The Six Crystal Systems

Minerals are Grouped into Six Crystal Systems based on Symmetry (see handout)

- **Crystal System**                          **Characteristic (or minimum)**
- Isometric (Cubic) System                  four 3 or 3-bar
- Hexagonal System                         one 6, 6-bar, 3 or 3-bar
- Tetragonal System                        one 4 or 4-bar
- Orthorhombic System                     three 2 and/or m
- Monoclinic System                       one 2 and/or m
- Triclinic System                        1 or 1-bar

Isometric System

- Four 3 or 3-bar (corner-corner of reference cube)
- Also have three perpendicular 4, 4-bar or 2 axes
- These are the crystallographic axes $a_1$, $a_2$, $a_3$; all equal length
- Isometric forms are equidimensional
- Highest symmetry system

The Cube and Octahedron are simple, common Isometric Forms
A Form is:

- A set of similarly shaped faces
- That are related to each other by the symmetry of the crystal
- Forms can be open or closed

More Isometric Forms

Isometric Minerals: Fluorite (CaF$_2$)

Isometric Minerals: Garnet (Ca,Fe,Mg,Mn)$_3$Al$_2$Si$_3$O$_{12}$

Halite

Isometric Minerals: Pyrite

The Six Crystal Systems

Crystallographic Axes

- Reference axes
- Conventional ways to hold and refer to faces on crystals
- Different convention for each system

Crystallographic Axes:
Isometric System
Crystallographic Axes:
Tetragonal System

Tetragonal Examples

Crystallographic Axes:
Orthorhombic System

Crystallographic Axes:
Monoclinic System

Crystallographic Axes:
Triclinic System

Crystallographic Axes:
Hexagonal System

Hexagonal Examples

The Six Crystal Systems