

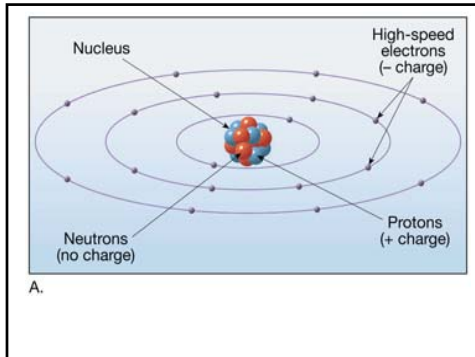
Minerals

Mineral

- Naturally occurring
- Inorganic
- Solid
- Regularly repeating internal arrangement of atoms
- Definite chemical composition

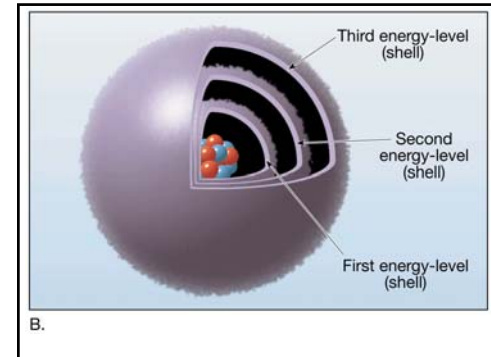
Rocks may be composed of minerals and/or other material

Periodic table of elements showing atomic number, symbol, atomic weight, and name of elements. The table is color-coded by groups: Metals (red), Transition metals (orange), Nonmetals (yellow), Noble gases (green), Lanthanide series (blue), and Actinide series (purple).



ATOM FEATURES

- Nucleus contains both protons and neutrons
- Each atom of an element has the same number of protons in the nucleus
- Different atoms of the same element may have different numbers of neutrons in the nucleus
- These differing-neutron atoms are called isotopes



ELECTRON FEATURES

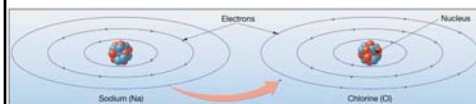
- Electrons occur in a cloud around nucleus
- More likely to occur at certain distances and with a certain amount of energy than in other places—the energy shells
- Inner shells fill before outer shells are created
- Full shells more stable than partial shells

PERIODIC TABLE

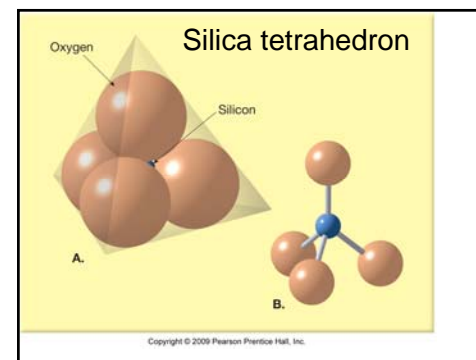
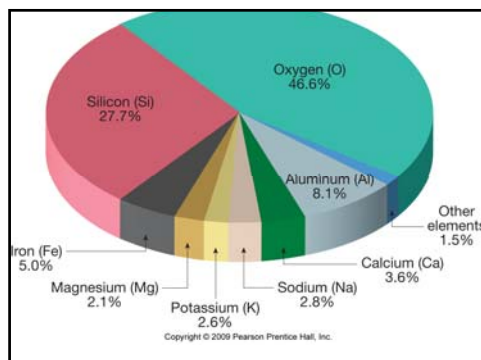
- Arranged from lowest atomic number to highest, from left to right, from top to bottom
- Each row corresponds to an energy level (electron shell)
- Each column contains elements with similar properties, which repeat on a regular (or periodic) basis
- These similar properties are a result of the same number of electrons in the outermost shell

Periodic table of elements showing atomic number, symbol, atomic weight, and name of elements. The table is color-coded by groups: Metals (red), Transition metals (orange), Nonmetals (yellow), Noble gases (green), Lanthanide series (blue), and Actinide series (purple).

Ionic bonding



- Result of stability of filled outer shells of electrons
- Sodium apt to lose its lone outer electron
- Chlorine apt to fill its nearly-full outer shell



Mineral/Formula	Cleavage	Silicate Structure
Olivine group (Mg, Fe) SiO_3	None	Independent tetrahedron
Pyroxene group (Augite) (Mg, Fe) SiO_3	Two planes at right angles	Single chains
Amphibole group (Hornblende) $\text{Ca}_2(\text{Fe, Mg})_5\text{Si}_8\text{O}_{22}(\text{OH})_2$	Two planes at 60° and 120°	Double chains



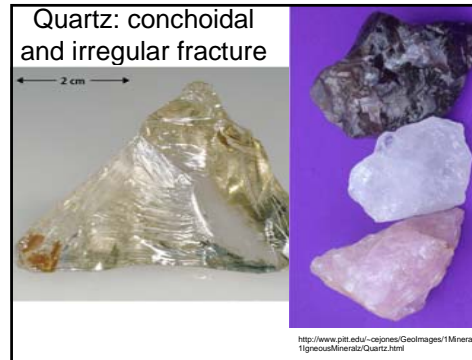
Mineral/Formula	Cleavage	Silicate Structure
Biotite $\text{K}(\text{Mg, Fe})_3\text{AlSi}_3\text{O}_{10}(\text{OH})_2$	One plane	Sheets
Muscovite $\text{KAl}_2(\text{AlSi}_3\text{O}_{10})(\text{OH})_2$		

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Mineral/Formula	Cleavage	Silicate Structure
Potassium feldspar (Orthoclase) KAlSi_3O_8	Two planes at 90°	Three-dimensional networks
Plagioclase feldspar (Ca, Na) AlSi_3O_8		
Quartz SiO_2	None	

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IMPORTANT MINERAL PROPERTIES

- LUSTER: all minerals have it
- CRYSTAL FORM: some show it
- STREAK: color may be white
- COLOR: may be diagnostic



Pyritohedrons

- Five sided faces
- Ten faces
-



Color may not help to identify mineral

- These are all quartz



<http://www.pitt.edu/~cjpores/Geolimages/1/Minerals/1/quartz/Mineral/Quartz.html>

Color may not help to identify mineral



http://minerals.calech.edu/Silica_Polymorphs/index.html

Color may be diagnostic



Azurite $\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$ Native Sulfur (S) Malachite $\text{Cu}_2\text{CO}_3(\text{OH})_2$

<http://geology.csupomona.edu/start/mineral/color.htm>



F.

IMPORTANT MINERAL PROPERTIES

- **HARDNESS:** compare to common items
- **CLEAVAGE:** planes of internal weakness
- **FRACTURE**
- **SPECIFIC GRAVITY:** density, heft
- **"OTHER" PROPERTIES**
 - MAGNETISM, TASTE, SMELL
 - FIZZ IN Hydrochloric ACID
 - DILUTE, HEATED, IF MINERAL IS POWDERED
 - DOUBLE REFRACTION

Hardness

- | | | | |
|----------------|-------------|---------------|------------------|
| | 1. Talc | 6. Orthoclase | |
| Fingernail 2.5 | 2. Gypsum | 7. Quartz | Streak plate 7.5 |
| Penny 3.5 | 3. Calcite | 8. Topaz | |
| | 4. Fluorite | 9. Corundum | |
| Steel nail 5 | 5. Apatite | 10. Diamond | |
| Glass 5.5 | | | |



Muscovite



