



Benchmarks from 4C Processes that Shape the Earth

4C Processes that Shape the Earth (K-2)#1

Chunks of rocks come in many sizes and shapes, from boulders to grains of sand and even smaller.

4C Processes that Shape the Earth (K-2)#2

Change is something that happens to many things.

4C Processes that Shape the Earth (K-2)#3

Animals and plants sometimes cause changes in their surroundings.

4C Processes that Shape the Earth (3-5)#1

Waves, wind, water, and ice shape and reshape the earth's land surface by eroding rock and soil in some areas and depositing them in other areas, sometimes in seasonal layers.

4C Processes that Shape the Earth (3-5)#2

Rock is composed of different combinations of minerals. Smaller rocks come from the breakage and weathering of bedrock and larger rocks. Soil is made partly from weathered rock, partly from plant remains—and also contains many living organisms.

4C Processes that Shape the Earth (6-8)#1

The interior of the earth is hot. Heat flow and movement of material within the earth cause earthquakes and volcanic eruptions and create mountains and ocean basins. Gas and dust from large volcanoes can change the atmosphere.

4C Processes that Shape the Earth (6-8)#2

Some changes in the earth's surface are abrupt (such as earthquakes and volcanic eruptions) while other changes happen very slowly (such as uplift and wearing down of mountains). The earth's surface is shaped in part by the motion of water and wind over very long times, which act to level mountain ranges.

4C Processes that Shape the Earth (6-8)#3

Sediments of sand and smaller particles (sometimes containing the remains of organisms) are gradually buried and are cemented together by dissolved minerals to form solid rock again.

4C Processes that Shape the Earth (6-8)#4

Sedimentary rock buried deep enough may be reformed by pressure and heat, perhaps melting and recrystallizing into different kinds of rock. These re-formed rock layers may be forced up again to become land surface and even mountains. Subsequently, this new rock too will erode. Rock bears evidence of the minerals, temperatures, and forces that created it.

4C Processes that Shape the Earth (6-8)#5

Thousands of layers of sedimentary rock confirm the long history of the changing surface of the earth and the changing life forms whose remains are found in successive layers. The youngest layers are not always found on top, because of folding, breaking, and uplift of layers.

4C Processes that Shape the Earth (6-8)#6

Although weathered rock is the basic component of soil, the composition and texture of soil and its fertility and resistance to erosion are greatly influenced by plant roots and debris, bacteria, fungi, worms, insects, rodents, and other organisms.

4C Processes that Shape the Earth (6-8)#7

Human activities, such as reducing the amount of forest cover, increasing the amount and variety of chemicals released into the atmosphere, and intensive farming, have changed the earth's land, oceans, and atmosphere. Some of these changes have decreased the capacity of the environment to support some life forms.

4C Processes that Shape the Earth (9-12)#1

Plants alter the earth's atmosphere by removing carbon dioxide from it, using the carbon to make sugars and releasing oxygen. This process is responsible for the oxygen content of the air.

4C Processes that Shape the Earth (9-12)#2

The formation, weathering, sedimentation, and reformation of rock constitute a continuing "rock cycle" in which the total amount of material stays the same as its forms change.

4C Processes that Shape the Earth (9-12)#3

The slow movement of material within the earth results from heat flowing out from the deep interior and the action of gravitational forces on regions of different density.

4C Processes that Shape the Earth (9-12)#4

The solid crust of the earth—including both the continents and the ocean basins—consists of separate plates that ride on a denser, hot, gradually deformable layer of the earth. The crust sections move very slowly, pressing against one another in some places, pulling apart in other places. Ocean-floor plates may slide under continental plates, sinking deep into the earth. The surface layers of these plates may fold, forming mountain ranges.

4C Processes that Shape the Earth (9-12)#5

Earthquakes often occur along the boundaries between colliding plates, and molten rock from below creates pressure that is released by volcanic eruptions, helping to build up mountains. Under the ocean basins, molten rock may well up between separating plates to create new ocean floor. Volcanic activity along the ocean floor may form undersea mountains, which can thrust above the ocean's surface to become islands.