

# 18C The Rock Cycle

*How does the rock cycle create new rocks and change one type into another?*

There are many regular repeating cycles in nature, like the seasons, or the water cycle. When it comes to rocks, the regularity of patterns does not apply. Igneous, metamorphic, and sedimentary rocks can be changed from one type to another by Earth's geologic processes. A rock's proximity to these processes is an important factor that impacts if and when any changes occur. In this investigation, you will learn about the formation of these 3 types of rock and the transformations they can make from one type of rock into a new type.

## Materials

- 2 (or more) crayons or candles of different colors for original samples
- Scraper (a penny works well)
- Paper towel
- Aluminum foil
- Aluminum pie tin
- 3 cups of water (one with ice cold water, one with warm water, and one empty)
- Ice
- Candle for heating sample
- Textbook

## 1 Creating rock type #1

1. Use your scraper to scrape small pieces of all of your original samples (crayons or candles) into separate piles onto the paper towel.
2. Follow your teacher's instructions on how to move all your scrapings onto a piece of aluminum foil. Be sure your scrapings are in a neat pile on the foil.
3. Fold up your aluminum foil with the scrapings contained in a small, sealed pocket so they can't escape or leak out. Keep folding until your foil package is about 3 x 4 cm.
4. Place the foil package on the table. Place a textbook on top of the foil package and press down on the book with one hand. You should feel the package compress slightly.
5. Remove the textbook and carefully unwrap the foil package. Examine the sample inside the package and remove a small piece of the sample. Place it onto the blank piece of paper and write "Rock Sample Chart" at the top of the paper. This will be where you place and compare small samples of each rock formed during this investigation. Answer questions a-e below.

- a. Examine and describe what your sample looks like.

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- b. What kind of rock does this sample represent? Use your answer to label the small piece of the sample you removed from the foil and placed onto the Rock Sample Chart.

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- c. What geologic process does the scraping of small pieces off of the original sample represent?

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- d. What geologic processes do the moving and placing of the scrapings onto the aluminum foil represent?

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- e. What geologic processes do the pressing on the foil package with the textbook represent?

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## **2** Creating rock type #2

1. Reseal the rock you just made in the aluminum foil package. (Do not include the small sample on the Rock Sample Chart, it will remain there for the duration of the investigation, along with a small sample of each rock you form).
2. Place your textbook back on top of the sealed package.
3. Place both hands on top of the textbook and push down as hard as you can without damaging the textbook or the package.
4. Light your candle and follow your teachers instructions on how to hold the package over the lit candle for 5 seconds.
5. Set the package on the table and place the textbook back on top of it. Let the package cool with the textbook on top of it.
6. Once the package is cool, remove the textbook and carefully unwrap the package. Examine the sample, and carefully remove a small piece and place it on the Rock Sample Chart. Answer questions a-e below.

- a. Examine and describe what your sample looks like.

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- b. What kind of rock does this sample represent?

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- c. Describe the transition in rock types that took place from start to finish in this part of the investigation.

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- d. Is your sample completely uniform in its consistency? If not, what was responsible for the inconsistency?

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- e. What does the heat from the candle represent?

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### **3** Creating rock type #3

1. Prepare 3 cups; one with ice cold water (without ice cubes in cup), one with warm water, and one without water.
2. Place your sample into the aluminum pie plate
3. Heat the pie plate over your candle until the entire sample has melted. Try to prevent ovulating your sample. If it starts to emit smoke, raise the pan away from the candle's flame and heat more slowly.
4. Pour approximately equal amounts of the remaining melted sample from the pie plate into each of the 3 cups.
5. Let the samples cool for 1 to 2 minutes. Place and label the 3 samples onto the Rock Samples Chart.

- a. Examine and describe what your 3 new samples look like.

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- b. What kind of rock do these samples represent?

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- c. Describe the transition in rock types that took place from start to finish in this part of the investigation.

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- d. What do the three different cups represent? How would actual samples of this type of rock differ if cooled in different ways?

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#### **4** Thinking about what you observed

- a. Could these transitions continue, or do the transitions from one rock type to another have to stop at rock type #3?

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- b. Compare the sedimentary rock and metamorphic rock forming processes.

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- c. What is the difference between the process of forming igneous and metamorphic rocks? What do these processes have in common?

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- d. Does there seem to be any real pattern as to the order in which rocks transform from one type into another?

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## 5 Geologic transformation scenarios

- a. Can a rock change but remain the same type of rock? For example, could a sedimentary rock somehow become a different kind of sedimentary rock? Describe a scenario where this could occur. Include the names of different rocks and their types when possible.

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- b. Limestone is formed from the calcium-rich exoskeletons of trillions of deceased tiny sea creatures being deposited and compacted on the ocean floor over millions of years. Limestone can turn into marble when subjected to enormous heat over time. Explain what kind of rock this makes limestone and marble, and describe a geologic event or scenario that would turn limestone into marble.

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- c. Half Dome in Yosemite National Park is a structure made from granite. It was once a large plume of material from Earth's mantle that rose up towards the surface, but stopped rising when it was still thousands of feet below the surface. What kind of rock is granite, and what processes helped to finally expose this giant rock formation instead of keeping it buried deep underground forever?

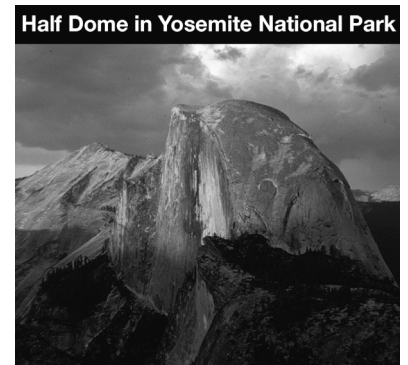


Photo courtesy of U.S. Geological Survey

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- d. What conditions may cause some rocks to be transformed from one kind of rock into another several times, while other kinds of rock remain unchanged for billions of years?

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