

Lesson Outline for Teaching

Lesson 2: Volcanoes

A. What is a volcano?

1. A(n) volcano is a vent in Earth's crust through which molten rock flows.
2. Molten rock below Earth's surface is called magma.

B. How do volcanoes form?

1. Volcanoes can form along convergent plate boundaries, when one plate subducts under another.
 - a. Magma from the hot mantle rises through cracks in the crust and forms a volcano.
 - b. Molten rock that erupts onto Earth's surface is called lava.
2. At divergent plate boundaries, magma rises in cracks between the two plates, forming volcanoes.
3. Volcanoes that are not associated with plate boundaries are called hot spots.
4. Geologists theorize that hotspots form over plumes, which are places where hot magma rises due to convection currents in the mantle.

C. Where do volcanoes form?

1. Most volcanoes occur on or along plate boundaries.
2. The Ring of Fire is the area of earthquake and volcanic activity that surrounds the Pacific Ocean.
3. Most volcanoes in the United States occur near the Pacific coast.

D. Types of Volcanoes

1. Cinder cones are small, steep-sided volcanoes that erupt gas-rich, basaltic lavas.
2. Composite volcanoes are large, steep-sided volcanoes that result from explosive eruptions of andesitic and rhyolitic lava along convergent plate boundaries.
3. Shield volcanoes are large, gentle-sloped volcanoes that result from quiet eruptions of basaltic lavas along divergent plate boundaries and oceanic hot spots.
4. Lava flows travel slowly and rarely are deadly; they can last for many months or longer.
5. Volcanic ash can explode out of a volcano up to 40 km into the air.
6. Mudflows form when thermal energy from an erupting volcano melts snow. The meltwater can mix with mud and ash from the volcano, and it flows downhill.
7. A(n) pyroclastic flow is a fast-moving avalanche of hot gas, ash, and volcanic rock.
8. Volcanic eruptions can be predicted by studying changes in the ground and patterns of earthquakes.

Lesson Outline continued

E. Volcanic Eruptions

1. Volcanic ash, made up of tiny particles of pulverized volcanic rock and glass, erupts explosively.
2. The eruption style of a volcano depends on the amount of gases dissolved in the magma, especially the amount of dissolved water vapor.
3. Viscosity is a fluid's resistance to flow. Viscosity of lava is higher when the magma has a high silica content.
4. As magma rises toward Earth's surface, the pressure on it decreases. Bubbles of gas form and rise in the magma. The bubbles affect the explosiveness of lava and the type of rock that forms as lava cools.

F. Volcanic Eruptions and Climate Change

1. The release of a large amount of volcanic ash can affect Earth's climate by blocking sunlight.
2. When droplets of sulfuric acid from volcanoes form in the atmosphere, they reflect sunlight into space.
3. Volcanic ash and acid droplets in the atmosphere cool Earth's climate.

Discussion Question

Why might the eruption of a large volcano pose a threat to many life-forms on Earth?

Large volcanoes can send out large amounts of volcanic ash, which blocks sunlight. This can significantly lower temperatures on Earth for several years, changing the global climate and possibly killing off plants and animals, which cannot adapt to sudden change.