

Weathering of Silicate Minerals Worksheet

Types	Description of process and results
Dissolution	Water molecules gang up on ions on outside of mineral lattice (surface) and break the mineral bonds, releasing the ions into solution. Water carries ions away.
Hydrolysis	Water molecules enter mineral formula, replacing other components and changing mineral to a new one: a clay mineral. Example: $2\text{KAlSi}_3\text{O}_8 + 2\text{H}^+ + 9\text{H}_2\text{O} = \text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4 + 4\text{H}_4\text{SiO}_4 + 2\text{K}^+$ K-feldspar + water = Kaolinite clay + silicic acid and potassium ions
Oxidation	Oxygen bonds with Fe ions on outside of mineral lattice (surface) removing Fe from mineral and producing Hematite (rust).

Complete the following table to indicate what happens to primary igneous and metamorphic minerals when they undergo chemical weathering on the Earth's surface. During chemical weathering of a rock, the usual element distribution is:

- Fe - Oxidizes: combines with O to form insoluble iron oxides, giving red to yellow soil cover.
- Al, Si, O - Hydrolizes: combines with water to form clays (only if all three (Al, Si, O) are in mineral).
- Quartz - Stays in place; doesn't break down chemically.
- Na, Ca, K, Mg, other cations, AND excess silica (silica not in quartz or not combined with Al and O to form clays) - Dissolves and is removed by water.

Mineral undergoing chemical weathering:	What happens to its components?
<i>Amphibole family:</i> Hornblende [Silicate with Ca, Mg, Fe, Al, OH]	
<i>Feldspar family:</i> <ul style="list-style-type: none"> • Plagioclase Feldspars: Anorthite and Labradorite [CaAl₂Si₂O₈] to Oligoclase and Albite [NaAlSi₃O₈] • Potassium Feldspars: Orthoclase and Microcline [KAlSi₃O₈] 	
Garnet Fe, Mg, Ca, Al Silicate	
<i>Mica family:</i> <ul style="list-style-type: none"> • Biotite [Silicate with K, Mg, Fe, Al, Ti, OH, F] • Muscovite [Silicate with K, Al, OH, F] 	
Olivine (Mg, Fe) ₂ SiO ₄	
Pyroxene family: Augite [Silicate with Fe, Mg]	
Quartz SiO ₂	
Serpentine Mg ₆ Si ₄ O ₁₀ (OH) ₈	
Talc Mg ₃ Si ₄ O ₁₀ (OH) ₂	