Short Performance Assessment: **MS-ESS2-1**
Grade Level: **Middle School**
Adapted from SNAP[1]

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| Title | **New York, A View from Below** | | |
| Designed by | Stanford NGSS Assessment Project (SNAP) | Course(s) | **Middle School** |
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| Performance Expectation | **MS-ESS2-1**: Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.<br><br>**Clarification Statement**: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.<br>**Assessment Boundary**: Assessment does not include the identification and naming of minerals. |

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| Science and Engineering Practice | **Developing and Using Models**<br>• Develop and use a model to describe phenomena. |
| Disciplinary Core Ideas | **ESS2.A: Earth's Materials and Systems**<br>• All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. |
| Crosscutting Concept | **Stability and Change**<br>• Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. |

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| Student Performance | 1. Components of the model<br>2. Relationships<br>3. Connections |

[1] The Short Performance Assessment (SPA) and the Assessment Rubric adapted from the Stanford NGSS Assessment Project http://snapgse.stanford.edu/

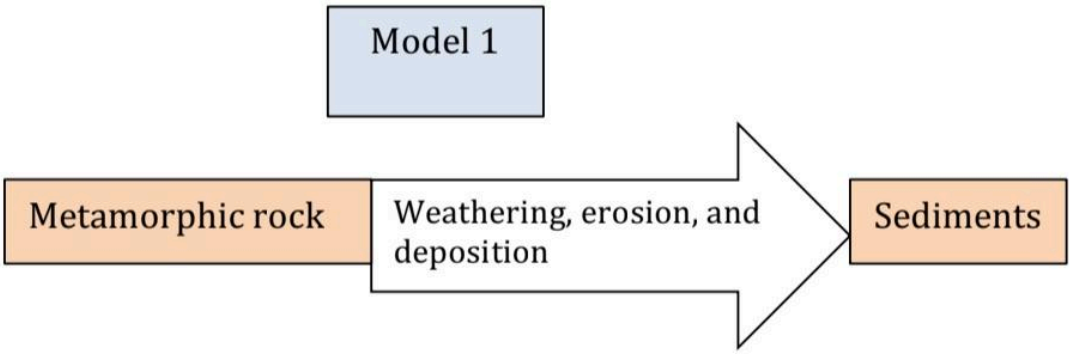
Name_____

A group of students in New York City are learning about earth science. They believe that processes they are learning about can only be seen in wild and far-away places. But, in fact, evidence of ways that matter is cycled through the earth can be seen in even the biggest cities and busiest neighborhoods.


The picture shown here is New York City's Coney Island. The sand came from a 1.1 billion year old metamorphic rock. A glacier broke the rock into pieces (sediments or sand) and moved it to this beach.

In this task, you will use what you know about the processes that change the earth to show the students evidence of billions of years of cycling of matter through the earth that can be seen all over their city.

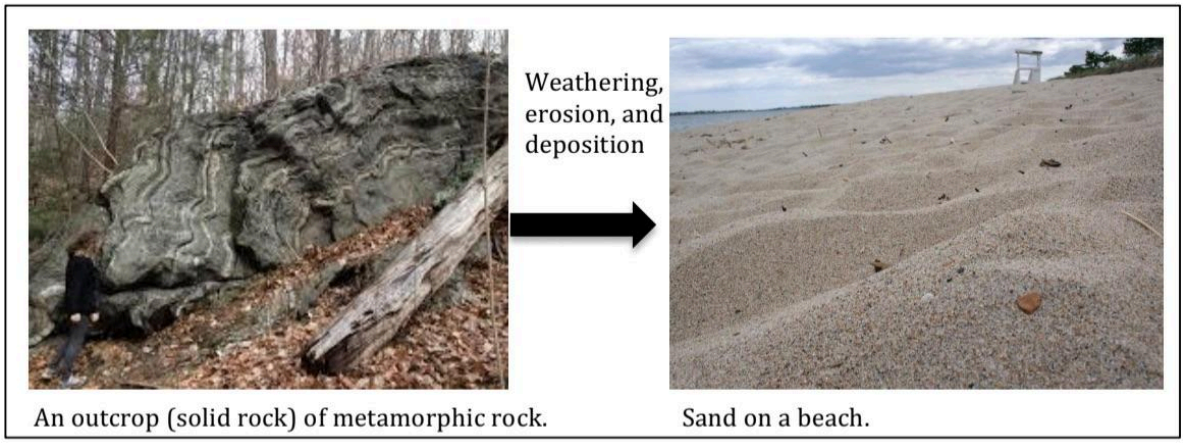
Begin with the sand on Coney Island. To help the students understand how this sand is an example of the cycling matter, you show them Model 1 below.




1. Describe to the students what Model 1 shows about how matter was changed to form sand on Coney Island.

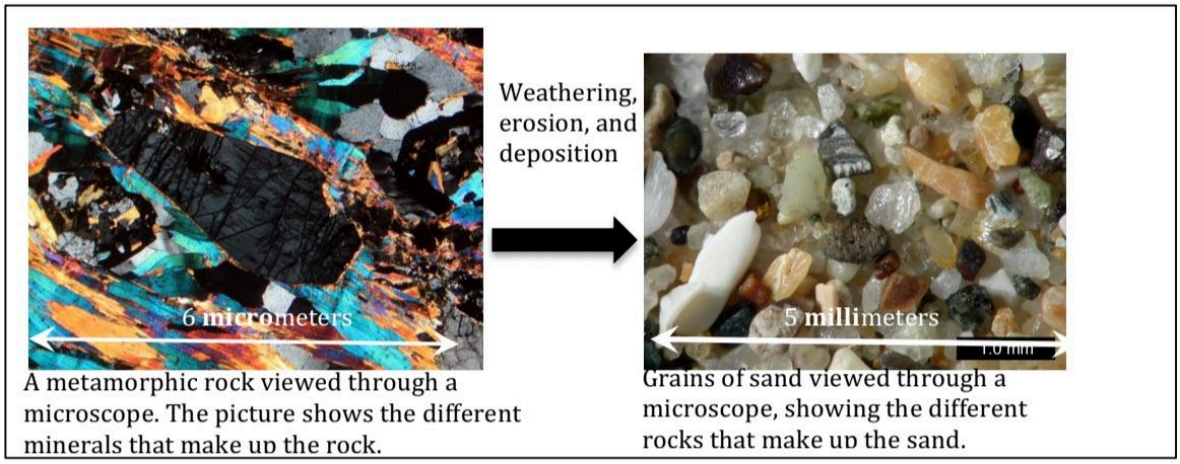
When you are exploring how rocks changed over time it can help to show changes at different scales. The models below show the changes that the Coney Island sand went through at large scale and small scale.

**Large Scale Model**




An outcrop (solid rock) of metamorphic rock. Sand on a beach.

**Small Scale Model**




A metamorphic rock viewed through a microscope. The picture shows the different minerals that make up the rock.

Grains of sand viewed through a microscope, showing the different rocks that make up the sand.

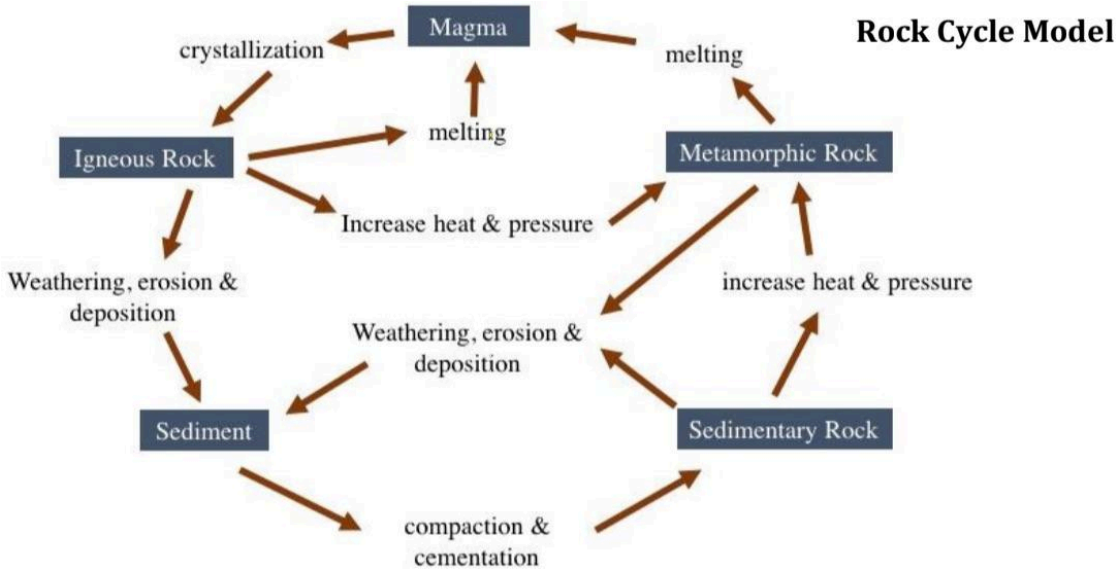
2. You have already used one kind of model to describe how matter changed. What new information can you get from examining models at different scales? Use evidence from the model to support your ideas.

a. What does the **large-scale** model show about how the sand formed?

b. What does the **small-scale** model show about how the sand formed?


3. Glaciers changed some of the bedrock into sand in New York, but some bedrock is still there. In fact, most of the all buildings in the city sit on part of the 450 million year old bedrock shown here call Manhattan Schist.

This rock did not always look the way it does today. Two processes that formed it are described in the table below. Answer the questions in the table to describe some of the ways matter was changed over time to form the Manhattan Schist.




You can use the rock cycle model **above** to help you answer the questions in the second column of the table.

| How the Manhattan Schist formed | Analysis of changes |
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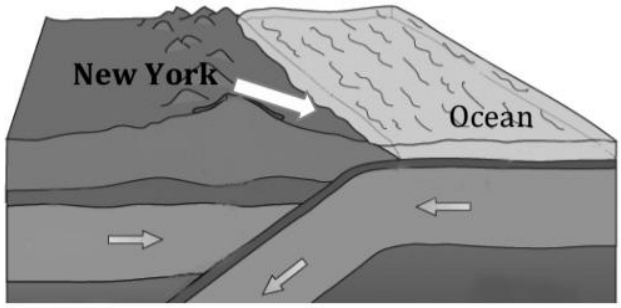
| Sediments were broken from the land by wind and water and were moved into the ocean at the edge of New York. The sediments were buried deeper under more and more sediments.<br>  | What type of new rock formed?<br><br>What process caused the new rock to form? |

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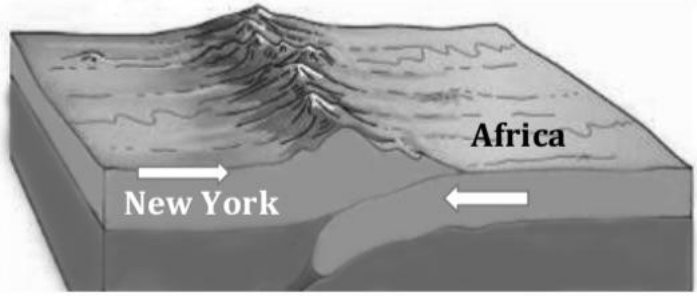
| Later, the African Plate began moving toward the North American Plate until the two continents collided. This collision compressed all of the rock at the edges of the continents, including the new rock that had formed under the ocean next to New York.<br>  <br> | What type of new rock formed?<br><br>What process caused the new rock to form? |

4. The process that changed the rocks over time and eventually formed the Manhattan Schist are an example of the movement of matter through the earth.

**Draw a model** with arrows and labels that shows how matter was changed over time to form the Manhattan schist. Your model should use they information you wrote in the table above.

Energy from the sun is transferred to the earth by sunlight, and this energy drives some of the processes that change rocks.

5. Find a place in your model on the previous page where energy from the sun helped to change the rocks. Label that place with an **S**.

How does energy from the sun help to change the rocks where you put your **S**?

**Image credits**

Images for Large-scale model- sites.temple.edu, celestecota.photoshelter.com, http://4.bp.blogspot.com/-92B_9OupLQw/UObmlaUTW0I/AAAAAAAAAZQ/q1oqtm5w1EE/s1600/areia01.jpg

Images for Small-scale model - http://pugnacitas.blogspot.com/, http://www.alexstrekeisen.it/english/meta/amphibolitefelsic.php

| Assessment Rubric* - Question 1 | | | | |
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| | Emerging | Developing | Approaching Proficiency | Excelling |
| Description of performance | | | | |
| Sample student responses | | | | |

| Assessment Rubric* - Question 2 | | | | |
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| | Emerging | Developing | Approaching Proficiency | Excelling |
| Description of performance | | | | |
| Sample student responses | | | | |

Insert additional Assessment Rubrics (if needed) here.