**ASSIGNMENT PROJECT 2**

**The Rock Cycle**

The rock cycle is a continuous process that describes the transformation of rocks from one type to another over geological time. There are three main types of rocks involved in the rock cycle: igneous, sedimentary, and metamorphic.

**Igneous Rocks**

Igneous rocks are formed from the solidification of molten rock material. This material can be either magma (below the Earth’s surface) or lava (on the Earth’s surface). The two main processes that lead to the formation of igneous rocks are cooling and crystallization. When magma cools and solidifies beneath the Earth’s surface, intrusive igneous rocks are formed. On the other hand, when lava cools and solidifies on the Earth’s surface, extrusive igneous rocks are formed.

**Sedimentary Rocks**

Sedimentary rocks are formed through the accumulation and compression of sediments. These sediments can be derived from the weathering and erosion of pre-existing rocks, as well as from the remains of living organisms. Over time, these sediments are compacted and cemented together to form sedimentary rocks.

**Metamorphic Rocks**

Metamorphic rocks are formed from pre-existing rocks that undergo changes due to high temperature, pressure, or chemically active fluids. These changes occur without melting the rock entirely. The original rock, known as the protolith, is subjected to these conditions, leading to recrystallization and reorganization of its mineral structure, resulting in the formation of a metamorphic rock.

**Igneous Rock Classification**

Igneous rocks are classified based on their texture and composition.

Texture refers to the size of the mineral grains in the rock and how they fit together.

Composition refers to the minerals present in the rock and their relative proportions.

Igneous Rock Textures

Aphanitic: A fine-grained texture where individual mineral grains are not visible with the naked eye.

**Phaneritic**: A coarse-grained texture where individual mineral grains are visible with the naked eye.

**Porphyritic:** A texture characterized by large crystals (phenocrysts) embedded in a matrix of smaller crystals.

**Vesicular:** A texture containing voids or cavities left by gas bubbles trapped in the cooling magma/lava.

**Glassy:** A texture where the rock appears similar to glass due to rapid cooling that prevents crystal formation.

**Pegmatitic:** An exceptionally coarse-grained texture characterized by very large crystals.

**Common Igneous Rock-Forming Minerals**

The common igneous rock-forming minerals include:

Quartz (SiO2)

Feldspar (KAlSi3O8 - NaAlSi3O8 - CaAl2Si2O8)

Mica (biotite - K(Fe,Mg)3AlSi3O10(OH)2 - muscovite - KAl2(AlSi3O10)(OH)2)

Amphibole (hornblende - Ca2(Mg,Fe)4Al(Si7Al)O22(OH)2)

Pyroxene (augite - (Ca,Na)(Mg,Fe,Al)(Si,Al)2O6)

Olivine ((Mg,Fe)2SiO4)

Plagioclase Feldspar ((Na,Ca)(Si,Al)4O8 - (NaAlSi3O8 - CaAl2Si2O8))

Potassium Feldspar (KAlSi3O8)

**Classification Based on Composition**

Igneous rocks can also be classified based on their composition into ultramafic, mafic, intermediate, and felsic.

**Ultramafic:** Igneous rocks with very low silica content and high levels of iron and magnesium.

**Mafic:** Igneous rocks with relatively low silica content and high levels of iron and magnesium.

**Intermediate:** Igneous rocks with moderate silica content and moderate levels of iron and magnesium.

**Felsic:** Igneous rocks with high silica content and lower levels of iron and magnesium.

**Igneous Rocks Classification**

Peridotite: Intrusive ultramafic

Basalt: Extrusive mafic

Gabbro: Intrusive mafic

Andesite: Extrusive intermediate

Diorite: Intrusive intermediate

Rhyolite: Extrusive felsic

Granite: Intrusive felsic

**Types of Volcanoes**

**Shield Volcanoes:** Broad, gently sloping volcanoes characterized by eruptions with low viscosity lava flows.

**Cinder Cone Volcanoes:** Steep-sided volcanoes built from explosive eruptions that eject fragmented lava.

**Stratovolcanoes (Composite Volcanoes):** Large, cone-shaped volcanoes built from alternating layers of lava flows, volcanic ash, cinders, blocks, and volcanic bombs.