

## Lab 1: Investigate the Rock Cycle

**IP:** What types of rock is magma made of?  
Write a possible explanation of this phenomenon.

Students may explain that magma or lava is made of melted rock or igneous rock. They may also discuss the three basic types of magma— basaltic, andesitic, and rhyolitic. They may also discuss specific magma components like silicon dioxide, iron, or magnesium.

**AP:** What role does lava play in volcano formation?  
Based on what you learned in this experiment, try to formulate an explanation to answer this question. What evidence did this experiment supply to aid in your understanding?

Students should understand that as lava erupts from a volcano it cools and forms igneous rock. As this process is repeated layers of igneous rock accumulate, forming a larger volcano.

**Revised Explanation:** After performing the experiment, what revisions need to be made to your explanation of the **IP**? What observations did you make that led to these revisions? Write your new explanation.

After students navigate the rock cycle they should understand that magma is formed when igneous rock or metamorphic rock is melted.

### Lab 2: Observe Convection Current

**IP:** What happens below Earth's surface that causes volcanoes to erupt?  
Write a possible explanation of this phenomenon.

Students may attribute volcanic eruptions to a pressure building beneath Earth's surface. They might elaborate on the presence of heat or other factors.

**AP:** In what way(s) do you think this lab experiment relates back to the anchoring phenomenon? How does the evidence collected in this experiment add to your understanding of volcanoes?

Students should now know that convection is the movement of thermal bodies of different heat energy from one region to another. The convection modeled in this experiment represents the convection occurring in the mantle. Convection cells in the mantle drive tectonic motion, which contributes to the creation of most volcanoes.

**Revised Explanation:** After performing the lab experiment, what revisions need to be made to your explanation of the **IP**? What observations did you make that led to these revisions? Write your new explanation below.

Students should accurately add the concept of convection currents to their explanation. They should attribute the pressure associated with volcanic eruptions to the material located closer to the core heating up and becoming less dense. By convection the less dense material rises, displacing heavier cooler material, and eventually exiting the crater of the volcano.

**Working Model:** Apply what you have learned in labs 1–2 to formulate an explanation of volcanoes.

Students should understand that magma is formed when rocks are forced beneath the surface into Earth's mantle where they are partially melted. Since the magma is less dense than the surrounding rock, the magma rises to the surface. Once on the surface it cools to form igneous rock.

### Lab 3: The Rise and Fall of Pangaea

**IP:** Why are similar fossils found on continents that are separated by massive oceans today?  
Write a possible explanation of this phenomenon.

Students may attribute the observed distribution of fossils to the former supercontinents like Pangaea. They might also reference other factors like migration.

**AP:** Where do volcanoes form?  
In what way(s) do you think this lab experiment relates back to the anchoring phenomenon? How does the evidence collected in this experiment add to your understanding of volcanoes?

After mapping the various locations of the most active volcanoes, students should understand that a majority of volcanoes form along the tectonic plate boundaries.

**Revised Explanation:** After performing the lab experiment, what revisions need to be made to your explanation of the **IP**? What observations did you make that led to these revisions? Write your new explanation below.

Students should be able to explain that finding similar fossils on continents that are now separated is a result of those continents being located next to one and drifting apart as time has passed. They will also be able to reference other sources of evidence for continental drift, such as mineral distribution and cratons.

**Working Model:** Apply what you have learned in labs 1–3 to formulate an explanation of volcanoes.

Students should understand the majority of volcanoes are formed along plate boundaries. Volcanoes erupt because magma is lighter than the solid rock around it and eventually forces its way to the surface through fissures or vents in Earth's surface. Magma is formed during the rock cycle as rocks are melted and returned to the surface as lava that cools to form igneous rocks.

## Lab 4: Construct Fault Models

**IP:** How do tectonic plates interact at plate boundaries?  
Write a possible explanation of this phenomenon.

Students may be familiar with the various types of plate boundaries like convergent, divergent, and transform. They may also be familiar with the movement that occurs at each boundary. Students may also discuss events like earthquakes that occur at plate boundaries.

**AP:** What role do plate boundaries play in the formation of volcanoes?  
In what way(s) do you think this lab experiment relates back to the anchoring phenomenon? How does the evidence collected in this experiment add to your understanding of volcanoes?

Students should understand volcanoes are commonly formed at divergent and convergent plate boundaries. At convergent plate boundaries, when a plate subducts into the mantle it is melted, which can lead to the formation of a volcano. At divergent boundaries, as the plates move apart, lava erupts through the fissure created.

**Revised Explanation:** After performing the lab experiment, what revisions or additions need to be made to your explanation of the **IP**? What observations did you make that led to these revisions? Write your new explanation below.

Students should understand the specific movement that occurs at each plate boundary. At transform boundaries the plates move past each other in opposite directions, often causing earthquakes. At convergent boundaries the plates move towards each other, resulting in the formation of mountains and volcanoes. At divergent boundaries the plates move away from each other. Magma rises from the fissure forming new oceanic crust.

**Final Model:** Apply what you have learned in labs 1–4 to formulate an explanation of volcanoes.

Students should understand that most volcanoes are formed at divergent and convergent plate boundaries. Volcanoes erupt because magma is lighter than the solid rock around it and eventually forces its way to the surface through fissures or vents in Earth's surface. Magma is formed during the rock cycle as rocks are melted and returned to the surface as lava that cools to form igneous rocks.