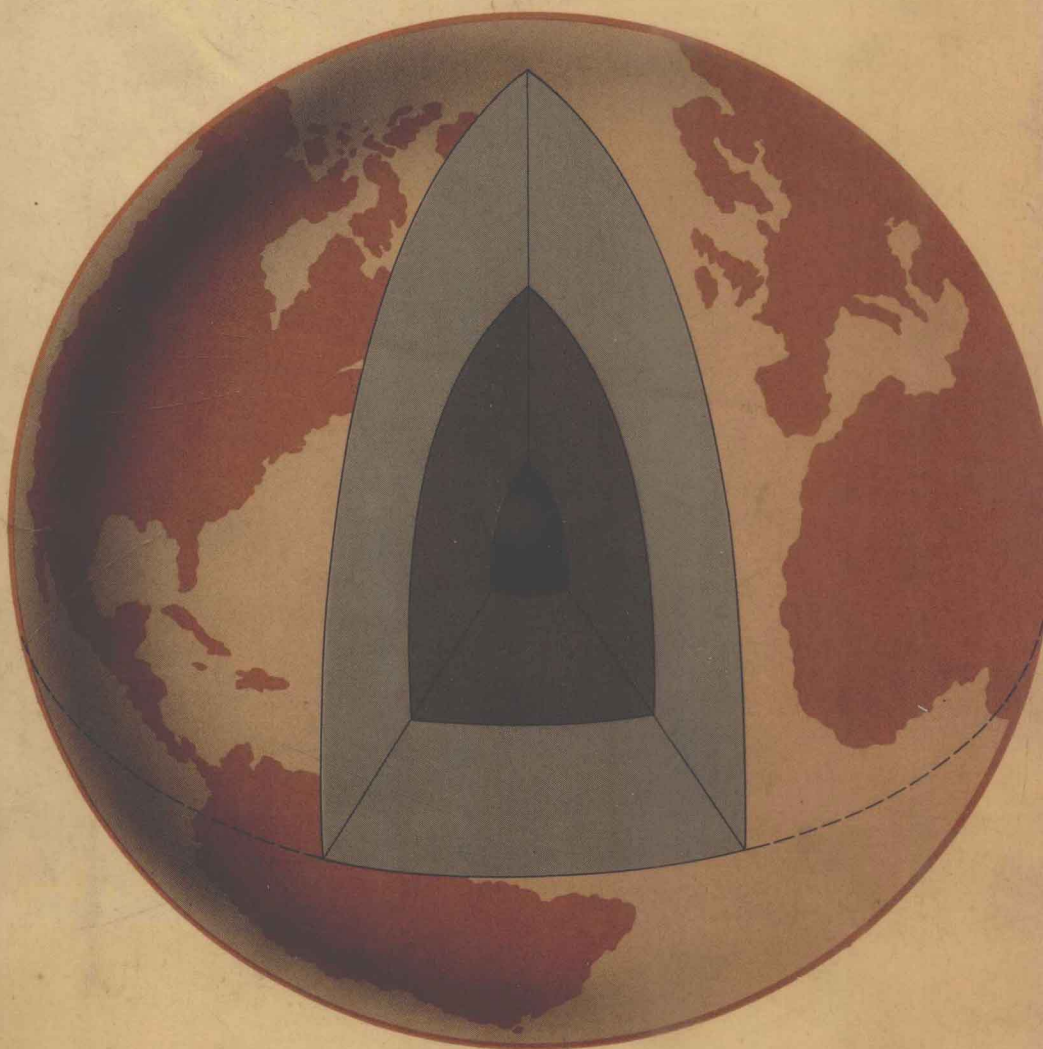
NUCLEUS

English for Science and Technology



GEOLOGY

Colin Barron/Ian Stewart



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ENGLISH FOR SCIENCE AND TECHNOLOGY
GEOLOGY

Colin Barron
Ian Stewart

Series Editors

Martin Bates and Tony Dudley-Evans

Science Adviser to the Series

Arthur Godman C. Chem., MRIC

Longman Group Limited
London

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A Guide to Verbalisation

Numbers

8	eight
8.1	eight point one
8.01	eight point zero one/ eight point nought one
8.25	eight point two five
85.25	eighty-five point two five
256	two hundred and fifty-six
2,630	two thousand six hundred and thirty
0	zero/nought
0.0013	zero point zero zero one three/ nought point nought nought one three
$\frac{1}{2}$	a half
$\frac{1}{4}$	a quarter
$\frac{3}{4}$	three quarters
$\frac{1}{16}$	one sixteenth
$\frac{1}{256}$	one two hundred and fifty- sixth (of . . .)
3.5×10^6	three point five times ten to the power of six
5:1	five to one

Years

1900	nineteen hundred
1755	seventeen fifty-five
1610	sixteen ten

Formulae

KAlSi_3O_8	/keɪ eɪ el es aɪ θriː əʊ eɪt/
$\text{Al}_2\text{O}_3\text{SiO}_2\text{H}_2\text{O}$	/eɪ el tuː əʊ θriː tuː es aɪ əʊ tuː tuː eɪtʃ tuː əʊ/

Others

0.917 gm/cc	zero nought point nine one seven grams per cubic centimetre
90°	ninety degrees
120°	one hundred and twenty degrees
0°C	zero nought degrees Celsius (or Centigrade)
1013 mb	one thousand and thirteen millibars
76%	seventy six per cent
3,450 m	three thousand four hundred and fifty metres
32 km	thirty-two kilometres
80 kph	eighty kilometres per hour

Unit 1 Properties and Shapes

Section 1 Presentation

1. Look at this table:

Mohs' scale of hardness	
1 talc (softest)	6 orthoclase
2 gypsum	7 quartz
3 calcite	8 topaz
4 fluorite	9 corundum
5 apatite	10 diamond (hardest)

Now ask and answer questions:

Example: What is the hardness of topaz?
Topaz *has a hardness of 8.*

2. Look at this example:

Topaz has a hardness of 8, i.e. it scratches quartz but does not scratch corundum.

Write sentences like this for:

- a) gypsum
- b) fluorite
- c) orthoclase

Now look at this example:

Haematite (Fe_2O_3) has a hardness of 6.5. What does this mean?
This means that it scratches orthoclase but it does not scratch quartz.

Make similar questions and answers for the following:

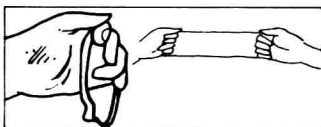
- d) A steel knife / 5.5
- e) A copper coin / 3
- f) A fingernail / 2.5
- g) Zircon (ZrSiO_4) / 7.5

3. Look at these examples:

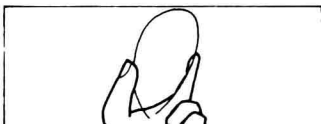
Tensile strength



Glass is *brittle*. It breaks easily.



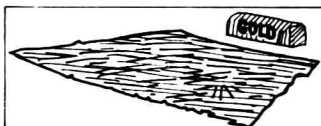
Rubber is *elastic*. It stretches and returns to the same shape.



A piece of wire is *flexible*. It bends.



Cheese is *sectile*. A knife cuts it into thin pieces.

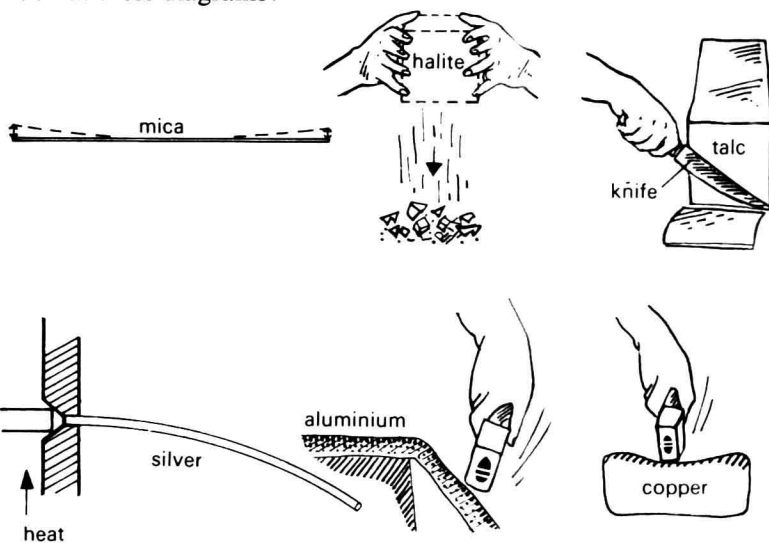


Gold is *malleable*. It forms thin sheets when it is hammered.



Copper is *ductile*. It forms thin wire when it is heated and pulled.

Look at these diagrams:



Now make questions and answers like this example:

Which material is flexible?

Aluminium.

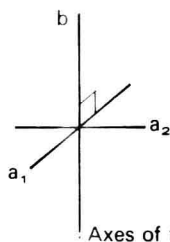
How do you know?

Because it bends.

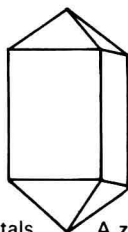
4. Look and read:

Shapes of crystals

Tetragonal crystals



Axes of tetragonal crystals

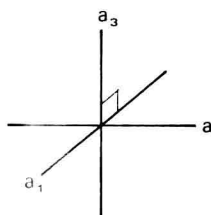


A zircon crystal

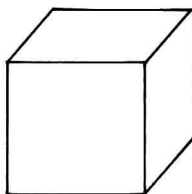
Tetragonal crystals have three axes perpendicular to each other, i.e. they intersect at right angles (90°). The two horizontal axes are equal in length and the vertical axis is either longer or shorter than these. An example of a tetragonal crystal is zircon.

Now look at these diagrams and complete the descriptions below:

Cubic crystals



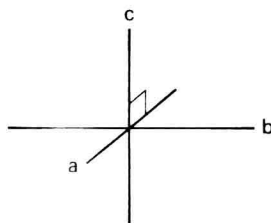
Axes of cubic crystals



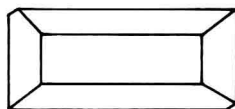
A fluorite crystal

- a) Cubic crystals have ... axes ... to each other, i.e. they ... at right angles (...). The ... horizontal ... and the ... axis are ... in An example of a ... is

Orthorhombic crystals



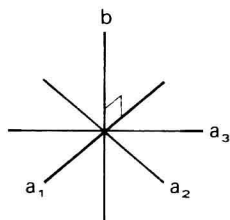
Axes of orthorhombic crystals



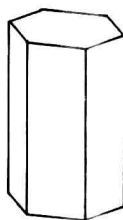
A barytes crystal

- b) ... crystals have ... to each other, i.e., they ... at ... (90°). The ... and the ... are all different in An example

Hexagonal crystals

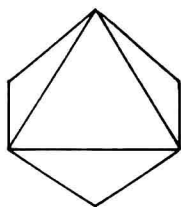


Axes of hexagonal crystals

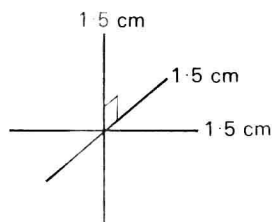


A beryl crystal

- c) ... crystals have ... horizontal ... They are ... length and intersect at an ... of 120° . The ... axis is ... to the horizontal ... and is either ... or ... than these.



A diamond crystal



- d) What shape is this crystal? This crystal is ...

Section 2 Development

5. Complete this table, using the information in Section 1:

Properties of some minerals

Mineral	Colour	Tensile strength	Crystal structure	Hardness	Relative density
diamond	colourless	brittle	...	...	3.5
graphite	black	brittle	hexagonal	1	2.1
halite	white	brittle	cubic	2.5	2.2
beryl	green/yellow	brittle	...	8	2.7
calcite	white	brittle	tetragonal	...	2.7
fluorite	colourless	brittle	...	...	3.2
gold	...	...	cubic	2.5	19.3
barytes	white	brittle	...	3	4.5
zircon	brown	brittle	tetragonal	7.5	4.3
copper	red	...	cubic	3	8.8

6. Read these descriptions of minerals and name them, using the table:

- a) Mineral X breaks easily and is white in colour. It has a tetragonal structure and is harder than gypsum but softer than fluorite. It has a relative density of 2.7.
Therefore, mineral X is
- b) Mineral Y is fairly hard and is brown in colour. It has a tetragonal structure.
Therefore mineral Y is
- c) Mineral Z is red in colour. It has a cubic structure and can be made into wire.
Therefore mineral Z is
- d) Which mineral has a similar hardness to mineral Z?

Now write similar descriptions for these minerals:

- e) gold
- f) halite
- g) beryl

Section 3 Reading

7. Read this passage:

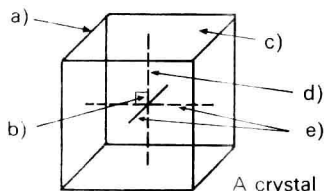
Crystals

When minerals solidify and grow they usually form symmetrical shapes known as crystals. The planes that form the outside of the crystals are known as faces. Every crystal forms one of six groups of shapes, called systems. Each crystal system is different because the arrangement of the atoms or ions within the crystal is different. Thus, the sodium and chlorine ions in halite form cubes and therefore the mineral crystallises in cubes.

Each crystal has one vertical axis and two or three horizontal axes, which extend through the centre of the crystal. In each crystal system the length of the axes and the angle of intersection are different.

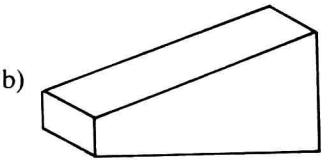
Now label this diagram, using the following words:

horizontal axes face vertical axis right angle edge



8. Say whether these statements are true or false. Correct the false statements.

a) Crystals usually form from a liquid.



This is an example of a crystal.

c) The axes of a halite crystal are all equal.

d) Crystals are divided into six systems.

e) An axis extends along the edge of a face.

f) Every crystal has three axes.

g) All crystals are shaped like cubes.

Section 4 Listening

9. Listen carefully to the passage twice. Then complete this table with the properties of the three minerals.

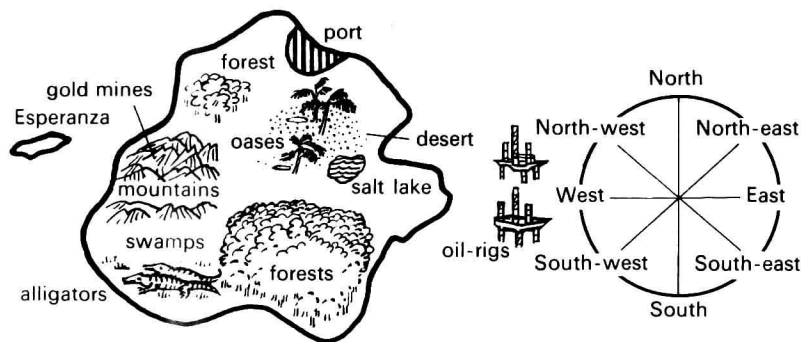
Properties of galena, cassiterite and cinnabar

Mineral	Colour	Tensile strength	Crystal system	Hardness	Relative density
galena (PbS)					
cassiterite (SnO ₂)					
cinnabar (HgS)					

Unit 2 Location

Section 1 Presentation

1. Look at this map:



Tropical island of Tefloonia

Now look at these examples and complete the sentences which follow:

Examples: The salt lake is *located in the east of* the island.
The island of Esperanza is *situated to the west of* Tefloonia.

- a) The port is located . . . of the island.
- b) The oil-rigs are situated . . . of Tefloonia.

Examples: Date palms are *found in the* desert.
The mines are *located in the middle of* the mountains.

- c) Alligators
- d) Gold is . . . in the mines.
- e) Palm trees are . . . around the oases . . . the desert.
- f) The swamps are . . . in the

Example: The mountains of Tefloonia are *concentrated in the* west.

- g) There is a small forest in the . . . but the forests of Tefloonia are mainly

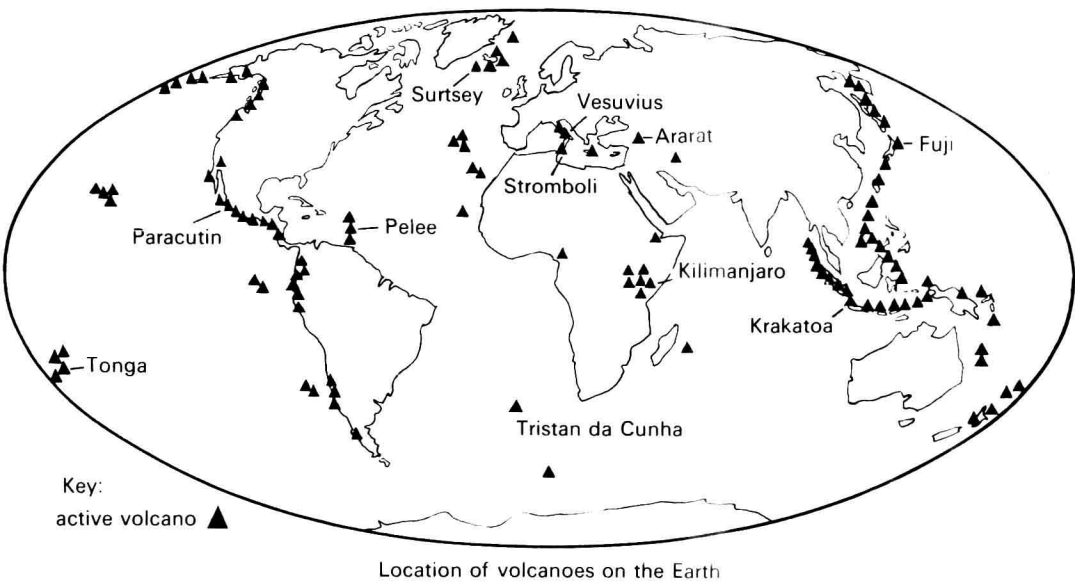
Example: Forest trees are *distributed throughout* the south-east of the island.

- h) Mountain vegetation is

2. Now look at a map of your own country and make sentences describing the following:

- a) Where permanent features and towns etc. *are located* or *situated*.
- b) Where crops, animals and minerals *are found*.
- c) What *is distributed throughout* or *concentrated in* certain areas.

3. Look at this map:



Now make sentences using the following table:

Volcanoes	<p>are situated</p> <p>are located</p> <p>are found</p> <p>are concentrated</p> <p>are distributed</p>	<p>around</p> <p>throughout</p> <p>in</p> <p>in the middle of</p> <p>in the east of</p> <p>in the west of</p> <p>in the north of</p> <p>in the south of</p> <p>to the north of</p> <p>to the south of</p> <p>to the east of</p> <p>to the west of</p> <p>to the north-east of</p> <p>to the south-east of</p> <p>to the north-west of</p>	<p>Africa</p> <p>the Pacific Ocean</p> <p>the Atlantic Ocean</p> <p>North America</p> <p>Australia</p> <p>China</p> <p>Britain</p> <p>Japan</p> <p>Malaya</p> <p>New Zealand</p>
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Now ask and answer questions, using the information in the table.

Example: Where are volcanoes concentrated?
Volcanoes are concentrated to the north of Australia.

4. Answer the following questions:

- a) Where are volcanoes situated in Africa?
- b) Where are volcanoes located in North America?
- c) Where is Mount Pelee located in relation to North America?
- d) In which part of Europe are volcanoes concentrated?
- e) Where are volcanoes situated in relation to South America and Africa?
- f) Are volcanoes concentrated in the east of China?

Section 2 Development

5. Look at this diagram:

