Name: Date:

Earth Breaks Down: Weathering

A low rumble breaks the early morning silence. Soon, a nearby mountain, a peaceful neighbor for thousands of years, begins to spit hot rocks, and ashes. Lava pours from a hole that has opened near its summit. The mountain and the area around it has changed suddenly, The land nearby will be carpeted with ash and lava. The shape of the land near the volcano will have changed suddenly.

Earth is always changing. Some changes happen rapidly, like those that follow a volcanic eruption. Other changes, however, happen very slowly. Weathering and erosion are two changes that alter Earth's surface, but they happen very slowly.

What is weathering?

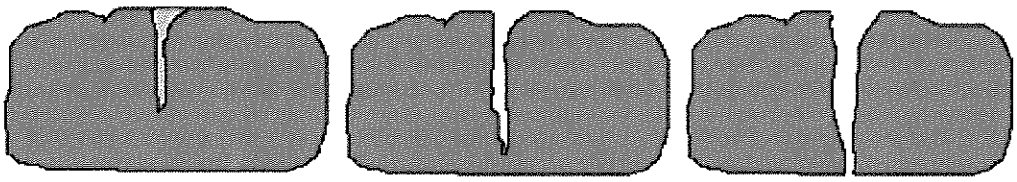
Weathering is when Earth's crust, its rocky exterior, breaks into smaller pieces. How does this happen? Two basic ways. First, there is what is called mechanical weathering. Mechanical weathering is when rock is simply broken into smaller pieces. Chemical weathering is the other type of weathering. Chemical weathering happens when the chemicals of the rocks are changed by the weathering process. The rock is broken into smaller pieces, and these pieces are different from the original rock.

Causes of mechanical weathering:

Temperature change: You may already know that when things get warmer, they expand slightly. When things get colder, they contract. Expand means to increase in size, and contract means to shrink, so when a rock expands and contracts that means it is constantly changing size. This can be happening as often as every day, when Earth heats up under the sun's light during the day and cools down at night. This expansion

and contraction loosens the rock, causing small cracks in the rock that can eventually cause it to break.

The action of ice: Water is different from other substances in an important way: it expands when it freezes. This is because water forms crystals when it freezes, and these crystals have more room between them than molecules of liquid water. If liquid water enters a crack in a rock and then freezes, its expansion can force the rock apart. It seems odd to think that something as ordinary as water has the power to break rock apart, but it does!



Water seeps into cracks and fractures in rock.

When the water freezes, it expands about 9% in volume, which wedges apart the rock.

With repeated freeze/thaw cycles, rock breaks into pieces.

Plant roots: Roots are powerful, too. A tree or shrub root that enters a crack in a buried rock will keep growing over the years. As the root gets larger and larger, it forces the rock to break apart.

Burrowing animals: Animals that dig burrows, underground homes, also help to weather rock. How? The holes ants, mice, moles, and woodchucks dig allow air and water to enter the soil. Air and water then cause the weathering of the rock.

Causes of chemical weathering:

Have you ever combined vinegar and baking soda and then seen the result? A gas - carbon dioxide - is produced. The vinegar and baking soda no longer exist. They have been changed into new substances. This is a chemical reaction.

Chemical weathering is cause by chemical reactions. What are the most important chemicals causing these chemical reactions? The first is oxygen, the substance in the air that we need to live. Oxygen can react with chemicals in rocks, changing them forever. One familiar change that involves oxygen is rusting. When iron or steel rusts, it has changed into a new substance that no longer has the strength of metal. When

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substances in rocks react with oxygen, they change color in the same way that rust is a change in color. The rock will no longer have the strength of the original rock.

Rain can carry chemicals in it that will react with rock. Acids dissolved in the rain water react with and break apart the chemicals that make up the rock. Acidity is a natural part of rain water, as carbon dioxide in the air combines with water to a weak acid. Pollution can increase amounts of acidic chemicals in the air, however. In polluted cites, statues made of stone are wearing away due to pollution.

Lastly, plants can produce chemicals that react with and wear away rock. Plant roots produce chemicals that break apart minerals in the soil and in rocks, releasing nutrients that they need to grow.

Weathering is essential to life on Earth.

Weathering builds soil, and soil nurtures plant life. Plants, in turn, feed animals. The land ecosystems of Earth could not exist without weathering.

Check your understanding:

1. Define weathering.

2. How is mechanical weathering different from chemical weathering?

3. List two causes of mechanical weathering.

4. List two causes of chemical weathering.

5. How is weathering important to life on Earth?

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