

Lesson 4.7: The Rock Cycle

Task	Page(s)	Learning Target
1	2	I can describe how rocks go through the rock cycle.
2	3	I can use observations to classify rocks and hypothesize the order by which they formed.
3	4	I can use a simulation to describe how rocks transform.
4	5-10	I can use a model to describe how rock materials change during the rock cycle.
5	11-12	I can use a simulation to describe how rocks transform in a rock cycle.

Task 1 Learning Target: I can describe how rocks go through the rock cycle.

1. Rock Cycle-

- A. How can sedimentary rock become igneous rock?
- B. How can igneous rock become metamorphic rock?
- C. How can sedimentary rock become metamorphic rock?
- D. How can igneous rock become sedimentary rock?

- E. How does the Rock Cycle relate to the Law of Conservation of Matter?

- F. Read the two examples below. Then answer the questions that follow:

Alternate Pathways

Pathway 1

Between New Zealand and South Africa, at the bottom of the Pacific Ocean, molten material from the mantle erupts from the mid-ocean ridge. As the material comes into contact with the very cold ocean water, it cools quickly to become rock. Over time, this rock ever so slowly moves away from the mid ocean ridge, as sea-floor spreading makes changes in the ocean floor. About 200 million years later, the rock is subducted at a deep-ocean trench. As the rock moves downward, it melts to become part of the mantle. Eventually this melted material moves back up the mid-ocean ridge to become rock again.

Pathway 2

Deep underground, a new rock forms as heat and pressure change its crystals and cause its grains to become foliated. Over millions of years, this rock is uplifted to become part of a mountain. Then, layers of rock above the foliated rock wear away, until it becomes exposed to the surface. Destructive forces wear it down and its fragments are carried away by a river's swift-flowing water. Eventually, these fragments flow into the ocean. Ocean water carries the rock fragments away from the river, and they are deposited on a beach. Over time, more and more sediment is deposited there, until the fragments that came from the foliated rock become cemented into a new rock. Then more and more rock forms about this rock, until the heat and pressure change its crystals and cause its grains to become foliated.

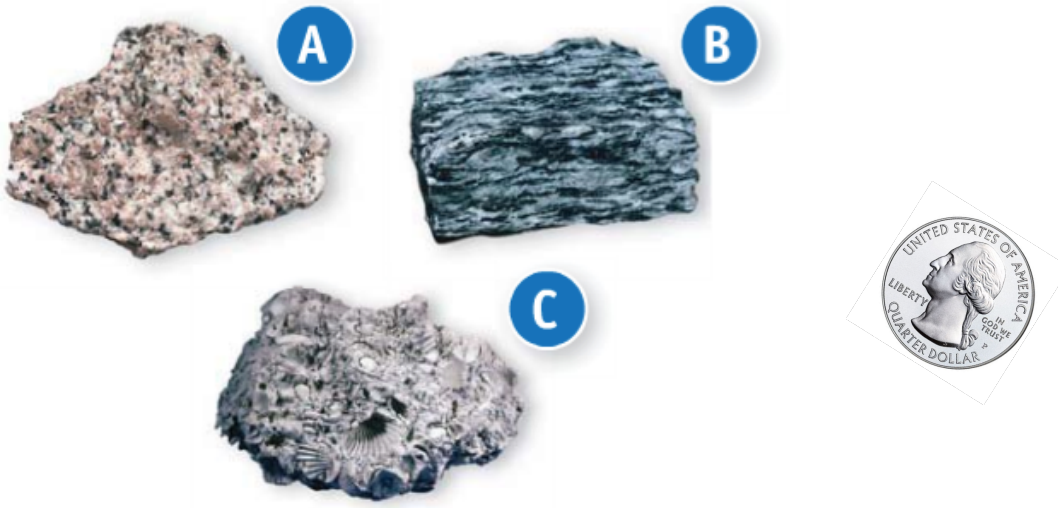
- 1. Which major group or groups of rocks are involved in the description of Pathway 1?
- 2. Make a flowchart that describes what occurs in Pathway 1.
- 3. Which major group or groups of rocks are involved in the description of Pathway 2?
- 4. Make a flowchart that describes what occurs in Pathway 2.
- 5. Write a description of another pathway through the rock cycle. In your description, tell how igneous rock changes to metamorphic rock, which then changes into sedimentary rock.

****Helpful Resource Link:**

http://www.bbc.co.uk/bitesize/ks3/science/environment_earth_universe/rock_cycle/activity/

Task 2 Learning Target: I can use observations to classify rocks and hypothesize the order by which they formed.

Observe the rocks closely and complete the following:



1. **Sketch** each of the rocks (A, B, C).
2. Record your observations in a data table
3. Identify each rock (igneous, sedimentary, or metamorphic).
4. Hypothesize the sequence in which these rocks might have formed.
5. Can there be another sequence that can explain how the rocks formed? Explain.

Task 3 Learning Target: I can use a simulation to describe how rocks transform.

Open the Process Mode of the *Rock Transformations* Simulation:

<https://apps.learning.amplify.com/rocktransformations/>

1. Press ANALYZE ROCKS to learn about the different types of rock in the cross section.

a. What were the different rock materials found in the Sim?

2. Make rocks in as many ways as you can. Changes should occur both above and below Earth's outer layer.

b. What processes did you use to form rocks?

c. Describe the time scale for rocks to change form.

d. Describe three changes that you modeled.

Use the sentence frame to help you form your idea:

I turned _____ into _____ by _____.

e. Which rock type cannot turn into another?

3. After you see rocks form, press ANALYZE ROCKS to learn more about them.

f. How do the rocks you formed differ from each other?

4. Open the Energy Mode of the Rock Transformations Sim. Explore the two energy sources in the Sim (energy from the sun and energy from Earth's interior).

g. In the Sim, we saw that rock is melted to form magma, and rock is weathered to make sediment. Where does the energy to transform rock into magma come from? Where does the energy to transform rock into sediment come from?

h. What new rock formations did you see when the landscape was only exposed to energy from Earth's interior?

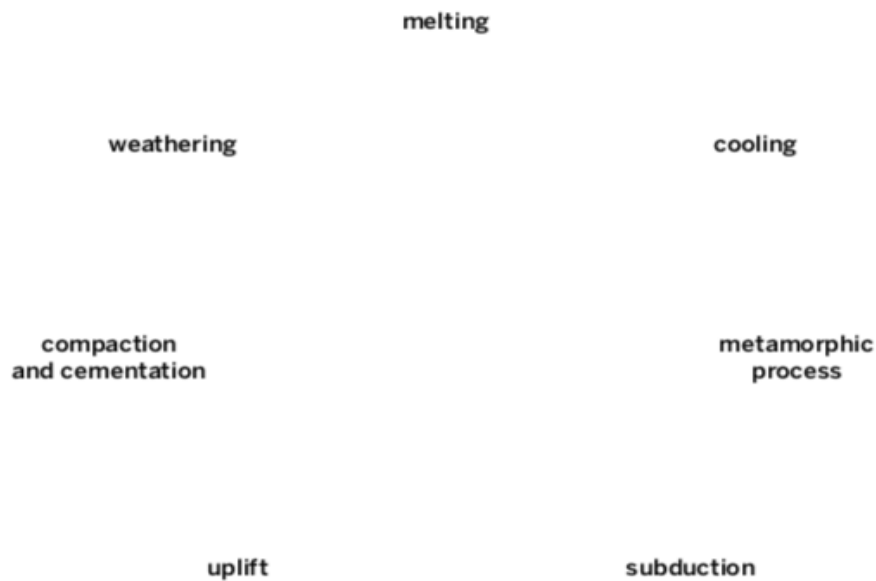
i. What new rock formations did you see when the landscape was only exposed to energy from the sun?

Task 4 Learning Target: I can use a model to describe how rock materials change during the rock cycle.

Rock Transformations Tracking Chart

Station	Process	What rock material are you after the process?	What do you look like?
		<input type="checkbox"/> sedimentary rock <input type="checkbox"/> igneous rock <input type="checkbox"/> metamorphic rock	<input type="checkbox"/> sediment <input type="checkbox"/> magma
		<input type="checkbox"/> sedimentary rock <input type="checkbox"/> igneous rock <input type="checkbox"/> metamorphic rock	<input type="checkbox"/> sediment <input type="checkbox"/> magma
		<input type="checkbox"/> sedimentary rock <input type="checkbox"/> igneous rock <input type="checkbox"/> metamorphic rock	<input type="checkbox"/> sediment <input type="checkbox"/> magma
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		<input type="checkbox"/> sedimentary rock <input type="checkbox"/> igneous rock <input type="checkbox"/> metamorphic rock	<input type="checkbox"/> sediment <input type="checkbox"/> magma
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Mapping Your Path Through Rock Transformations



Rockin' & Rolling Through the Rock Cycle

Write a short story about the ROCK CYCLE from the perspective of a rock. Be creative and give your rock a name and some personality as it travels on the adventure of a lifetime!

Be sure to use correct scientific terminology and your “geologic knowledge” to explain how rocks change from one type to another over millions of years. Include as many details as you can to enhance your story.

Your story must include the following:







- ___ A description of the physical characteristics of your rock at each stage
(What would it look like?)
- ___ A description of the processes that occurred at each stage
(melting, cooling, crystallization, heat, pressure, weathering, erosion, compaction)
- ___ A logical order of events in the life cycle of a rock

Station A

Name: _____ Date: _____

Process: Weathering

- Wind and rain break you into pieces. On your Rock Transformations Tracking Chart, circle what you become as a result of this process.
- Roll the die. Then, refer to the table below.







Roll a . . .	What happens to you after you transform?	Next process
1 	You are still partly solid rock.	Repeat station A.
2 	You are transported downhill.	Go to station D.
3 	You are transported downhill.	Go to station D.
4 	You are transported downhill.	Go to station D.
5 	You are transported downhill.	Go to station D.
6 	You are transported downhill.	Go to station D.

Station B

Name: _____ Date: _____

Process: Melting

- You are heated enough to melt. On your Rock Transformations Tracking Chart, circle what you become as a result of this process.
- Roll the die. Then, refer to the table below.







Roll a . . .	What happens to you after you transform?	Next process
1 	You move up through the rock above you.	Go to station C.
2 	You move up through the rock above you.	Go to station C.
3 	You move up through the rock above you.	Go to station C.
4 	You are still partly solid rock.	Repeat station B.
5 	You are still partly solid rock.	Repeat station B.
6 	You are still partly solid rock.	Repeat station B.

Station C

Name: _____ Date: _____

Process: Cooling

- You cool off and become a solid. On your Rock Transformations Tracking Chart, circle what you become as a result of this process.
- Roll the die. Then, refer to the table below.







	Roll a . . .	What happens to you after you transform?	Next process
1		You cool inside the outer layer of Earth.	Go to station E.
2		You cool inside the outer layer of Earth.	Go to station E.
3		You cool inside the outer layer of Earth.	Go to station F.
4		You cool inside the outer layer of Earth.	Go to station F.
5		You cool on top of the outer layer of Earth.	Go to station A.
6		You cool on top of the outer layer of Earth.	Go to station A.

Station D

Name: _____ Date: _____

Process: Compaction and Cementation

- You are buried beneath sediment and stuck together. On your Rock Transformations Tracking Chart, circle what you become as a result of this process.
- Roll the die. Then, refer to the table below.







	Roll a . . .	What happens to you after you transform?	Next process
1		You are now underground.	Go to station F.
2		You are now underground.	Go to station F.
3		You are now underground.	Go to station F.
4		You are now underground.	Go to station E.
5		You are now underground.	Go to station E.
6		You are now underground.	Go to station E.

Station E

Name: _____ Date: _____

Process: Uplift

- You are pushed upward toward the surface. On your Rock Transformations Tracking Chart, circle what you become as a result of this process.
- Roll the die. Then, refer to the table below.







Roll a . . .	What happens to you after you transform?	Next process
1 	You are still surrounded by rock.	Repeat station E.
2 	You are still surrounded by rock.	Repeat station E.
3 	You are still surrounded by rock.	Repeat station E.
4 	You are still surrounded by rock.	Repeat station E.
5 	You are at the surface.	Go to station A.
6 	You are at the surface.	Go to station A.

Station F

Name: _____ Date: _____

Process: Subduction

- You are pulled down below the outer layer of Earth by plate motion. On your Rock Transformations Tracking Chart, circle what you become as a result of this process.
- Roll the die. Then, refer to the table below.







Roll a . . .	What happens to you after you transform?	Next process
1 	You move into Earth's interior.	Go to station B.
2 	You move into Earth's interior.	Go to station B.
3 	You move into Earth's interior.	Go to station B.
4 	You move into Earth's interior.	Go to station G.
5 	You move into Earth's interior.	Go to station G.
6 	You move into Earth's interior.	Go to station G.

Station G

Name: _____ Date: _____

Process: Metamorphic Process

- You are heated and squeezed. On your Rock Transformations Tracking Chart, circle what you become as a result of this process.
- Roll the die. Then, refer to the table below.

	Roll a . . .	What happens to you after you transform?	Next process
1		You are transformed without being melted.	Go to station F.
2		You are transformed without being melted.	Go to station F.
3		You are transformed without being melted.	Go to station E.
4		You are transformed without being melted.	Go to station E.
5		You are transformed without being melted.	Go to station B.
6		You are transformed without being melted.	Go to station B.

Task 5 Learning Target: I can use a simulation to describe how rocks transform in a rock cycle.

Visit the following link: <https://www.learner.org/series/interactive-rock-cycle/>

1. Click on "Start your rock collection" and observe different rock types and their characteristics.
2. Click on "Identify Rock Types" and complete the multiple-choice activity and the table below:

Rock Name	Sketch	Characteristics	Rock Type
Conglomerate			
Gneiss			

*Choose any remaining rock			

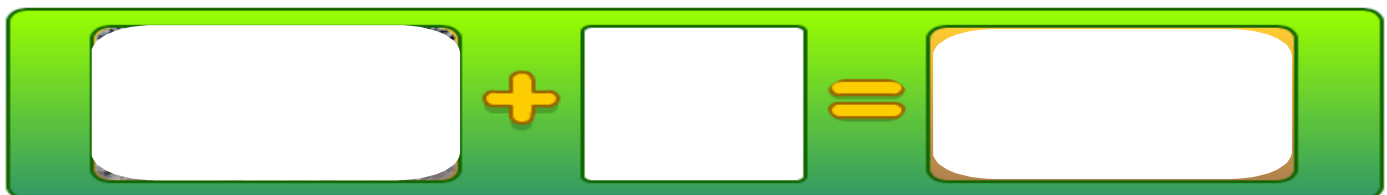
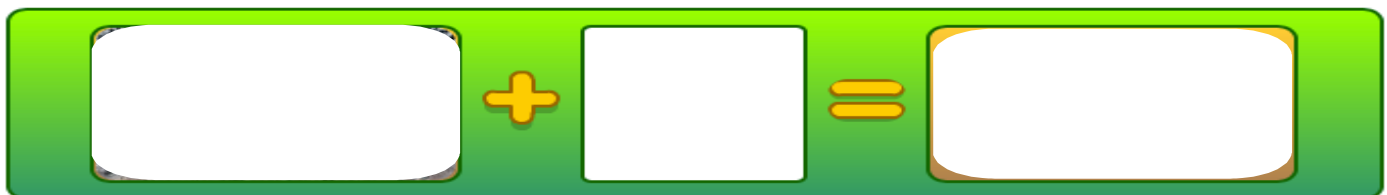
Record your score: _____

3a. Click on "How Rocks Change" and then click on "Start" to watch the "Heat and Pressure" animation.
What type of rock was formed in this animation? _____

3b. Click on "Next" at the bottom of the screen. Watch the animations on "Melting" and "Cooling."
What type of rock was formed in this animation? _____

3c. Click on "Next" at the bottom of the screen. Watch the animations on "Weathering & Erosion" and "Compacting & Cementing".
What type of rock was formed in this animation? _____

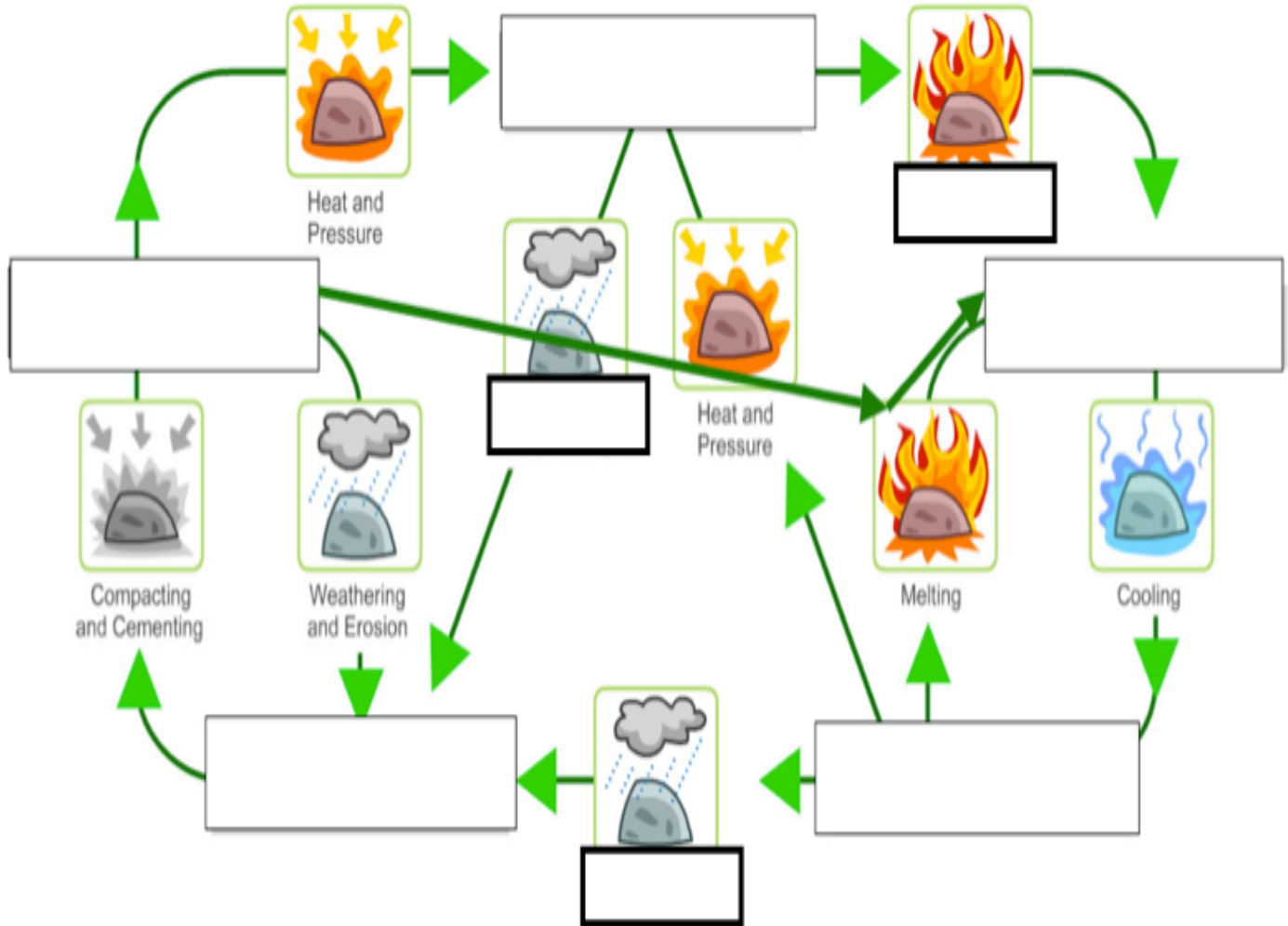
4. Click on "Transform the Rock" at the bottom of the screen by completing the activity and recording the 2 most difficult equations:



Record your score _____

5. Click on “The Rock Cycle Diagram” and explore the diagram by clicking the names of the rock types and clicking on the images. Complete the model diagram below and answer the questions that follow.

The Rock Cycle



- When rocks are affected by weathering and erosion, they change into _____.
- When sediment is compacted and cemented, it changes into _____.
- When heat and pressure are applied to a sedimentary rock, it changes into _____.
- When melting of a metamorphic rock occurs, it changes into _____.
- When magma is cooled, it changes into _____.