Some Physical Properties of Minerals

- Color
- Streak
- Luster
- Diaphaneity
- Hardness
- Cleavage
- Fracture
- Chemical reactivity
- Growth form

The physical/chemical properties of minerals are a manifestation of their chemical composition and lattice structure.

What are minerals made of?

Each atom of a given element has the same number of protons as every other atom of that element.

A given element generally has several **isotopes**, which have differing numbers of neutrons in their nucleus.

The element carbon has 6 protons.
The isotope carbon-12 has 6 protons and 6 neutrons.
The isotope **carbon-14** has 6 protons and 8 neutrons.

How are atoms bound together to form molecules and crystal lattices?

Octet rule:
Atoms tend to gain, lose or share electrons until they are surrounded by eight valence electrons

A positive ion (a cation) has more protons than electrons.

A negative ion (an anion) has more electrons than protons.

cat ion is +ve

ant ion (anion) is -ve

In an ionic bond, electrons are transferred from one atom to another to fill valence shells

In an covalent bond, one or more valence electrons are shared by two or more atomic nuclei to fill valence shells

In a metallic bond, valence electrons are shared by many atomic nuclei

What determines the properties of minerals?

Growth form of minerals

What broken chips of a mineral look like: fracture and cleavage

Hardness

Some minerals naturally occur in several colors

Other minerals have distinctive colors that do not vary (much) from specimen to specimen

Streak -- the color of a fine powder of a mineral

Diaphaneity:
How or whether light passes through the crystal

Luster:
How light interacts with the surface of the mineral grain

Chemical reactivity:
salty taste -- halite

Chemical reactivity: effervescence in acid -- calcite

Magnetism: magnetite (and, to a lesser extent, other minerals)

High specific gravity
(high density, or mass per volume):
galena
(and some other ore minerals)

Looks like most people think gold should look:
pyrite

Actually looks like gold:

gold

Gold is an elemental mineral, in which the mineral lattice is composed of just one type of element.

What are some other elemental minerals?

Which minerals are the most abundant or important?

The feldspar mineral family:
potassium (K) feldspar
sodium (Na) plagioclase feldspar
calcium (Ca) plagioclase feldspar

Carbonates (calcite, dolomite)
Halides (halite, fluorite)
Oxides (hematite, magnetite, corundum, ice)
Sulfides (galena, sphalerite, pyrite)
Sulfates (gypsum, anhydrite, barite)
Native elements (gold, copper, diamond, graphite, sulfur, silver, platinum)