

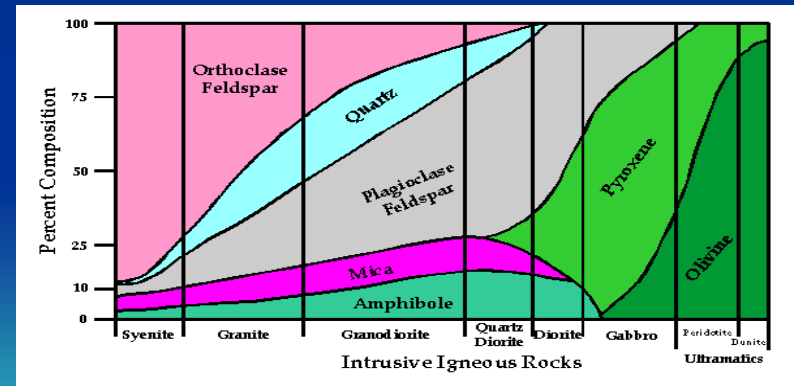


# Minerals Laboratory



## Natural Disasters ENVI 105 Lab

Ray Rector - Instructor



# Preview of Mineral Section

## I. What are Minerals?

Where are minerals found?

How do minerals form?

What types of minerals are there?

The common rock-forming minerals?



## II. The Physical Properties of Minerals

## III. Determining the Identify of a Mineral

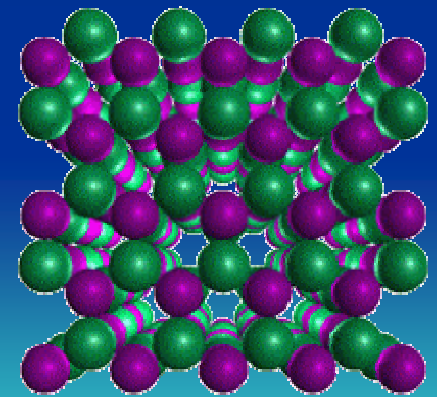
# What are Minerals?

**Definition:** any *naturally-occurring*, homogeneous solid that has a distinctive internal *crystalline* structure, a *definite chemical composition* and a set of *unique physical properties*. Minerals are usually *formed by inorganic processes*.



# What Makes Each Mineral Unique?

A mineral's *crystal structure* and *chemical composition* together determine the mineral's *unique physical properties*



# Where are Minerals Found?

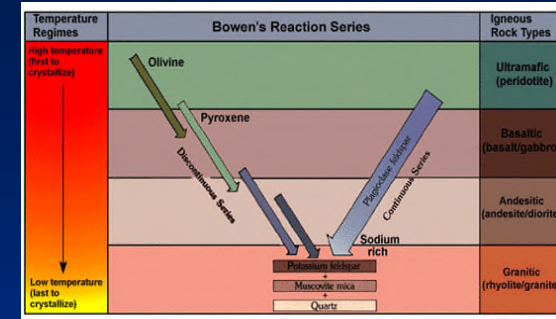
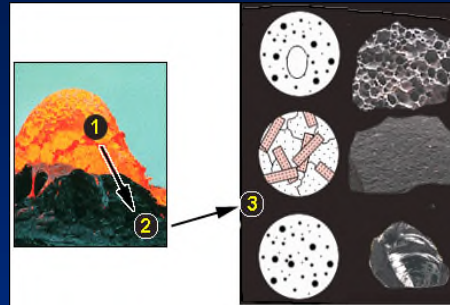
**Short Answer = Everywhere!**

- 1) Igneous Rocks
- 2) Sedimentary Rocks
- 3) Metamorphic Rocks
- 4) Sediment



# How do Minerals Form?

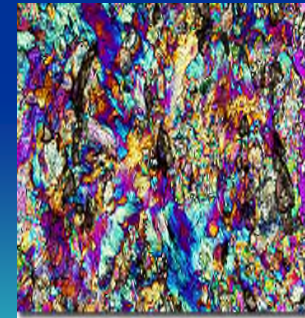
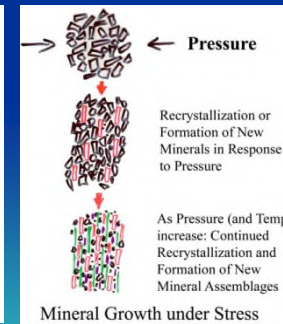
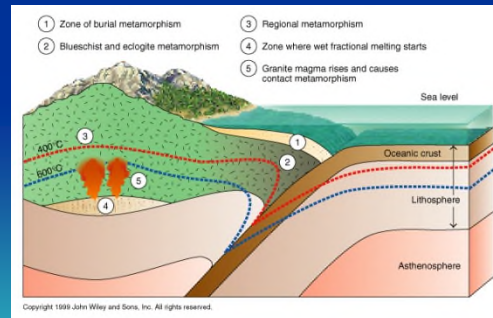
1) Crystallization from a cooling magma or lava



2) Crystallization from aqueous solutions



3) Crystallization from preexisting minerals



# Bowen's Reaction Series

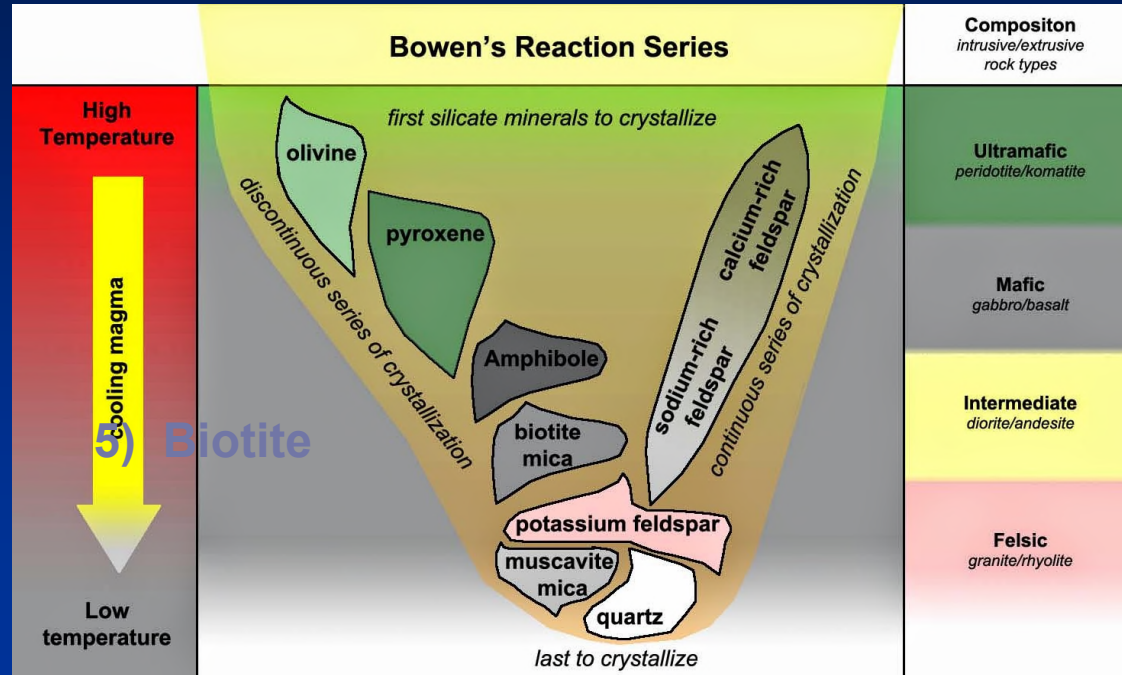
## Common Igneous Rock-forming Minerals Crystallizing from a Magma

### Mafic, Higher-Temp Minerals

- 1) Ca-Plagioclase
- 2) Olivine
- 3) Augite (pyroxene)
- 4) Hornblende (amphibole)
- 5) Biotite

### Felsic/Silicic, Lower-Temp Minerals

- 1) Na-Plagioclase
- 2) Biotite
- 3) Potassium Feldspar
- 3) Quartz
- 4) Muscovite



# Types of Rocks

**Igneous Rocks**

**Sedimentary Rocks**

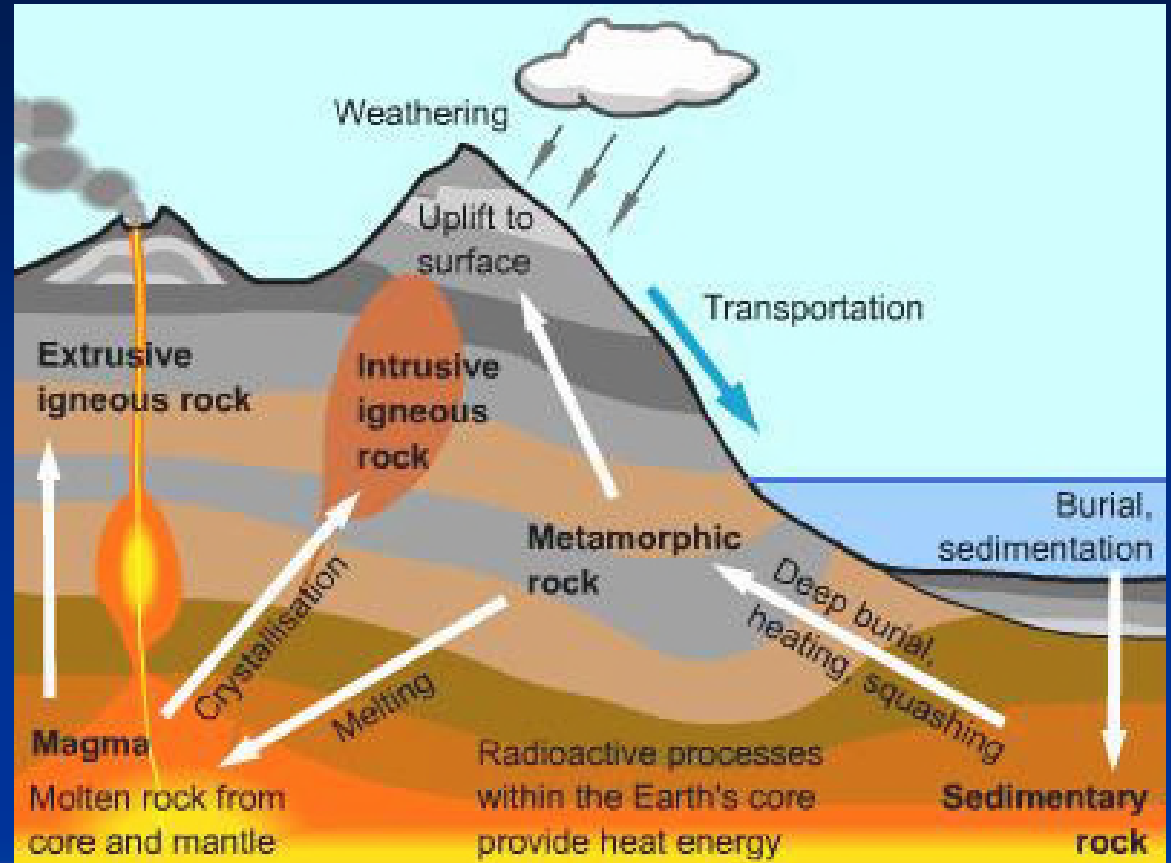
**Metamorphic Rocks**

Texture	Composition		
	Felsic (Granitic)	Intermediate (Andesitic)	Mafic (Basaltic)
Phaneritic (course-grained)	 Granite	 Diorite	 Gabbro
Aphanitic (fine-grained)	 Rhyolite	 Andesite	 Basalt
Porphyritic	 Granite porphyry	 Andesite porphyry	 Basalt porphyry

# The Rock Cycle

## Three Primary Rock Types

- 1) **Igneous**
- 2) **Metamorphic**
- 3) **Sedimentary**



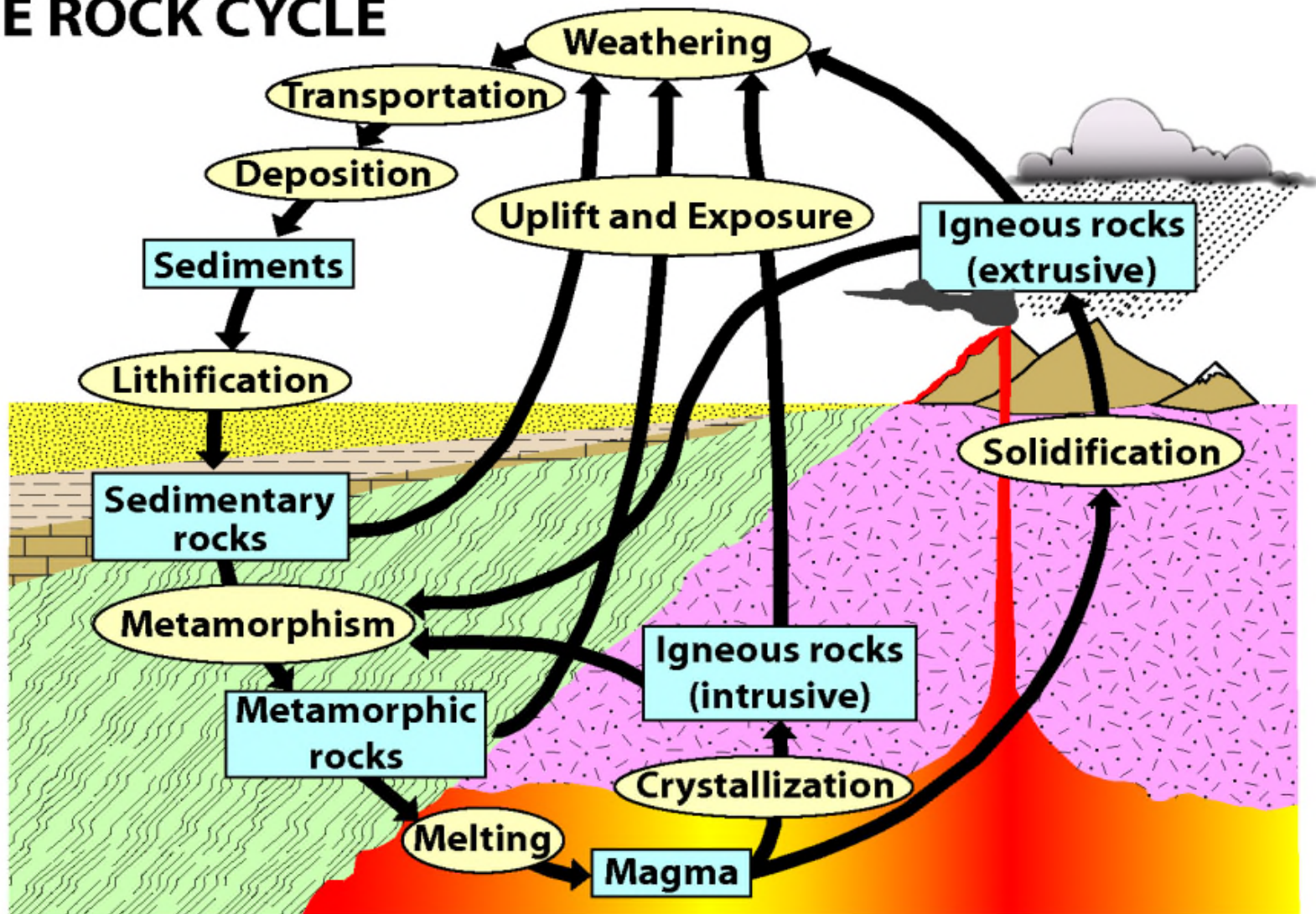
## Key Concept:

## The Rock Cycle is Perpetuated by Several Major Processes

- 1) Magmatic Activity
- 2) Uplift and Mountain Building
- 3) Weathering, Erosion, Deposition, and Burial of Sediment



# THE ROCK CYCLE



## Igneous Rocks -

Rocks that form from the cooling of molten rock (magma), Example: granite and basalt

## Sedimentary Rocks -

Rocks that are formed from pieces of other rocks, Example: sandstone, or that are deposited from the ocean by chemical processes, Example: limestone

## Metamorphic Rocks -

Rocks that are changed by heat and pressure without melting, Example: gneiss

# Various Types of Minerals

- ✓ Over 4000 Species
- ✓ Grouped into Categories
- ✓ Silicate group is by far the largest and most important mineral group
- ✓ Only about 20 minerals make up 95%+ of all rocks
- ✓ Minerals are identified by their Chemical and Physical Properties

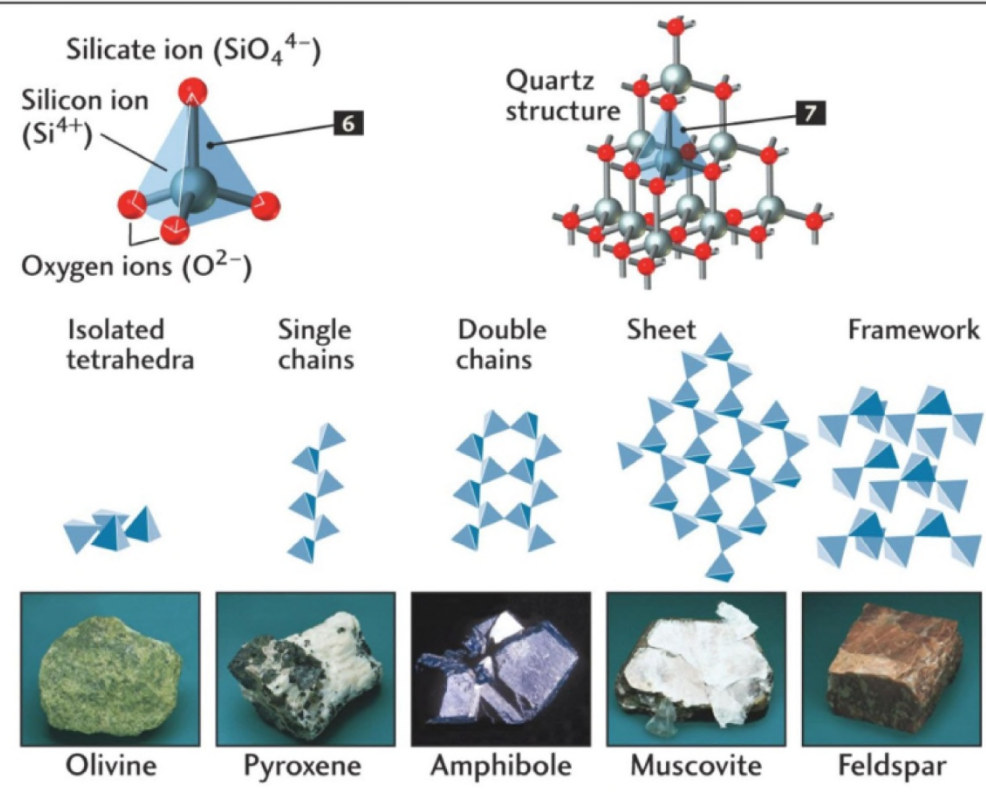


# Common Rock-Forming Minerals

## Rock-Forming Minerals

- ◆ Clay
- ◆ Quartz
- ◆ Calcite
- ◆ Olivine
- ◆ Dolomite
- ◆ Pyroxene
- ◆ Amphibole
- ◆ Biotite, Muscovite Micas
- ◆ Orthoclase, Plagioclase Feldspars

Although there are very many rock types, they are mainly built from one or more of 11 rock-forming minerals. Others are uncommon to rare.



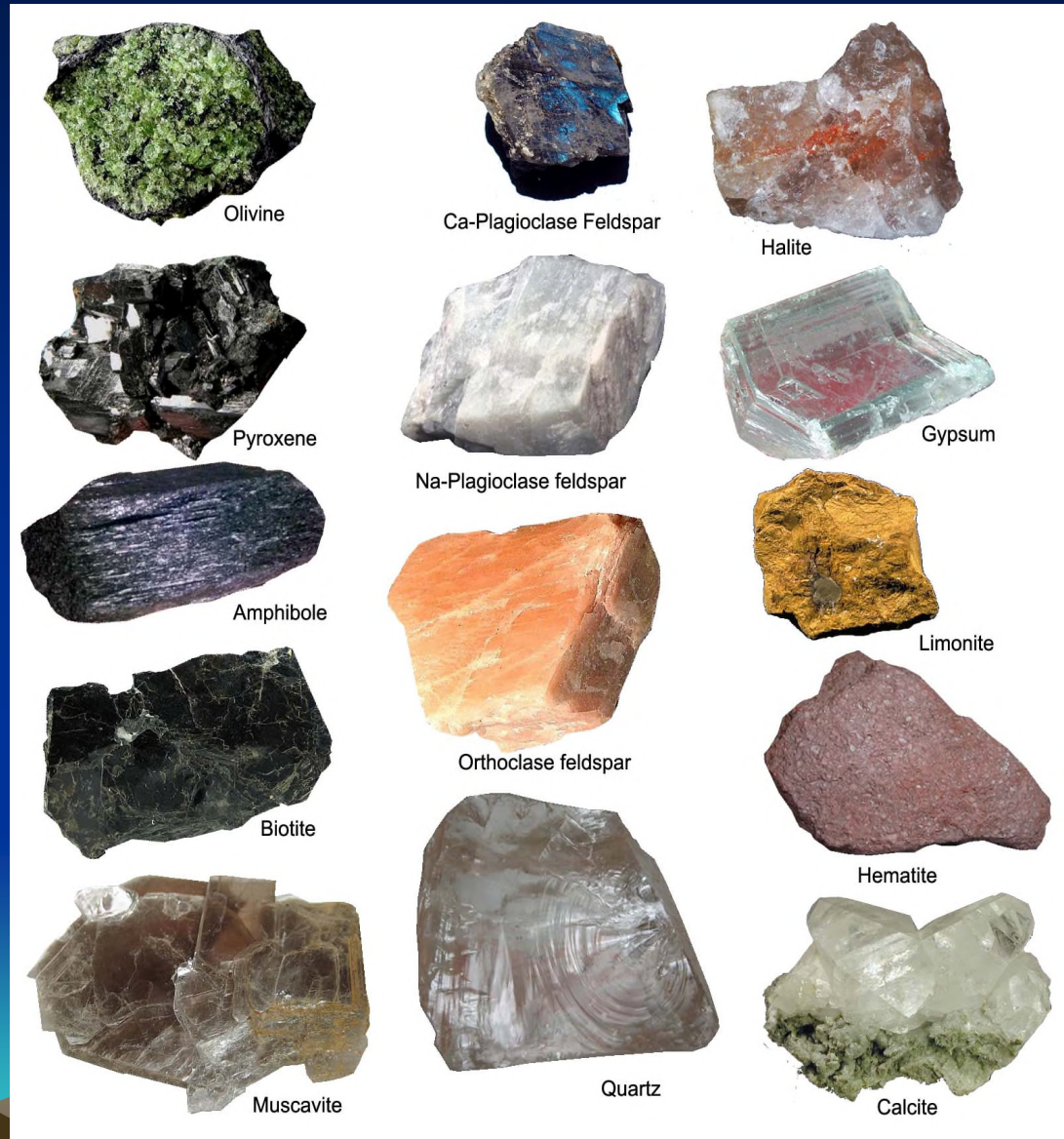
# Common Rock-Forming Minerals

## Dark-Colored Minerals

- 1) Ca-Plagioclase
- 2) Hornblende (amphibole)
- 3) Augite (pyroxene)
- 4) Olivine
- 5) Biotite

## Light-Colored Minerals

- 1) Na-Plagioclase
- 2) Potassium Feldspar
- 3) Quartz
- 4) Muscovite
- 5) Calcite
- 6) Gypsum



# Mineral Reference Samples



# Important Mineral ID Properties

1) Crystal Form & Habit

2) Luster

3) Color

4) Hardness

5) Cleavage

6) Other properties

- Streak
- Reaction to acid
- Magnetic
- Taste



# Mineral Habit

## Defined:

Characteristic external habit or shape of an individual crystal or groups of crystals


Crystal habit is divided into several categories, based on:

- Internal crystal structure
- External crystal shape


Habit is useful for mineral ID

### Crystal Habit


- Crystal habit is the ideal shape of crystal faces.
- Ideal faces require ideal growth conditions.
- Many descriptive terms are used to characterize habit.




Cubes




Octahedra




Blades




Hexagonal Prisms



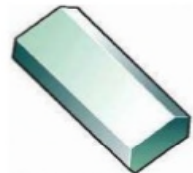
Dodecahedra



Compound Forms



Rhombohedra



Tetragonal Prisms

Essentials of Geology, 3<sup>rd</sup> edition, by Stephen Mars hak
Chapter 3: Patterns in Nature: Minerals

						
Isometric	Hexagonal	Tetragonal	Trigonal	Orthorhombic	Monoclinic	Triclinic
						
Isometric	Hexagonal	Tetragonal	Trigonal	Orthorhombic	Monoclinic	Triclinic

# Mineral Luster

**Defined:** The quality of reflected light emitted by a mineral crystal

Luster can be divided into two useful categories:

- Metallic and Nonmetallic

Nonmetallic lusters can be further subdivided into:

- Glassy, Pearly, Waxy, and Dull

Luster is useful for mineral ID





# Mineral Color

**Defined:** The hue and shade of the reflected light emitted by a mineral crystal

**Mineral color can be divided into two useful shade categories:**

- Dark-colored and Light-colored



**Color can also be divided into the hue categories:**

- White, Gray, Black, Red, Orange, Yellow, Green, Blue, Purple, etc.
- Color is useful for mineral ID

