Weathering, Erosion and Deposition

Weathering: The ___________ or ___________ breakdown of rock into ___________ particles.

Erosion: The ___________ or movement of the weathered sediments.

Deposition: The ___________ of the weathered sediments.

Physical Weathering

Two types of weathering
1. Physical (Mechanical)
2. Chemical

Physical Weathering

Any process that causes a rock to crack or ___________ into pieces WITHOUT chemically changing the rock.

Frost Wedging

1. Water seeps into small cracks in a rock.
2. As the water ___________ it ___________.
3. Over time, the cycle of ___________ and ___________ will cause the rock to break or ___________ apart.
Physical Weathering

Root Wedging

Trees and plants can grow roots through cracks in rocks and break them apart over time.

Even the hairlike roots of mosses can grow between the grains that make up the rock.

Physical Weathering

Exfoliation

Result of extreme temperature changes.

As rock is heated by the sun, the outside of the rock expands.

Physical Weathering

When temperatures cool at night, the outside of the rock contracts.

The cycle of heating and cooling causes the outer layers of the rock to break off ("peel") in layers.

Physical Weathering

Abrasion (grinding action)

This process occurs when sediments carried by streams or wind blown sand cause particles to collide into each other and any other surrounding rock.
Chemical Weathering

Any process that causes rocks to **breakdown** by **chemical** action resulting in a change of the rock's **mineral composition**.

Chemical Weathering

**Carbonation**

Occurs when **carbon dioxide** in the atmosphere dissolves in the droplets of water that make up clouds. This forms a weak **carbonic** acid that reacts with certain rocks that contain the mineral **calcite**.

Chemical Weathering

These rocks include **marble** and **limestone**.

Chemical Weathering

Carbonic acid rain water seeps into the **limestone** bedrock through the cracks. The **chemical** reaction dissolves the **limestone**.

\[
\text{CaCO}_3 + \text{H}_2\text{CO}_3 \rightarrow \text{Ca}^{2+} + 2\text{HCO}_3^{-}
\]

(calcium carbonate) (carbonic acid)

Chemical Weathering

This process forms underground **caves**.

http://www.teachersdomain.org/asset/ess05_vid_cavebiogeo/

A cave forms. Other features may include:

- **Sinkholes**
- **Columns**
- **Stalactites**
- **Stalagmites**
Chemical Weathering

**Hydration**

Occurs when _______ **water** dissolves certain minerals in a rock.

Example: _______ **water** will dissolve much of the feldspar in granite allowing it to break apart. The quartz remains behind to become sand.

**Oxidation**

Occurs when _______ **oxygen** in the atmosphere combines with certain minerals to change their form and breakdown rock.

**Plant Acids**

Plants produce weak acids that can also dissolve certain minerals that make up rocks.

Human Activity

Gases produced by humans can dissolve in water droplets of clouds to produce _______ **acid rain**.

Factors Affecting Weathering

**Climate** is the _______ **major** factor that affects the rate of weathering.

**Temperature**

In warm climates, _______ **chemical action** is the dominant type of weathering.

In cold climates, _______ **frost wedging**

(Also known as _______ **frost action**) is the dominant type of weathering.
Factors Affecting Weathering

**Precipitation**

As precipitation increases, the amount (and rate) of **frost action** will **increase**.

As precipitation increases, the amount (and rate) of **chemical** weathering will **increase**.

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Factors Affecting Weathering

**Chemical** weathering is the most rapid in **warm**, **wet/humid** climates.

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What type of weathering would be more common in a warm and dry climate...

Physical (or) Chemical?

Desert = wind abrasion.....

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Factors Affecting Weathering

Different **rock** types (their mineral composition) **Differential** weathering is the process by which softer, less **weather-resistant** rocks wear away, leaving harder, more **resistant** rocks behind.
Which rock is more resistant to weathering?

Factors Affecting Weathering

Particle size

Weathering occurs on the outside surface of rocks. So the more surface area that is exposed to weathering, the faster the rock will be broken down.

Factors Affecting Weathering

As the rock breaks down into smaller pieces, the more surface area is exposed and the rate of weathering increases.

**smaller particles = fastering weathering**

Factors Affecting Weathering

Quick Review

1. Climate
2. Different rock types (mineral comp.)
3. Particle size

Soil

Soil is a combination of weathered rock and organic matter (as a result of biological activity). Humus is decayed plant and animal material found in soil. Soil that contains ~25% humus is considered rich soil.
Darker, richer, topsoil is a result of biological activity.

Soil Layers (Soil Profile)

- **Topsoil**
  - the top layer of soil that contains more humus than the layers below.
  - Consists of clay and silt that have been deposited from above. Contains less humus.

- **Sub-soil**
  - Consists of weathered rock fragments, usually from the parent rock below.

- **Horizon**
  - The layer of rock beneath the soil, frequently contains the parent rock of the soil above.

Due to biological activity.