

G201 Midterm 1 Study Guide

Minerals

Definition of a mineral:

Definition of a rock:

Composition of minerals

Chemically:

Physically:

Structure of Atoms

(Atomic Structure)

Idealized structure of an atom

Bonding among mineral components

Structure of minerals

Classification of Minerals

Several major groups exist including

- Non-silicates – several groups
- Silicates

Physical properties of minerals

Most important mineral group: Silicates

Structures of Silicates

Silicate Minerals

- Isolated tetrahedra
 - Olivine, Garnet family
- Single chain
 - Pyroxene family
- Double chain
 - Amphibole family
- Sheets or layers of linked tetrahedra
 - Mica family
 - Clay family
- Complex 3-dimensional structures (frameworks)
 - Quartz
 - Feldspar family

Physical properties of minerals

- Luster
- Color
- Streak
- Hardness
- Cleavage
- Fracture
- Specific Gravity (Density)

Weathering and soils

Weathering – the physical breakdown (disintegration) and chemical alteration (decomposition) of rocks at or near Earth's surface

Erosion – the physical removal of material by mobile agents such as water, wind, ice, or gravity

Mass wasting – the transfer of rock and soil downslope under the influence of gravity

Two types of weathering; Mechanical weathering – breaking of rocks into smaller pieces; Chemical Weathering, breaks down rock components and internal structures of minerals

Four types of mechanical weathering

Chemical weathering

Physical changes include rounding of corners or edges; Rates of weathering; Advanced mechanical weathering aids chemical weathering by increasing the surface area; Others factors affecting weathering

Silicate minerals weather in the same order as their order of crystallization; Climate and temperature and moisture are the most crucial factors in chemical weathering; most effective in areas of warm, moist climates; Differential weathering, masses of rock do not weather uniformly due to regional and local factors

Soil

Soil is a combination of mineral and organic matter, water, and air

Typical components in a soil that yields good plant growth

Factors controlling soil formation

Soil profile

Igneous Rocks

- Igneous rocks form as molten rock (magma) cools and solidifies (through crystallization, mostly)
- Characteristics of magma

What is a Magma

Crystallization of Magma

Bowen's reaction series

Igneous Compositions - mineralogical

Igneous compositions - chemical

Felsic igneous rocks

- Granite
- Rhyolite

Glassy felsic igneous rocks

- Obsidian

Intermediate igneous rocks

- Diorite
- Andesite

Mafic igneous rocks

- Basalt
- Gabbro

Origin of Magma

- Melting process: Generation of magma from solid rocks

Geothermal Gradient

Melting regimes

- Mantle beneath divergent plate boundaries
- Mantle beneath convergent plate boundaries
- Continental crust

Evolution of magmas

- Processes responsible for changing the composition of a magma
 - Magmatic differentiation
 - Assimilation

- Magma mixing

Processes that change magma compositions

Igneous textures

- Aphanitic (fine-grained) texture
- Phaneritic (coarse-grained) texture

- Porphyritic texture
- Glassy texture