Minerals, elements and the Earth's crust: teachers' notes

Level

This activity is suitable for students aged 11-14.

Topic

The activity uses questions about the composition of minerals and ores to reinforce work on **elements**, **compounds**, symbols and formulae.

Description

The activity includes two tables. One gives information about the most common elements in the Earth's crust and the other the chemical composition of some minerals. Students answer questions based upon the information in these tables. This would be a useful exercise for homework or to be used in the case of teacher absence.

Context

Students need to be familiar with chemical elements, symbols, compounds and formulae.

Teaching points

Reference books and / or internet access should be available to help students tackle the research questions. Alternatively, teachers may wish to make the questions that refer to Table 2 easier, and less dependent on reference sources, by filling in some more of the cells in the table.

Timing

About half an hour.

Resources

Each student will need a copy of the Periodic Table.

The activity

Students tackle a series of questions based on tables giving information about the most common elements in the Earth's crust and about the chemical composition of some minerals.

Answers to questions

Q 1. Appropriate bar chart.

Q 2. Oxygen.

Q 3. Magnesium.

Q 4. They are found combined because they are relatively reactive elements and combine with oxygen from the atmosphere and with other elements to form compounds.

Q 5. A compound.

RS•C

Q 6. Magnesium (because it is the rarest). No definite answer is possible because there is no information about the ease of extraction of any of the elements.

Q 7. See Table 1

Mineral name	**Chemical formula**	**How many atoms of each element are present in the formula**	**Useful element**	**Uses of this element**
Galena	PbS	Lead x 1 Sulfur x1	Lead	Flashing (rainproof strips) on roofs, car batteries
Pyrite	FeS_2	Iron x 1 Sulfur x 2	Sulfur (pyrite is not used as an ore of iron)	Making sulfuric acid
Chalcopyrite	$CuFeS_2$	Copper x 1 Iron x 1 Sulfur x 2	Copper	Plumbing pipes and electrical wires. Coinage
Chalcocite	Cu_2S	Copper x 2 Sulfur x 1	Copper	Plumbing pipes and electrical wires. Coinage
Bauxite	Al_2O_3	Aluminium x 2 Oxygen x 3	Aluminium	Making alloys for aircraft, packaging, electrical use *etc*
Magnetite	Fe_3O_4	Iron x 3 Oxygen x 4	Iron	Making steel for construction, transport, packaging *etc*
Haematite	Fe_2O_3	Iron x 2 Oxygen x 3	Iron	Making steel for construction, transport, packaging *etc*
Rutile	TiO_2	Titanium x 1 Oxygen x 2	Titanium	Making alloys for aircraft parts

Table 1 Answers

Q 8. Chalocite has the highest proportion of copper atoms. Chalcopyrite has one copper atom in every four atoms (one quarter, or 25%, of the atoms are copper) whereas in chalcocite it is two copper atoms in every three atoms (two-thirds, or 67%, of the atoms are copper).

Q 9. Chalcocite, because it contains the highest proportion of copper. No definite answer is possible because there is no information about the ease of extraction of copper from either of these minerals, nor about the purity of the ores.

Q 10. See Table 1.

Q 11. Lead: unreactive metal / shiny silver / prehistoric / from Anglo-Saxon / Group 4

Sulfur: reactive non-metal / yellow solid / prehistoric / from Latin / Group 6

Copper: unreactive metal / shiny red-brown / prehistoric / from Cyprus / transition metal

Aluminium: reactive metal / shiny silver / 1826 / from Latin / Group 3

Iron: fairly unreactive metal / shiny silver / ~4000 BC / from Anglo-Saxon / transition metal

Titanium: fairly reactive metal / shiny silver / 1795 / from Latin / transition metal