BORATES

Borate minerals are minerals that contain a borate anion group. Simple borate anion is BO_3 and has a -3 charge. This means each borate anion requires a +3 cation to generate a non-charged stable compound or mineral. But there are also more complex boron-oxygen combinations like B_2O_5 amd B_3O_6.

59. Ulexite - $NaCaB_5O_6(OH)_6 \cdot 5H_2O$

Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _____
Hardness - _____
Luster/Streak _____/_____
Use (if any) - _____
Other _____
_____

Ulexite is also known as TV rock due to its unusual optical characteristics. The fibers of ulexite act as optical fibers, transmitting light along their lengths by internal reflection. When a piece of ulexite is cut with flat polished faces perpendicular to the orientation of the fibers, a good-quality specimen will display an image of whatever surface is adjacent to its other side

CARBONATES

Carbonate minerals are minerals that contain a carbonate anion group. Simple borate anion is CO_3 and has a -2 charge. This means each borate anion requires a +2 cation to generate a non-charged stable compound or mineral. There are many very common carbonate minerals. You are responsible for knowing 5 of them, two of which, aragonite and calcite, have ths same chemical composition

5. Aragonite - $CaCO_3$

Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _____
Hardness - _____
Luster/Streak _____/_____
Use (if any) - _____
Other _____

_____

Near surface,
low temperature phase

5. Calcite - $CaCO_3$

Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _____
Hardness - _____
Luster/Streak _____/_____
Use (if any) - _____
Other _____

_____

Reactive to acid

Dogtooth
crystals

CARBONATES - continued

19. Dolomite $CaMg(CO_3)_2$

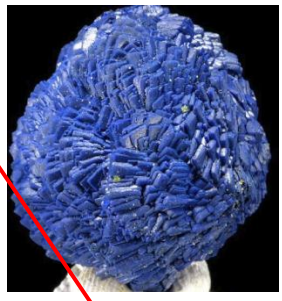
Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _____
Hardness - _____
Luster/Streak _____/_____
Use (if any) - _____
Other _____

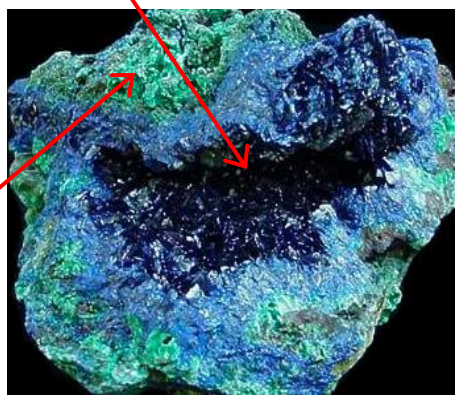
_____

7. Azurite $Cu_3(CO_3)_2(OH)_2$

Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _____
Hardness - _____
Luster/Streak _____/_____
Use (if any) - _____
Other _____

_____





36. Malachite $Cu_2CO_3(OH)_2$

Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _____
Hardness - _____
Luster/Streak _____/_____
Use (if any) - _____
Other _____

_____

HALIDES

The **halide mineral** class include those **minerals** with a dominant **halide** anion (F^-, Cl^-, Br^- and I^-). Each carries a -1 charge that must be balanced. You are only responsible for two.

22. Fluorite – CaF_2

Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _octahedral_
Hardness - _____
Luster/Streak _____/_____
Use (if any) - _____
Other _____

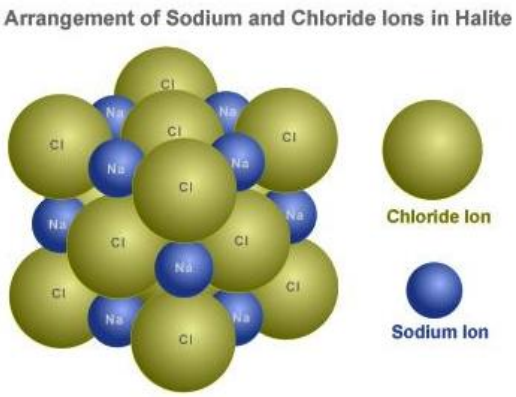
_____

30. Halite - NaCl

Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _____
Hardness - _____
Luster/Streak _____/_____
Use (if any) - _____
Other _____

_____

Evaporite mineral



HYDROXIDES

A group of minerals combining metallic elements with either water (H_2O) or a hydroxyl goup (OH) or both.

8. Bauxite – $Al(OH)_3$ or AlO(OH)

Gibbsite, Diaspore

Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _____
Hardness - _____
Luster/Streak _____/_____
Use (if any) - _____
Other _____
_____

Almost all aluminum produced has come from bauxite, which is actually a combination of minerals.

OXIDES

An **oxide** is a chemical compound that contains at least one oxygen atom and one other element in its chemical formula.

17. Corundum - Al_2O_3

Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _____
Hardness - _____
Luster/Streak _____/_____
Use (if any) - _____
Other _____
_____

Rubies and sapphires are gem corundum.

OXIDES – continued -- Iron OXIDES

24. Goethite/Limonite (FeO(OH)

Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _____
Hardness - _____
Luster/Streak _____/_____
Use (if any) - _____
Other _____

_____

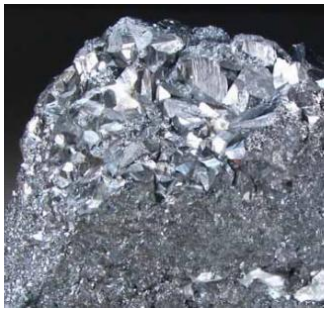
31. Hematite Fe_2O_3

Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _____
Hardness - _____
Luster/Streak _____/_____
Use (if any) - _____
Other _____

_____

35. Magnetite Fe_3O_4

Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _____
Hardness - _____
Luster/Streak _____/_____
Use (if any) - _____
Other _____



_____

PHOSPHATES

Phosphate minerals are those minerals that contain the tetrahedrally coordinated phosphate (PO_4^{3-}) anion along with the freely substituting **arsenate** (AsO_4^{3-}) and **vanadate** (VO_4^{3-}). **Chlorine** (Cl^-), fluorine (F^-), and **hydroxide** (OH^-) anions also fit into the crystal structure.

4. Apatite $Ca_5(PO_4)_3(F,Cl,OH)$

Color - _____
Crystal Habit - _____
Crystal System - _____
Cleavage - _____
Hardness - 5 on Mohs scale
Luster/Streak _____/_____
Use (if any) - _____
Other _____
_____