Physical Characteristics of Minerals
Teacher's Notes

A mineral is an inorganic substance found naturally on the Earth's crust.

All minerals are crystals but not all crystals are minerals. Some organic materials, such as DNA and uric acid, are crystalline. Minerals are the building blocks of rocks.

This activity requires specimens of several minerals. Quartz, feldspar, calcite, mica, pyrite, halite (salt) and talc are good examples. Some of the tests (scratch/hardness and streak) can be destructive and may damage good examples. Mica and calcite specimens are especially prone to damage. If the samples are not consumable then the number of tests should be limited and the specimens retained for future reference. Teachers may wish to perform this activity as a demonstration.

The E De C Clarke Museum at UWA has excellent specimens and information.

Minerals can be characterised by their:

1. **Crystalline habit:** due to the arrangement of their atoms (prismatic, cubic, tabular etc). Sodium chloride forms cubic crystals whereas calcite forms hexagonal ones.
2. **Cleavage:** the planes along which they break and the angles these surfaces make with each other. These can be estimated by eye or a compass and is due to the bonding between molecules. Mica has one cleavage plane which causes it to break into flat sheets. Iron pyrites (fool's gold) has six which causes it to break into cubic prisms.
3. **Colour:** In most metallic ores colour can be a useful clue to mineral composition, especially once they have been oxidised. Green and blue often indicate copper whilst red usually indicates iron. With crystals trace elements can cause a great variety of colour differences.
4. **Streak:** This is the colour of the powdered mineral and is best seen when rubbed against a white tile of unglazed porcelain. This colour can be quite different from that of the parent mineral. Streak is a better diagnostic characteristic than colour.
5. **Scratch or hardness:** By comparing the ability of one mineral to scratch another, a comparative scale has been developed.
   Mohs' Scale
   1. Talc
   2. Gypsum
   3. Calcite
   4. Fluorite
   5. Apatite
   6. Orthoclase
   7. Quartz
   8. Topaz
   9. Corundum
   10. Diamond

   As a rough guide: your fingernail is 2.5, window glass is 5.5 and a steel nail is 6.0.
6. **Lustre:** This depends on the refraction, absorption and reflection of light on the surface of the mineral**.** Haematite is earthy, quartz is vitreous (glassy) and galena is metallic.
7. **Magnetism:** Some minerals, e.g., magnetite, are magnetic.
8. **Specific Gravity:** This measures the relative weight of the mineral compared with an equal volume of water (compare their masses when suspended in water). Precious stones such as diamond, zircon and rubies are easily distinguished by this process.

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Equipment

A selection of minerals
A hand lens
A glass slide and steel nail
A white porcelain plate
A magnet.
Triple beam balance, beaker, water and string