

Definition of a Rock

- A rock is any coherent, naturally occurring substance generally composed of minerals.
 - Examples: granite, sandstone, obsidian (no minerals), glacier ice.
 - Common non-rocks: beach sand, molten lava, concrete.

ROCK CYCLE

- **ROCK CYCLE:** any rock type can become any other rock type.
- There are 3 rock types: igneous rocks, sedimentary rocks, and metamorphic rocks.

DEFINITION of a MINERAL

- A mineral is a substance with these characteristics:
- Crystalline - and so has an ordered arrangement of atoms
 - Definite chemical composition - for example, quartz (SiO_2) or pyrite (FeS_2) - or limited range of compositions (for example, a complex mineral named hornblende)
 - Naturally occurring
 - Inorganic (never lived, although graphite, diamond, and calcite may be bioproducts of organisms)
 - *These 4 criteria cause each type of mineral to have its own unique properties.*

Properties of Minerals: Tools for Identification

- Hardness
- Luster
- Color
- Streak
- Cleavage
- Fracture
- Cleavage vs. crystal form
- Miscellaneous properties

Hardness

- Measure of the resistance of a mineral to scratching (not breakage)
- **Mohs Hardness Scale** (Softest = 1, Hardest = 10)

| | |
|--------------------------|---------------------------|
| 1 - Talc | <i>KNIFE, NAIL: 5-5.5</i> |
| 2 - Gypsum | 6 - Orthoclase |
| <i>FINGERNAIL : 2.25</i> | <i>GLASS PLATE: 6</i> |
| 3 - Calcite | 7 - Quartz |
| <i>PENNY : 3.5</i> | 8 - Topaz |
| 4 - Fluorite | 9 - Corundum |
| 5 - Apatite | 10 - Diamond |

Luster

- The way a mineral reflects light
- **METALLIC:** opaque, looks like a metal such as gold, silver, iron, etc.
- **NON-METALLIC:** (needs to be more descriptive)
 - *VITREOUS* or *GLASSY* (Samples 3, 12) - strong glint (shiny like glass)
 - *PEARLY* (talc, some gypsum) - looks like mother-of-pearl
 - *RESINOUS* - reflects light in a manner similar to syrup or tree sap ("glazed")
 - *EARTHY* - dull, little or no reflection

Color

- The intrinsic color of the mineral.
- NOTE: color is rarely diagnostic - usually a very poor identifier!! Some examples...
- Sulfur is normally yellow.
- Pyrite is normally brassy.
- Quartz can have almost any color!

Streak

- The color of the powdery residue of a mineral left behind when you drag it across an unglazed porcelain plate (hardness of plate = 6).

Cleavage

- Breakage of a mineral along a flat plane of weakness.
- **How To Describe Cleavage:**
- If you see only 1 set of parallel planes...
 - Denoted '1 direction of cleavage' (mica was used as an example in class).
- If you see only 2 sets of parallel planes, you must give the intersection angle of the two planes.
 - Denoted '2 directions of cleavage at 90°' (if they intersect at a right angle).
- If you see 3 sets of parallel planes, denoted
 - '3 directions of cleavage at 90°' (termed CUBIC - salt has cubic cleavage) or
 - '3 directions of cleavage not at 90°' (termed RHOMBOHEDRAL).

Fracture

- Uneven breakage (non-planar breakage)
 - **CONCHOIDAL**: see obsidian sample or quartz; breaks along a surface marked by concentric circles
 - **SPLINTERY**: like splinters in wood (sample 16)
 - **UNEVEN**: a "catch-all" term for non-diagnostic, non-planar breakage

Crystal Form

- How a mineral grows
 - May be difficult to distinguish from cleavage.
 - If crystal grows out of an apparent flat cleavage face, the face isn't cleavage – it is crystal form.

Miscellaneous

- *Some minerals have very helpful (unique) diagnostic properties.*
 - Magnetite exhibits magnetism.
 - Sulfur smells like rotten eggs (after scratching the surface).
 - Calcite fizzes when HCl acid is applied to it.
 - Halite (rock salt) tastes salty.
 - Some minerals are exceptionally dense because they are composed of heavy elements, or contain closely-packed atoms.

Mineral Classification

- Metals
 - Combined with oxygen = oxide minerals
 - Combined with sulfur = sulfide minerals
 - Not combined with other elements = native (native gold, native copper, etc.)
- Silicates (Si is an important ingredient)
- Ferromagnesian (Fe, Mg) - dark and dense