

## **NEW LEARNING STANDARDS:**

6.ESS.3 Igneous, metamorphic and sedimentary rocks form in different ways.

Magma or lava cools and crystallizes to form igneous rocks. Heat and pressure applied to existing rock forms metamorphic rocks. Sedimentary rock forms as existing rock weathers chemically and/or physically and the weathered material is compressed and then lithifies. Each rock type can provide information about the environment in which it forms.

## **SCIENTIFIC INQUIRY and APPLICATION PRACTICES:**

During the years of grades K-12, all students must use the following scientific inquiry and application practices with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas:

Asking questions (for science) and defining problems (for engineering) that guide scientific investigations

Developing descriptions, models, explanations and predictions.

Planning and carrying out investigations

Constructing explanations (for science) and designing solutions (for engineering) that conclude scientific investigations

Using appropriate mathematics, tools, and techniques to gather data/information, and analyze and interpret data

Engaging in argument from evidence

Obtaining, evaluating, and communicating scientific procedures and explanations

\*These practices are a combination of ODE Science Inquiry and Application and Frame-work for K-12 Science Education Scientific and Engineering Practices

**Social Studies:** Explain how tradition and diffusion have influenced modern cultural practices and products in the Eastern Hemisphere.

- The student can define and give examples of tradition.
- The student can define and give examples of diffusion.
- The student can define and give examples of cultural practices.
- The student can define and give examples of cultural products.
- The student can explain how tradition has influenced modern cultural practices and products.
- The student can explain how diffusion has influenced modern cultural practices and products.

**Objective:** The objective of the following activity is to give students the opportunity to gain deeper understanding of the rock cycle through a kinesthetic activity that simulates the path of a mineral over a period of time through the rock cycle.

**Students will already have a background knowledge of the rock cycle prior to completing this simulation.**

**Duration:** 1 period—Rock Cycle Simulation, 1 period—introduce Kamishiai (Japanese storytelling and street theater, 2 periods—create Kamishiai Rock Cycle Story, 1 period—student present Kamishiai Rocky Cycle Story.

**Materials:** 1 dice per station, Rock Cycle Station Cards (8) {Hang throughout the classroom. Make sure that adequate space is between stations. Multiple groups may be at the same station during the lab}, Rock Cycle Student Handout, Calculator (helpful, but not necessary), white paper, colored pencils, crayons, markers

1. Put students into pairs.
2. Give students copy of 'Rock Cycle Data Sheet' and 1 die
3. Distribute the student pairs evenly among the locations to begin this lab.
4. Model how to move through the Rock Cycle. I typically model several stops in the rock cycle whole class. All the information needed will be on the station cards.
5. Assign a beginning location to each student group.
6. Students will record their beginning location on Rock Cycle Data Sheets
7. Students will roll their die and record the information from Rock Cycle on the Student information sheet
8. Students will either remain at their current station or move the station from the information sheet
9. Students should complete at least 8 rounds. After completion students should share interesting facts they learned.
10. Students should total the age of their rocks.
11. Students will create story in the Kamishiai (Japanese storytelling and street theater). Prior to students creating their own Kamishiai I would utilize the links to introduce students to Kamishiai. If time allows have pairs of students begin how they journeyed through the rock cycle.

[https://www.youtube.com/watch?v=v6URceEr\\_zc](https://www.youtube.com/watch?v=v6URceEr_zc)

<http://www.kamishibai.com/PDF/CreatingUsingKamishibai.pdf>

<https://www.presentationzen.com/presentationzen/2011/10/kamishibai-is-a-form-of-visual-and-participatory-storytelling-that-combines-the-use-of-hand-drawn-visuals-with-the-engaging-n.html>

12. Students will present their story to the class.

### Teacher Information Page

Station	Roll	Time in Years	Rationale	Instructions
Animal	1-2	10	Another animal eats the original animal. You become part of the new animal.	stay
Animal	3-6	1,000	Another animal eats the original animal. You become part of the soil/ocean floor.	Go to sediment
Plant	1-2	10	An animal eats the part of the plant were you were become part of the animal	Go to animal
Plant	3-6	1,000	Plant dies become part of the soil/ocean floor.	Go to sediment
Sediment	1-2	100	You are washed further downstream/deeper into the ocean	stay
Sediment	3	10	You get absorbed into the roots of a plant.	Go to plant
Sediment	4-6	10,000	You get buried under additional layers of sediment and eventually become a sedimentary rock	Go to Sedimentary Rock
Sedimentary Rock	1-2	10,000,000	You are buried beneath the ground and remain there.	Stay
Sedimentary Rock	3-4	1,000	You are exposed to the surface. Erosion breaks you off from your layer. You become sediment again.	Go to Sediment

Sedimentary Rock	5	10,000	You are exposed to a nearby source of magma and melt.	Go to magma
Sedimentary Rock	6	10,000	The tectonic plate you are on crashes into another tectonic plate. You are crushed by HUGE forces and become a metamorphic rock.	Go to metamorphic rock
Magma	1	10,000,000	You are part of a pocket of magma that is near the surface, but the rock above is too thick to break through.	stay
Magma	2	10,000,000	You are carried into the mantle.	Go to sediment
Magma	3-4	100,000	You cool down before you reach the surface. You become an intrusive igneous rock	Go to igneous intrusive rock
Magma	5-6	100,000	You explode out of a volcano and cool quickly when you land. You become an extrusive igneous rock.	Go to igneous extrusive igneous
Igneous Intrusive rock	1-2	1,000,000	You remain buried beneath the ground	stay
Igneous Intrusive rock	3	1,000	You are exposed to the surface. Erosion breaks you off from the rest of the rock. You become Sediment	Go to sediment
Igneous Intrusive rock	4-5	10,000	You are exposed to a nearby source of magma and melt. You become magma	Go to magma
Igneous Intrusive rock	6	100,000	Your tectonic plate crashes into another tectonic plate. You are exposed to HUGE forces. You become a metamorphic rock	Go to metamorphic rock
Extrusive Igneous Rock	1-2	10,000,00	You get buried under another layer of extrusive igneous rock and remain	Stay
Extrusive Igneous Rock	3-6	1,000	You are exposed to the surface. Erosion breaks you off from the rest of the rock. You become Sediment	Go to sediment
Metamorphic Rock	1-2	10,000,000	You remain buried in the crust.	Stay

Metamorphic Rock	3-4	100,000,000	You are exposed to more heat and pressure and become another type of metamorphic rock.	Stay
Metamorphic Rock	5	1,000	You are exposed to the surface. Erosion breaks you off from the rest of the rock. You become Sediment	Go to sediment
Metamorphic Rock	6	10,000	You are exposed to a nearby source of magma and melt. You become magma	Go to sediment

# Animal

<b>Roll</b>	<b>Time (in years)</b>	<b>Rationale</b>	<b>Instructions</b>
1-2	10	Another animal eats the original animal. You become part of the new animal.	<b>stay</b>
3-6	1,000	Another animal eats the original animal. You become part of the soil/ocean floor.	Go to <b>Sediment</b>

# PLANT

<b>Roll</b>	<b>Time (in years)</b>	<b>Rationale</b>	<b>Instructions</b>
1-2	10	An animal eats the part of the plant were you were become part of the animal	Go to <b>Animal</b>
3-6	1,000	Plant dies become part of the soil/ocean floor.	Go to <b>Sediment</b>

# Sediment

<b>Roll</b>	<b>Time (in years)</b>	<b>Rationale</b>	<b>Instructions</b>
1-2	100	You are washed further downstream/deeper into the ocean	<b>Stay</b>
3	10	You get absorbed into the roots of a plant.	<b>Go to plant</b>
4-6	10,000	You get buried under additional layers of sediment and eventually become a sedimentary rock	Go to <b>Sedimentary Rock</b>



# Sedimentary Rock

<b>Roll</b>	<b>Time (in years)</b>	<b>Rationale</b>	<b>Instructions</b>
1-2	10,000,000	You are buried beneath the ground and remain there.	<b>Stay</b>
3-4	1,000	You are exposed to the surface. Erosion breaks you off from your layer. You become sediment again.	Go to <b>Sediment</b>
5	10,000	You are exposed to a nearby source of magma and melt.	Go to <b>Magma</b>
6	10,000	The tectonic plate you are on crashes into another tectonic plate. You are crushed by HUGE forces and become a metamorphic rock.	Go to <b>Metamorphic Rock</b>

# Magma

<b>Roll</b>	<b>Time (in years)</b>	<b>Rationale</b>	<b>Instructions</b>
1	10,000,000	You are part of a pocket of magma that is near the surface, but the rock above is too thick to break through.	<b>Stay</b>
2	10,000,000	You are carried into the mantle.	Go to <b>Sediment</b>
3-4	100,000	You cool down before you reach the surface. You become an intrusive igneous rock	Go to <b>Igneous- Intrusive Rock</b>
5-6	100,000	You explode out of a volcano and cool quickly when you land. You become an extrusive igneous rock.	Go to <b>Igneous- Extrusive Rock</b>

# Igneous-Intrusive

<b>Roll</b>	<b>Time (in years)</b>	<b>Rationale</b>	<b>Instructions</b>
1-2	1,000,000	You remain buried beneath the ground.	<b>Stay</b>
3	1,000	You are exposed to the surface. Erosion breaks you off from the rest of the rock. You become Sediment	Go to <b>Sediment</b>
4-5	10,000	You are exposed to a nearby source of magma and melt. You become magma.	Go to <b>Magma</b>
6	100,000	Your tectonic plate crashes into another tectonic plate. You are exposed to HUGE forces. You become a metamorphic rock	Go to <b>Metamorphic</b>

# Igneous-Extrusive

<b>Roll</b>	<b>Time (in years)</b>	<b>Rationale</b>	<b>Instructions</b>
1-2	10,000,000	You get buried under another layer of extrusive igneous rock and remain	<b>Stay</b>
3-6	1,000	You are exposed to the surface. Erosion breaks you off from the rest of you rock. You become sediment.	Go to <b>Sediment</b>

# Metamorphic

<b>Roll</b>	<b>Time (in years)</b>	<b>Rationale</b>	<b>Instructions</b>
1-2	10,000,000	You remain buried in the crust.	<b>Stay</b>
3-4	100,000,000	You are exposed to more heat and pressure and become another type of metamorphic rock.	<b>Stay</b>
5	1,000	You are exposed to the surface. Erosion breaks you off from the rest of you rock. You become sediment.	Go to <b>Sediment</b>
6	10,000	You are exposed to a nearby source of magma and melt.	Go to <b>Magma</b>

## Rock Cycle Data Sheet

<b>Round #</b>	<b>Location in Rock Cycle</b>	<b>Years in location</b>	<b>What "caused" the change</b>	<b>Age of Mineral</b>
<b>1</b>				
<b>2</b>				
<b>3</b>				
<b>4</b>				
<b>5</b>				
<b>6</b>				
<b>7</b>				
<b>8</b>				
<b>Total</b>	<b>Age of Rock</b>			

## Rock Cycle Data Sheet

<b>Round #</b>	<b>Location in Rock Cycle</b>	<b>Years in location</b>	<b>What "caused" the change</b>	<b>Age of Mineral</b>
<b>9</b>				
<b>10</b>				
<b>11</b>				
<b>12</b>				
<b>13</b>				
<b>14</b>				
<b>15</b>				
<b>16</b>				
<b>Total</b>	<b>Age of Rock</b>			