MINERALS!

Mrs. Ross

ITS ALL VERY ELEMENTAL

Elements– the simplest form of matter that has a unique set of properties; cannot be broken down into simpler substances by chemical means// the basic building blocks of minerals.

118 known elements– 4 recently (2015) discovered ones!

- Atoms
- Smallest particles of matter
- Have all the characteristics of an element
- The nucleus is the central part of an atom and contains:
  - Protons – positively charged particles
  - Neutrons– neutral particles (No charge)

MINERALS

To be a mineral, there are a few requirements that must be met:

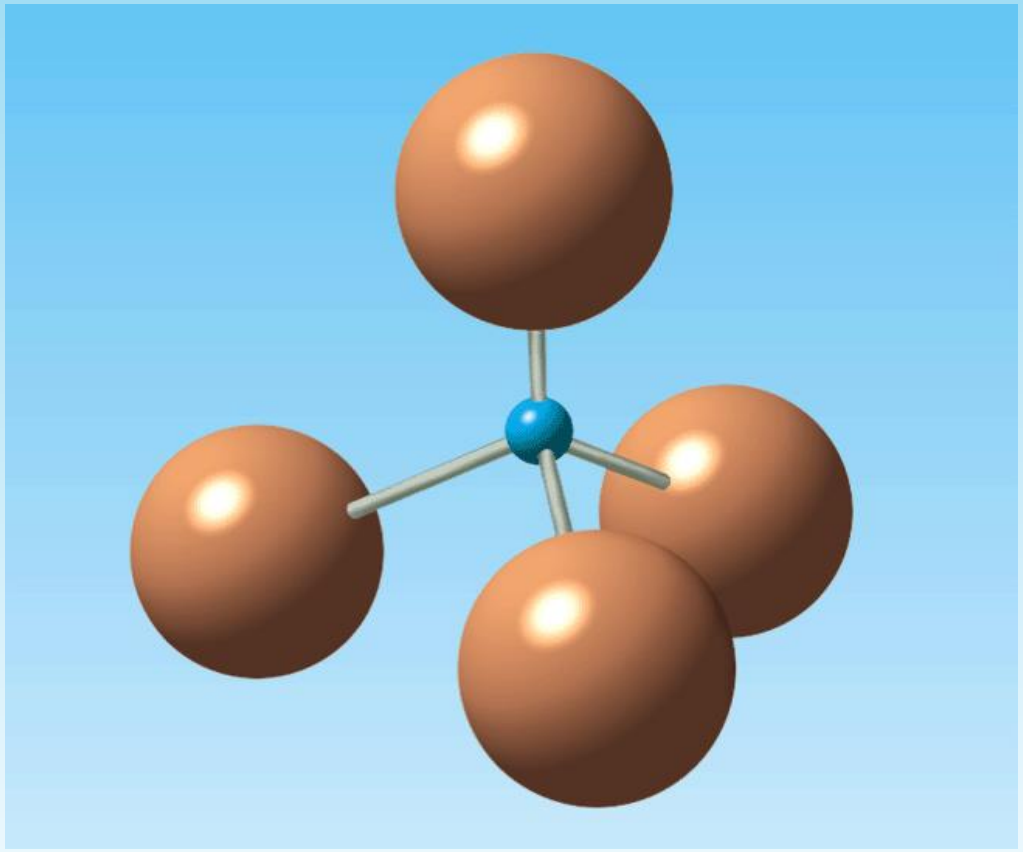
1. Naturally occurring
2. Solid substance
3. Orderly crystalline structure
4. Definite chemical composition
5. Generally considered inorganic

MINERAL GROUPS

Mineral groups can be classified on their composition

1. Silicates
   A. Silicon and oxygen combine to form a structure called the **silicon-oxygen tetrahedron.** This silicon-oxygen tetrahedron provides the framework of every silicate mineral.

SILICON- OXYGEN TETRAHEDRON



2. Carbonates

- Minerals that contain the elements carbon, oxygen, and one or more other metallic elements

3. Oxides

- Minerals that contain oxygen and one or more other elements, which are usually metals

4. Sulfates and Sulfides

- Minerals that contain the element sulfur

5. Halides

- Minerals that contain a halogen ion plus one or more other elements

6. Native elements

- Minerals that exist in relatively pure form

SULFIDES

NATIVE COPPER

HOW MINERALS FORM

2 POSSIBLE WAYS FOR THIS TO HAPPEN

1. Magma or Lava cools and hardens

2. Dissolved materials in water crystallize

CRYSTALLIZATION

Crystallization– the process by which atoms are arranged to form a material with a crystal structure.

CRYSTALLIZATION OF MAGMA/ LAVA CRYSTAL SIZE

1. Rate at which magma cools

- Slow cooling leads to the formation of large crystals.
- Faster cooling leads to formation of smaller crystals
  - Closer to the surface= faster cooling= smaller crystals

2. The amount of gas in the magma

3. The chemical composition of magma (different chemical groups form different shaped crystals)

CRYSTALLIZATION OF SOLUTIONS

Solution– a mixture in which a substance is dissolved in another– usually water.

FORMATION FROM EVAPORATION

When water evaporates, anything that was dissolved in the water is left behind.

If the substance left behind is composed of mineral making elements, it can form crystals

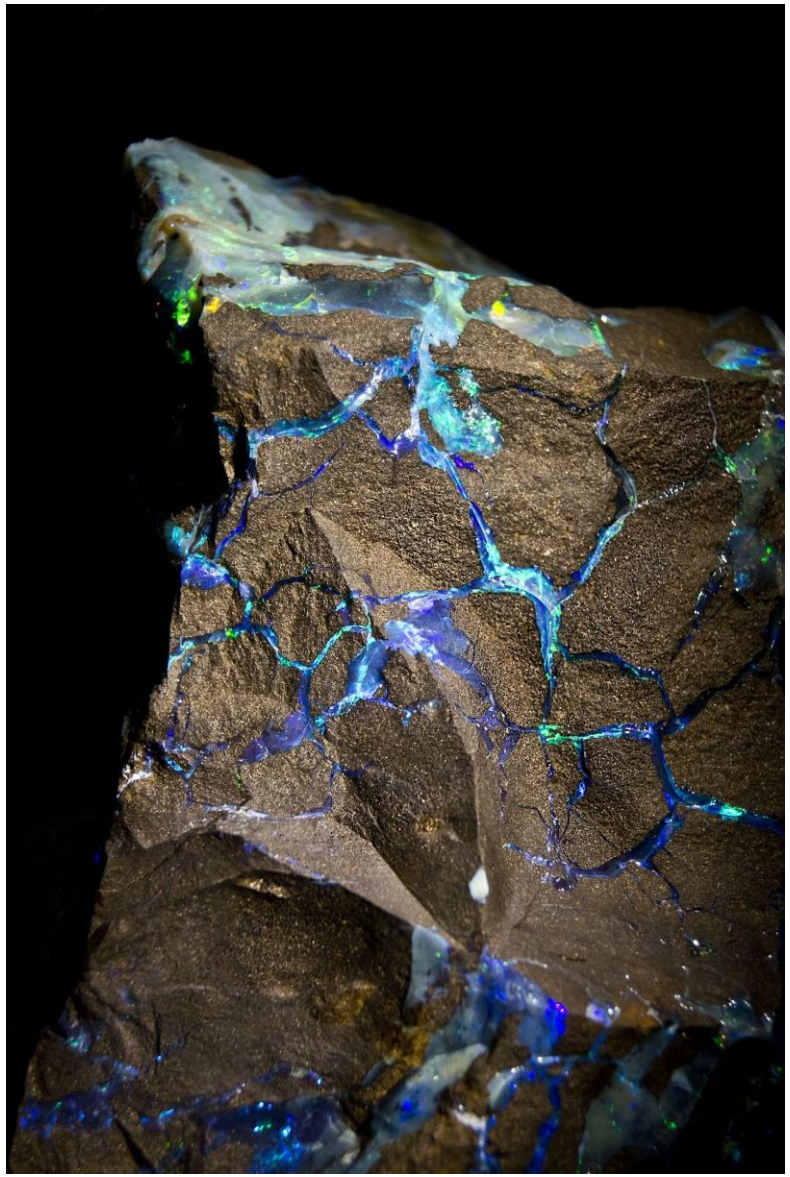
FORMATION FROM HOT WATER SOLUTION

Pure metals can crystalize underground– often in veins

Vein– narrow channel or slab of a mineral that is different from the surrounding rock.

CREATING VEINS, A SHORT STORY

Magma heats the water underground→ elements & compounds dissolve in hot water to form solutions→ the solutions follow cracks within the rock→ elements & compounds leave the solution during cooling and crystallize as minerals→ these minerals form a narrow channel or slab in the rock called a vein.



PROPERTIES OF MINERALS

- Color
  - Small amounts of different elements can give the same mineral different colors
- Streak
  - Streak is the color of a mineral in its powdered form.

- Luster
  - Luster is used to describe how light is reflected from the surface of a mineral

TYPES OF LUSTER

Metallic- Looks shiny (like metal)

Vitreous– having the appearance of glass

Resinous– looks like resin (dull glass)

Pearly– iridescent like a pearl

Silky– looks like silk

Adamite– brilliant luster of a diamond

Waxy, earthy, and dull– exactly what they sound like

PYRITE (FOOL'S GOLD) DISPLAYS METALLIC LUSTER

MORE PROPERTIES

- Crystal Form
- Crystal form is the visible expression of a mineral's internal arrangement of atoms.

- Hardness
- Hardness is a measure of the resistance of a mineral to being scratched.
- Mohs scale consists of 10 minerals arranged from 10 (hardest) to 1 (softest).

QUARTZ OFTEN HAS GOOD CRYSTAL FORM

JUST A COUPLE MORE

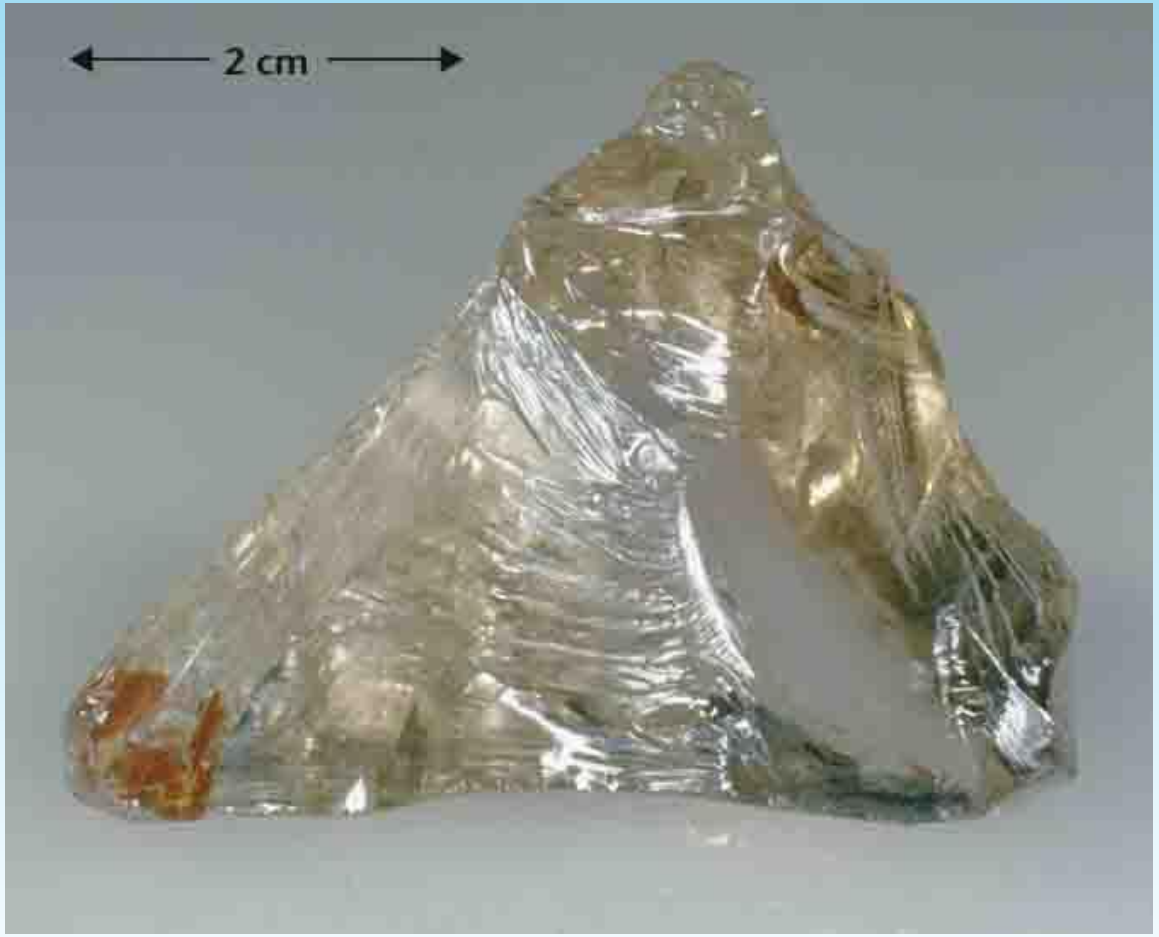
- Cleavage
  - The tendency of a mineral to cleave, or break, along flat, even surfaces

1. Basal- one direction (sheets)
2. Prismatic– two directions
3. Cubic– three directions at right angles
4. Rhombohedral– three directions, not at right angles
5. Octrahedral– eight faces
6. Dodecahedral– 12 faces

- Fracture
  - Minerals that do not show cleavage when broken are said to fracture
  - Fracture– the uneven breakage of a mineral

MICA HAS CLEAVAGE IN ONE DIRECTION

CONCHOIDAL FRACTURE



LAST ONE

- Density
  - Density is a property of all matter that is the ratio of an object's mass to its volume
- Distinctive properties of minerals
  - Some minerals can be recognized by other distinctive properties
    - Taste, smell, texture, etc.