

# Sand Inquiry Record Sheet

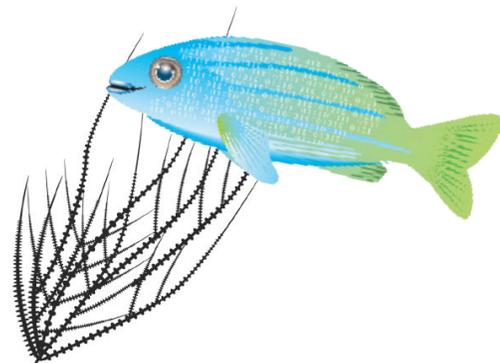
Name: Teacher Guide

Date: \_\_\_\_\_

## Directions:

1. Place a small sample of sand onto a piece of paper.
2. Using a toothpick, separate the particles.
3. Use a magnifying glass to observe the particles.
4. Feel the sand texture with your fingers.
5. Glue (or tape) samples of the particles into the circle.
6. Answer the following questions in complete sentences.

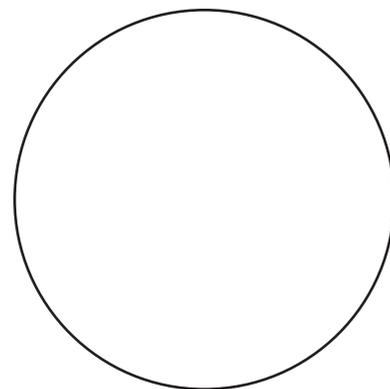
\*Student answers will vary. We've provided some suggestions below based on the performance expectations.



## Sample 1

1. Describe how the sand looks and feels.

Look for students to describe observations about the shape, texture, color, size, and overall look of the sand. They may also describe features like stickiness, the sound the sand makes, etc.



2. Where do you think the sand particles came from?

Look for students to make inferences about where the sand may be from based on their observations above. Student observations about the sand is the evidence they are gathering to better understand the effects of weathering and erosion.

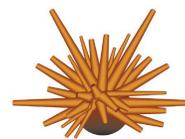
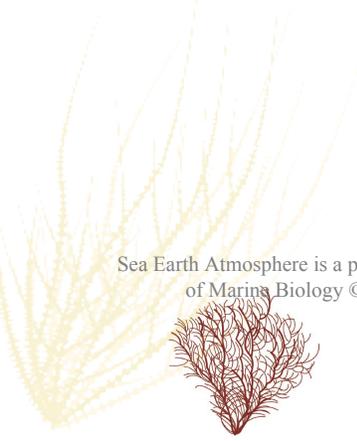
Black sand near to a lava field, for example, provides evidence of lava weathering into smaller pieces, eroding, and being deposited on the beach.

3. How do you think the sand got to the beach?

Look for students to be creative and use their prior knowledge of going to the beach to inform their wonderings and hypotheses.

Encourage specific references to weathering and erosion.

Example answers include wind, waves, currents, fish poop, dredging, people.





### Vinegar Test:

The vinegar test is used to help determine if the sand is of volcanic or biological origin.

- Vinegar is a weak acid that reacts with and dissolves calcium carbonate.
- The shells and skeletons of many marine invertebrates (like corals, urchins, clams, calcified algae, plankton, etc.) are made of calcium carbonate.
- When vinegar dissolves calcium carbonate, it releases carbon dioxide bubbles. If there is no calcium carbonate present when you add the vinegar, there will not be any bubbles.

1. What would happen if you add vinegar to:
  - a. biological sand (with shells, corals, or algae)?  
Sand from biological sources should contain calcium carbonate and start to dissolve (bubble) in the presence of a weak acid like vinegar.
  - b. volcanic sand (from volcanic rock)?  
Volcanic sand should not bubble or dissolve. However, sand is often a mixture from multiple sources, so there may be some bubbling even in sand that is mostly not biological.
2. From your exploration of the three sand samples, record your hypotheses about the origin of the sand.
3. For each sand sample, place 1 teaspoon of sand into the glass dish and slowly add 1 teaspoon of vinegar.  
Measurements are approximate, but have students use a uniform amount for each sample.
4. Record your observations and interpretations for each sand sample on the table below.  
See example responses.

Sample	Hypothesis	Observations	Is the sand of volcanic or biological origin?	Explain your evidence
<p><b>1</b></p> <p>Color of Sand: <u>white sand</u></p>	<p>Comes from living things like coral. It will bubble in vinegar.</p>	<p>Lots of bubbles! Some of the sand even moved around it was bubbling so much.</p>	<p>Biological!</p>	<p>All of the sand is bubbling. This shows that it has calcium carbonate from living animals or algae.</p>
<p><b>2</b></p> <p>Color of Sand: <u>black sand</u></p>	<p>I think it comes from volcanic rock because it is all dark, and shells are white.</p>	<p>No bubbles at all!</p>	<p>Volcanic!</p>	<p>There was no bubbling. Also, I have noticed that sand on beaches near to dark rocks or mountains is also dark.</p>
<p><b>3</b></p> <p>Color of Sand: <u>yellow and brown</u></p>	<p>I think it comes from a brown type of rock and maybe some shells. Probably some fish poop too.</p>	<p>Some bubbles, but not as much as the white sand.</p>	<p>I am not sure. Some biological and some looks like rocks, but it is not black.</p>	<p>The bubbles show that some of the sand is biological, but not all of the sand is bubbling. I do not know if volcanic rocks can be brown or yellow.</p>

## Activity Questions:



1. What differences did you observe between the different colors of sand?
  - Look for students to notice differences in color, shape, size, smoothness.
  - Look for mention of differences in the vinegar test.
  - Look for mention of uniformity (or lack of it) in samples.
2. What do the differences you observed tell you about the source of that sand?
  - Look for mention that color of the sand is related to vinegar test results.
  - Look for mention that color can be used to identify sand origin.

3. If one sand sample bubbled a little bit but another bubbled a lot when you added vinegar, what would this tell you about the amount of biological material in each sample?

The sample with more bubbling should have more biological material (assuming that there was the same amount of starting material—both sand and vinegar).



4. How do you think the sand got to the beach?
  - Look for mention of various mechanisms of transport (e.g., wind, waves, currents, people, etc. Students might mention beach nourishment projects, like the trucking, dredging, or general movement of sand from one area to another.
  - Look for mention of weathering and erosion! By biologic and abiotic sources.
5. Did you see anything else in the sand? Describe any items that do not look biological or volcanic.
  - Look for mention of natural objects (like wood, whole shells, algae, etc.)
  - Look for mention of man-made objects (like plastics, metal, glass, etc.)
6. How do you think non-sand items got to the beach?
  - Look for mention of mechanisms of transport similar to #4, and references to human actions.
7. Do all beaches get their sand in the same way? Explain your ideas.

- Look for mention of differences in location of beaches. The nearby geology and exposure to natural elements (wind, waves, rain, organisms) as well as human influences will affect sand.

- Students may also observe that sand composition at a beach varies by location within a beach and varies over time (by seasons as well as over years).

