Sea Level Rise Experiment

Name: ________________________   Date: ____________

Background:
An iceberg is a large piece of ice that is floating freely in the water. Icebergs form when chunks of ice break off of glaciers, ice shelves, or a larger icebergs.

A glacier is a large piece of ice on top of land. Glacier ice forms by the accumulation and compaction of snow. Glaciers typically occur on mountains or near the poles.

 Directions:

1. Gather your supplies (tub, clay (or large rock), ice cubes, water, ruler, tape, marker) to build your sea level rise model.

2. If you are using clay, mold it into an island and stick the clay to the bottom of your container. If you are using rocks, place them in the container. Make sure the island has a flat surface for your ice cubes (glaciers) to balance on.

3. Tape your sea level gauge (ruler) to the inside of the container so that you can measure the height of the water (sea level).

4. Add water to the container. Make sure the top of your island is above the water level!

5. Make some predictions based on your model:
   a. Imagine that you put an ice cube directly in the water. What does the ice represent?
      An iceberg.
   b. What will happen to the water level as the ice cube melts?
      The water level will stay the same as the iceberg melts because the floating iceberg is already balanced with the water level. NOTE 1: most of the iceberg is below the water level. NOTE 2: The water level WILL rise when the ice cube is first put in the water.
   c. Imagine that you put an ice cube on top of your island. What does the ice on top of the island represent?
      A glacier.
   d. What will happen to the water level as the ice on top of your island melts?
      The water level will rise as the glacier melts because more water is being added to the ocean basin. NOTE: The water level will NOT rise when the ice cube is first put on the rock.

Sea Earth Atmosphere is a product of the National Oceanic and Atmospheric Administration, the Hawai‘i Sea Grant College Program, and the Hawai‘i Institute of Marine Biology © University of Hawai‘i, 2020. This document may be freely reproduced and distributed for non-profit educational purposes.
6. Conduct your trials.

**Trial #1: Icebergs**

a. Place ice cubes in the water near your island. These ice cubes represent icebergs. How many ice cubes did you use? _________________ **Students should use a few ice cubes.**

b. Measure and record the water level BEFORE the icebergs melt in the data table below.

c. Measure and record the water level AFTER the icebergs melt in the data table below.

d. Calculate the difference in water level before and after.

\[
\text{Water level after} - \text{Water level before} = \text{change in water level.}
\]

There should be no change.

**Trial #2: Glaciers**

a. Reset your ocean in the same container, or use a separate container.

b. Add the same number of cubes as above, but this time place them on the island. These ice cubes represent glaciers.

c. Measure and record the water level BEFORE the glaciers melt in the data table below.

d. Measure and record the water level AFTER the glaciers melt in the data table below.

e. Calculate the difference in water level before and after.

\[
\text{Water level after} - \text{Water level before} = \text{change in water level.}
\]

There should be an increase in water level.

<table>
<thead>
<tr>
<th>Placement of ice cubes</th>
<th>Starting height of water level (mm)</th>
<th>Height of water after ice melts (mm)</th>
<th>Change in water level (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial #1 (iceberg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial #2 (glacier)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Activity Questions:

1. What do each of your supply items represent in your model? Draw a line to match the supplies to what they represent below:

   - a. Container
   - b. Clay or large rock (or other material that doesn't absorb water)
   - c. Ice cubes
   - d. Water
   - e. Ruler

   ![Diagram of labeled supplies](image)

2. How was sea level change different between the iceberg and the glacier trial?
   
   Sea level should not change when icebergs melt, but sea level rises when glaciers melt.

3. How does this experiment model sea level rise in the real world?
   
   This model is very similar to what happens in the real world. Icebergs that are floating in the ocean do not change sea level when they melt because their volume has already affected sea level. Glaciers, on the other hand, cause sea levels to rise when they melt because they are actually removing water from land and adding water to the ocean basin.

4. What is the atmosphere?
   
   The atmosphere is the envelope of gases surrounding the earth or another planet.

5. What is the hydrosphere?
   
   The hydrosphere is all the water on the earth's surface, such as lakes and seas. Sometimes including water over the earth's surface, such as clouds.

6. How does warming of the Earth's atmosphere affect the hydrosphere?

   Warming of Earth's atmosphere can cause ice to melt. If glaciers melt, the sea level can rise and change coastal dynamics. The warming atmosphere also causes thermal expansion, where motion of water molecule increases and expands, further contributing to sea level rise.
7. What causes sea level rise?

Sea level rises when water is added (like from melting glaciers) and when water warms. The warming of water increases sea level because warming temperature increases the natural motion of water molecules, causing them to move farther apart. **NOTE:** Increased temperature causes increase in volume of liquids assuming that pressure remains constant.

8. How do you think rising sea level will affect people where you live?

Rising sea levels will mean that storm waves and high tides reach farther onshore. This will impact low-lying areas with roads, homes, airports, farms, etc. In Palau, for example, the increasing sea level is bringing salt water into their taro patches, negatively impacting the taro growth. In Hawai‘i, there is concern about coastal roads, homes, tourist areas like Waikīkī, and major infrastructure like water and sewer pipes as well as the Honolulu International Airport. People are working on innovative plans to elevate roads and infrastructure, create water ways for boating and commuting, build pedestrian paths over water, and help people move their homes more inland.