**Igneous Rocks Notes**

**Definitions**

**Igneous (First Ever Rocks) -** Formed from the cooling and crystallization of magma or lava

**Magma -** Hot, molten rock below the Earth’s surface

**Lava -** Magma that flows onto the Earth’s Surface

**\*Silica content affects the temperature of magma and impacts the magma’s viscosity (resistance to flow) and physical color.\***

**Silica Content In Different Types Of Rocks**

**Basaltic -** low silica content flows easily

**42%-52% silica**

**Mafic** = Dark Colored

**Andesitic -** medium silica content medium flow

**52.1% - 66% silica**

**Intermediate** = 50/50 Color

**Rhyolitic -** high silica content flows slowly

**More than 66% silica**

**Felsic** = Light Colored

**Vesicles** = Air Holes / Bubbles (caused by rapid cooling of lava)

**Factors That Affect The Formation Of Magma**

**Temperature -** Increases with depth (geothermal gradient)

**Pressure -** Increases with depth

- Affects melting points of rocks

- As pressure increases, the melting point increases

**\*As temperature increases, the pressure also increases and vice-versa\***

**Water Content -** Rocks containing small percentages of water

- As water content increases, the melting point decreases

**Mineral Content -** Different minerals melt at different temperatures

- Rocks rich in iron and magnesium melt at higher temperatures than those rich in silicon

**Bowen’s Reaction Series -** Describes the temperature at which minerals crystalize when cooled, or melt when heated

**Highest Crystallization:**

- Olivine

- Pyroxene

- Amphibole

- Biotite

- Potassium Feldspar

- Muscovite Mica

- Quartz

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**Classification of Igneous Rocks**

**Igneous Rocks -** are classified according to their composition and texture

**Texture -** is dependent upon the location of the cooling

**Intrusive Rocks -** Cool deep in the Earth

- Slow cooling rate causing large crystals

- Coarse (rough) grained

**Extrusive Rocks -** Cool near the Earth´s surface

- Fast cooling rate causing fined grained (smooth) or small crystals

- Glassy, no crystals

**Porphyry -** Type of rock containing large and small crystals

- Indicates cooling rate changed rapidly

- Has both intrusive and extrusive rock properties

**Vesicular -** Characterized by having vesicles, or holes formed by gas bubbles (spongy)

\***Only extrusive types of rocks are vesicular\***

**Composition -** Determined by the magma type that forms the rock

**Granitic -** Form light-colored rocks

- Felsic

- Thick and slow-moving

- Large amounts of silica

- Contains mostly quartz and feldspar

**Basaltic -** Form dark-colored rocks

- Mafic

- Fast and runny

- Low Silica

- Contains mostly plagioclase and pyroxene

**Intermediate -** Composition between basaltic and granitic

**Ultramafic -** Contains iron-rich minerals

- Always dark

- Ultrabasic

**Three groups of Ultramafic rocks:**

- Dunites

- Peridotites

- Pyroxenites

Granitic - Rhyolitic - Felsic = Light Color

Basaltic - Mafic = Dark

Andesitic - Intermediate = 50/50

Ultra Basic - Ultramafic = Very Dark Color

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**Igneous Rocks as Resources**

**Valuable minerals are often found in veins**

- Crystallize last in Bowen´s Reaction Series (ex. Gold, silver, lead, and copper)

**Pegmatite -** Is an igneous rock with extremely large-grained minerals that can contain rare ores such as lithium and beryllium.

**Kimberlite -** Is a rare, ultramafic rock that can contain diamonds and other minerals formed only under very high pressure

- Formed at great depths (150-300 km)

- Mostly found in South Africa

**Igneous rocks are hard, dense, and durable**

- Due to interlocking grain texture

- Ideal for construction and building

**Partial Melting -** Is the process while some minerals melt at relatively low temperatures while some don’t.

**Fractional Crystallization -** A process by which different minerals crystallize at different temperatures