

Lesson Outline for Teaching

Lesson 3: The Rock Cycle

A. What is the rock cycle?

1. Recycling of rock material occurs naturally on Earth.
2. The rock cycle is the series of processes that continually change one rock type into another.

B. Processes of the Rock Cycle

1. The formation of minerals or rocks are key processes of the rock cycle.
2. Igneous rock forms from melted rock that is on or below Earth's surface.
 - a. Extrusive rock forms when lava erupts, cools, and crystallizes on Earth's surface.
 - b. Intrusive rock forms when magma cools and crystallizes inside Earth.
 - c. Both extrusive and intrusive rock are igneous rock.
3. Uplift is the process that moves large amounts of rock up to Earth's surface and to higher elevations.
4. Uplift is driven by the movement of tectonic plates and is related to the building of mountains.
5. At Earth's surface, rock is subject to the environment.
 - a. Rock is weathered by wind, rain, glaciers, and the activities of some organisms (or living things); these processes break down exposed rock into sediment.
 - b. Sediment is moved by erosion—the process by which glaciers, rain, and wind carry sediment to low-lying places called basins.
6. The process of laying down sediment in a new location is called deposition; over time, deposition causes layers of sediment to form, one on top of the other.
7. In the process of compaction, the weight of upper layers of sediment on lower layers of sediment pushes the grains of the bottom layers closer together.
 - a. There are tiny spaces called pores between the grains of sedimentary rock.
 - b. When there is water containing dissolved minerals in the pores between sediment, the minerals can crystallize, which helps cement the grains together in sedimentary rock.
8. Below Earth's surface, rocks are sometimes subject to high temperatures and pressures, which cause them to undergo metamorphism.
 - a. With high enough temperatures, the metamorphic rock can melt and become magma.
 - b. When the magma cools and solidifies, igneous rock forms, and another turn of the rock cycle begins.

Lesson Outline continued

9. The movement of Earth's tectonic plates helps drive the rock cycle.
- a. Volcanoes form near plate boundaries, giving rise to igneous rock; this kind of rock also forms where plates move apart.
 - b. Rocks near colliding plates are often exposed to high pressure, which causes them to undergo metamorphism.
 - c. When plates collide, one plate can get pushed deep below Earth's surface, where the rock melts and becomes magma; in time, it is likely to become igneous rock.
 - d. Colliding plates can push rock to Earth's surface; such rock is subject to erosion, which breaks the rock into sediment. These pieces of rock can eventually form sedimentary rock.

Discussion Question

Which processes of the rock cycle do you notice during your everyday life? Explain. Name some places in the world where you would be more likely to notice processes of the rock cycle that you don't commonly see where you live. Explain your answer.

Students in most places will notice the forces that weather rock and cause erosion: They may also notice sediment moving in the wind on windy days and perhaps the movement of sediment in streams, rivers, or human-made drainage. Students who live in mountainous areas or at high latitudes would be likely to be aware of glaciers and be able to notice evidence that glaciers move sediment; students who live in such areas would also be likely to notice deposition of sediment in basins. Students who live near volcanic areas would be likely to notice lava cooling and becoming igneous rock. Students who live in an earthquake-prone area are most likely to notice the plate movement that causes rock to be subducted deep under Earth's surface or to be uplifted above Earth's surface.