

ACTIVITY THREE

What Will Happen If Climate Variability & Change Cause Glacier & Polar Ice Cap Melting?

This activity will show how increased temperatures will hasten the melting of ice in the environment, contributing to a rise in sea level and subsequent flooding of coastal areas.

MATERIALS

- Tanks from Activity One
- Glass or plastic covers
- Two clamp lamps with 60-watt bulbs
- Tinted plastic wrap or transparency paper
- Water
- Blue food coloring (optional)
- "Icebergs" and "glaciers" (freeze water in paper cups or milk cartons; peel off paper)
- Rulers
- Pencils
- Crayons
- Grease pencil or marker (optional)
- Graph paper
- Student Activity Three lab sheets

PROCEDURE

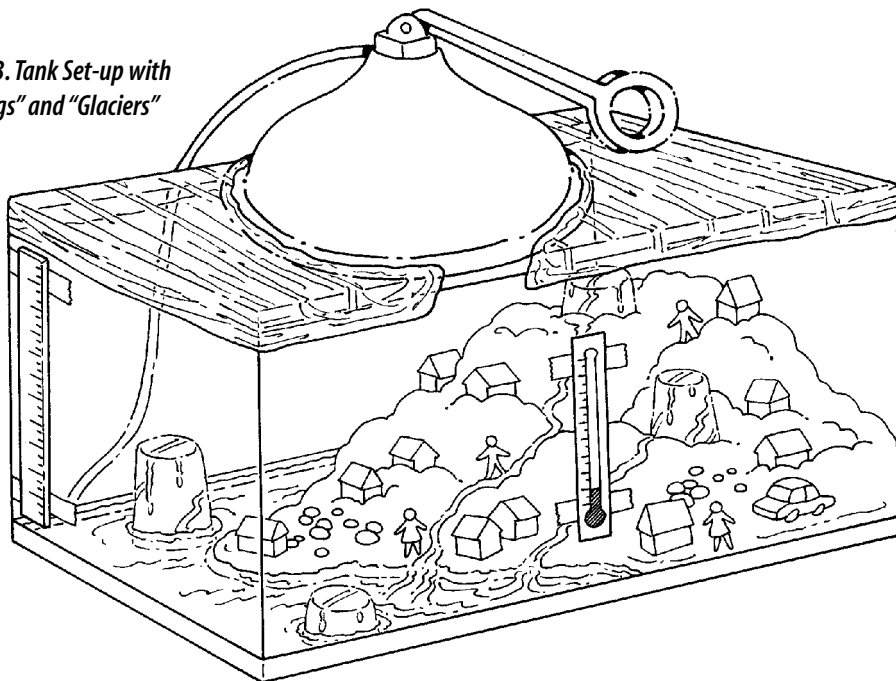
Step 1

Set up Tank 1 and Tank 2 as in Activity One. Add blue food coloring to the water (optional) and carefully pour into the tank. Take a baseline temperature. Measure the water level in the tank. (You may wish to tape a ruler to the front of the tank and mark the water level on the tank glass with a grease pencil or marker.) Record data on the *Student Activity Three Lab Sheets* for *Tanks 1 and 2*.

Step 2

Explain the difference between glaciers and icebergs to the students. Then place one or more "icebergs" and "glaciers" in your tanks (see Figure 3). Note the rise in the water level with the introduction of the ice. Draw a diagram of the tank and measure and record the new temperature and water height on the *Student Activity Three Lab Sheets* for *Tanks 1 and 2*.

Figure 3. Tank Set-up with "Icebergs" and "Glaciers"



Step 3

Place a lamp over Tank 1. Place a glass cover, plastic wrap, and a lamp over Tank 2. (*NOTE: Place the plastic wrap material around the lamp bell, not under it. CAUTION: Material in direct contact with the bare bulb may catch fire. Explain to the students this is only being done to prevent the plastic wrap from catching on fire. In the “real” atmosphere, the sun’s rays pass directly through the atmosphere.*) Record the temperature and water level changes in the tanks at 1, 5, 10, 30, and 60-minute intervals on the lab sheets.

Step 4

Complete lab sheets.

CONCLUSION

- Discuss the differences in melt rates and water rise in Tanks 1 and 2;
- Ask what happened to the homes and buildings on the shoreline;
- Ask why climate variability and change on Earth might affect the coastline development in the United States and other places;
- Discuss how knowing about changes in climate in advance might affect settlement patterns and building planning in coastal areas.

EXTENSIONS

1. Research and discuss how and where glaciers form. How would these conditions and regions be affected by climate variability and change?
2. Have the students compare the glaciers with the icebergs from their activity. What makes them different? Where do icebergs come from? Ask the students to predict what would happen to an iceberg as it floats in the ocean.

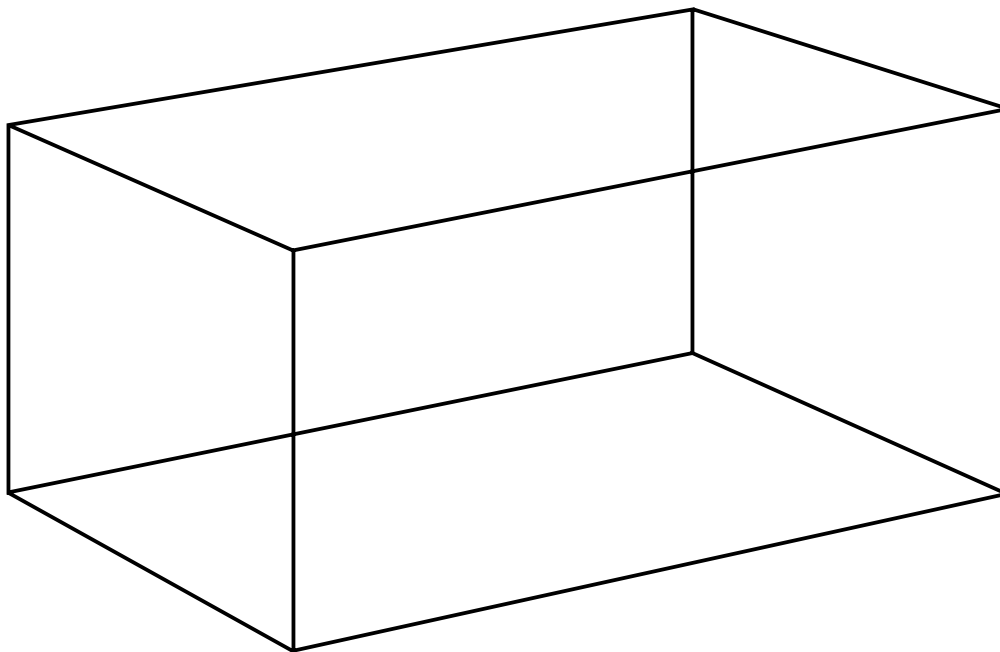
STUDENT ACTIVITY THREE LAB SHEET

What Will Happen if Climate Variability & Change Cause Glacier & Polar Ice Cap Melting (Tank 1)?

Name _____

TANK 1

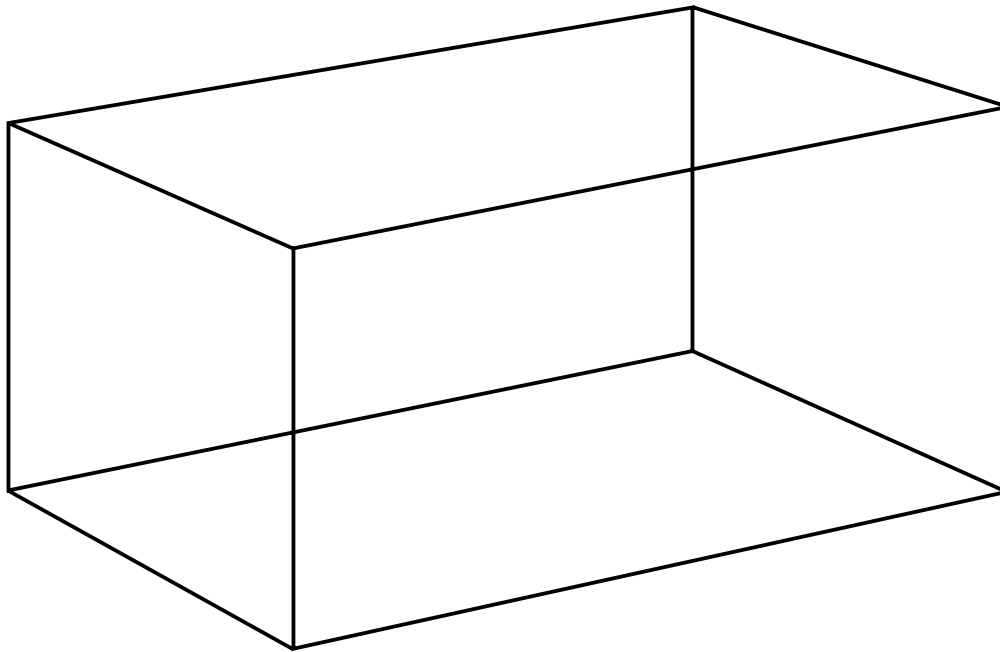
1. Draw the interior of Tank 1 after the glaciers and icebergs were added:



2. MEASUREMENTS

TIME	TEMPERATURE	WATER HEIGHT
Before ice is added		
After ice is added		
1 minute		
5 minutes		
10 minutes		
30 minutes		
60 minutes		

3. Draw a diagram of Tank 1 below after 60 minutes.



4. Using graph paper, make a graph of both temperature and wave height for Tank 1.

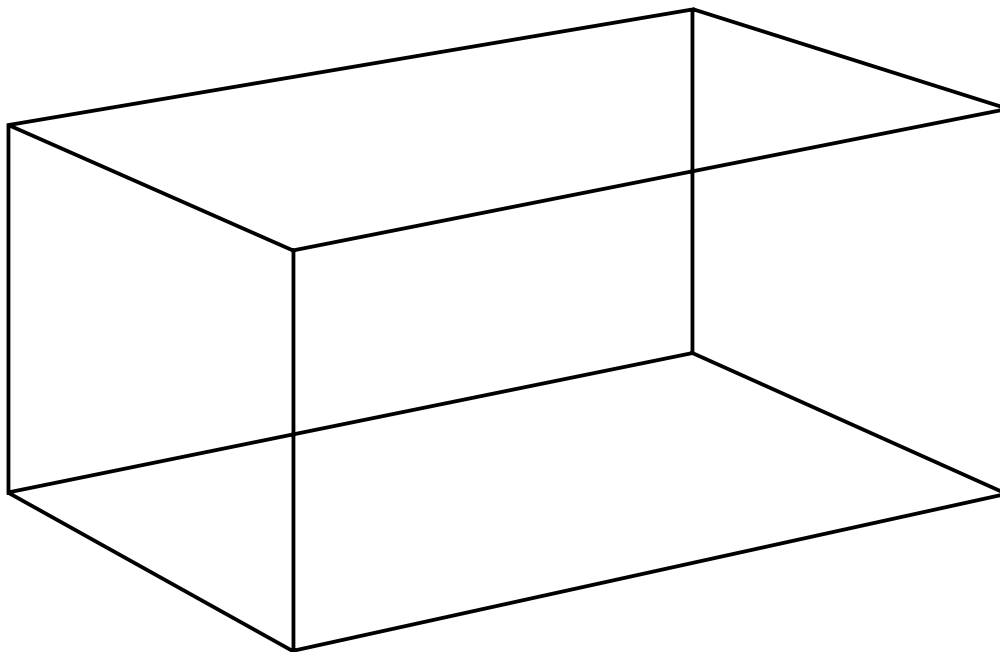
STUDENT ACTIVITY THREE LAB SHEET

What Will Happen if Climate Variability & Change Cause Glacier & Polar Ice Cap Melting (Tank 2)?

Name _____

TANK 2

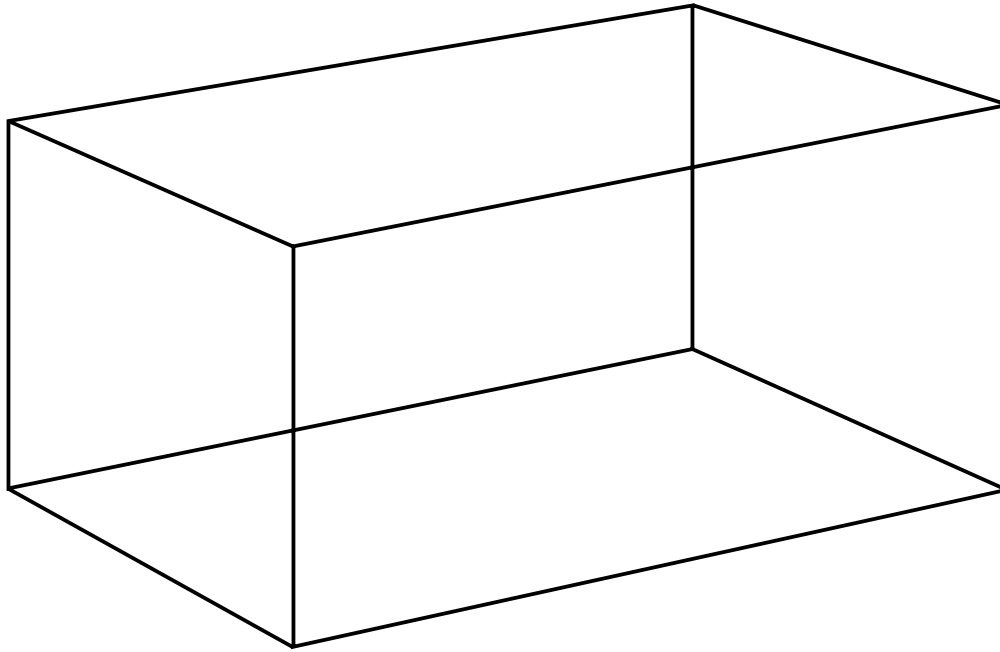
1. Draw the interior of Tank 2 after the glaciers and icebergs were added:



2. MEASUREMENTS

TIME	TEMPERATURE	WATER HEIGHT
Before ice is added		
After ice is added		
1 minute		
5 minutes		
10 minutes		
30 minutes		
60 minutes		

3. Draw a diagram of Tank 2 below after 60 minutes.



4. Using graph paper, make a graph of both temperature and wave height for Tank 2.

STUDENT ACTIVITY THREE LAB SHEET

What Will Happen if Climate Variability & Change Cause Glacier & Polar Ice Cap Melting?

Name _____

Answer the following questions:

1. What was the total temperature change in Tank 1?



2. What was the total temperature change in Tank 2?



3. Which tank had the highest final temperature?



4. Connect the temperature marks on the graphs you made. Which tank heated up the quickest?



5. Explain why the tanks heated up differently.



6. What differences did you observe between Tanks 1 and 2? Did the ice melt at different rates? Describe what you saw.



7. What happened to the coastline of your land? Did the rising water affect any buildings?



8. What kinds of problems might this situation cause in the real world?



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9. Sea levels around the world ARE rising as a result of climate variability and change. What information might we need to know to plan for a future of rising sea levels on Earth?



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10. Given all that you have learned from the experiments in Activities One, Two and Three, what are some serious challenges we may face as a result of climate variability and change?



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11. What actions can we take now to counteract our impacts on climate variability and change?



Activity Three Lab Sheet**WHAT WILL HAPPEN IF CLIMATE VARIABILITY & CHANGE CAUSE GLACIER & POLAR ICE CAP MELTING?**

Students' answers should be in their own words and in complete sentences.

1. Calculate temperature change from laboratory readings.
2. Calculate temperature change from laboratory readings.
3. Tank 2 had the highest final temperature.
4. Tank 2 heated up more quickly.
5. The two tanks heated up differently because Tank 2 had a cover and plastic wrap that helped trap the heat in the tank.
6. The difference is that the cover and plastic wrap on Tank 2 retained the heat, causing the ice to melt faster.
7. The coastline flooded. The effect on buildings will be unique to your set-up. Answers will vary.
8. This might cause the destruction of buildings, the loss of property, large population relocations, or any other answer that applies observations from the activity.
9. We need to know how high the sea level will rise, how this rise will affect coastlines, and alternate locations for populations.
10. Some serious challenges could be a significant increase in worldwide temperatures that can affect evaporation and precipitation rates. Areas where precipitation will increase can expect to see changes to the Earth's surface (such as mudslides) due to increased erosion, and a possible increase in vegetation. Other areas, where precipitation will decrease, can expect to have droughts or decreased flooding. Lastly, we might face a rise in sea level due to the melting of glaciers. The answers given can address both positive and negative issues.
11. We can reduce the release of greenhouse gases by controlling human pollution, planting more trees, stopping deforestation, reducing fossil fuel burning (which adds aerosols to the atmosphere), etc.