Weathering

Directions: Read, highlight, and answer the questions.

Creating the perfect soil is critical to sustaining a consistent food supply. Without good soil, we don’t have crops. No crops, leads to no food. No food leads to... well you get the picture. So how is soil formed?

Simply put, it starts with weathering. Weathering can happen mechanically or chemically as each of these processes break down rocks. It’s interesting how something as hard as a rock and sometimes immoveable such as a mountain can become so gooey, slippery, and tiny filling up each and every farm acre as well as supporting the growth of all plants.

Mechanical weathering

Mechanical weathering happens when something physically breaks a rock into smaller pieces. This type of weathering does not change the minerals that make up a rock. It just breaks them into smaller pieces.

Mechanical weathering is most common in cold, dry climates. In the winter time here in Ohio we get a great view of how mechanical weathering happens. Whenever water slips into the cracks of black top, it creates potholes. The water freezes in the winter time. Remember that when water freezes, it is one of the few chemicals that expand. The water freezes, expands in the cracks, and then breaks the rock into smaller pieces. Ice acts like a wedge pushing the rock apart. As water thaws and refreezes, it repeats this same process. For that reason, this process is called the freeze-thaw cycle.

For those of you ever placing a bottle of water in the freezer and walking off forgetting about it, you have experienced the impact of water expanding in the form of a frozen bottle that is now open. Do this to a can of soda, and boom 😊

Another type of mechanical weathering comes in the form of wave motion. Ocean waves are notorious for rolling rocks along the bottom of the sea smashing them into other rocks and slowly breaking them down. Scientists refer to this as abrasion which means to scrape or wear away. This type of wave motion is one of the critical parts for making sand.

Biological Weathering

A special type of mechanical weathering happens from the many biological life forms inhabiting nature. One of the most common examples comes from the roots of plants. Roots will slowly grow into the cracks of rocks. As the roots grow, they push against the sides of the rocks much like the expanding ice in the freeze-thaw cycle. Eventually, the roots push hard enough that it snaps the rock in two. The roots continue to grow filling the gaps and repeating the process over again.

Chemical Weathering

The other type of weathering that breaks down rock happens chemically. In most cases, it’s the simplest, most abundant chemical around that causes the breakup, water. Many minerals react with water. As water strikes a rock, it can react causing the mineral to weaken or dissolve. As the mineral slowly leaves the rock, chunks of material break away.

Climate plays a large role in chemical weathering. Warm, wet locations help chemical weathering happen quickly. It can still happen in cold climates but much slower. Interestingly, chemical weathering and
mechanical weathering can work together making the whole process happen faster.

Another type of chemical weathering that has gained much publicity over the last 50 years is weathering from acid rain. This is a common type of chemical weathering. As we burn more fossil fuels (oil, coal, and natural gas), we pollute the atmosphere with sulfur, carbon, and nitrogen compounds.

These compounds mix with the water in the air forming weak acids. These acids aren’t strong enough to hurt humans, but they can do lots of damage to plants. When it rains, the acid rain falls with the water hitting many rocks and stones. If you’ve ever been to a cemetery and noticed how some gravestones look weathered, worn, and hard to read, this is caused by acid rain. Acid rain is one of the fastest ways to wear down rock happening in less than 100 years. As with many chemical weathering examples, warm, wet weather helps this process happen faster.

1. The effects of chemical weathering would be most evident:
   a. in polar regions.
   b. in deserts.
   c. in tropical climates
   d. at high, dry altitudes.

2. This type of weathering does not change the rock’s chemical composition.
   a. Mechanical weathering
   b. Chemical weathering
   c. Biological weathering
   d. Both A and C

3. This type of weathering breaks the rock apart using chemicals in the environment.
   a. Mechanical weathering
   b. Chemical weathering
   c. Biological weathering
   d. Both A and C

4. Define each of the following forms of weathering include the best environmental conditions necessary for each to occur.
   a. Freeze-thaw cycle
   b. Wave motion
   c. Biological Weathering
   d. Chemical