

**LAB I: HANDS ON OBSERVATIONS LAB -
USE GLACIER GOO TO DEVELOP A MODEL TO SUPPORT THE DATA**

(For this section students work in a team of 2-4. Each student needs a work sheet)



Image 9) Supplies used in lab

SUPPLIES: Set up needed for each team:

- Batch of Glacier Goo (recipe attached)
- Small Rectangular container (we used plastic box ~13" x 7-1/2" x 4-1/4" h)
- Section of matboard cut to fit **snuggly** in container to form a 'ramp' for glacier goo
- Attached graph measuring paper with 10cm line – cut to fit & laminate/plastic sleeve
- Dry erase marker
- Stop watch
- Calculator
- 6 inch ruler with centimeter measurements

Optional Supplies - Tape, Plastic knife

LAB ACTIVITY:

SET UP: done in advance by the teacher or by the students with supervision.

- Tape a copy of the laminated gridded graph paper to the ramp surface
- Set the matboard ramp in your container with one end resting on the upper rim and one end resting in the bottom creating a ramp for glacier (goo)
- Make sure the team has the full list of supplies

Start with A Glacier Review: You will be using glacier goo as a model for polar glaciers. Before you start let's review, answering the following questions in full sentences:

1. Thinking back to the 'Glacier Basics', are glaciers rigid blocks of ice? Explain.

2. What is needed for a glacier to maintain a steady size and surface elevation (height)? Remember the glacier basics equations.

3. Could a change in **ablation** cause a change in the elevation of the glacier? Explain.

4. Recall the data you graphed for P.I.G. Write a hypothesis to explain the cause of the changes in P.I.G.

Compare your hypothesis with your class. Now use your model to test this hypothesis.

ACTIVITY: TEST YOUR HYPOTHESIS

Image 10) Side view of glacier set up

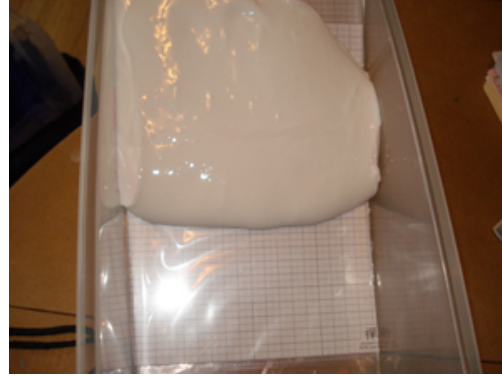


Image 11) Top view of glacier set up

- 1. What makes glaciers move in nature?** _____
Mound your glacier (goo) on the top of the ramp. Release and describe your glacier (goo) movement:

How is the glacier goo like a real glacier?

- 2. Establishing Baseline:** Set aside 1/3 of your glacier goo. Place the remaining goo at the top of the ramp so that the bottom edge ('toe') lines up with the top 10 cm line on your graph paper. Insert your ruler into the glacier just above the toe to measure elevation (height). Record elevation _____. Now you have 'baseline'. Start each of the following '**Runs #1, 2, 3**' from this baseline to test elevation changes with changing conditions.
- 3. Ablation Run #1:** Begin at baseline. Release your glacier (goo). Time and observe for 2 minutes. Measure your glacier using your ruler as a 'glacial ablation stake' to check for ablation (elevation loss) at the 10 cm start line. Were there elevation changes? ____
Does this match one of the glacier equations on **Glacier Basics on page 2**?

- 4. Steady Run #2:** Begin at baseline. As the glacier flows add small bits of your remaining glacier (goo) to the glacier surface as 'new snow' every 20 seconds. Compare elevations in run #2 to run #1? _____
Does this match one of the glacier equations from **Glacier Basics on page 2**?

- 5. Ice Shelf Run #3.** What if the ice shelf in front of our glacier were to melt from warming ocean water? Begin at baseline and place your ruler in front of the glacier as a shelf to hold it in place for 1 minute. Ice will continue to flow over it. Remove your ice shelf (ruler) and observe. Does the glacier behavior change once the ice shelf is removed? Describe what happened, and if it relates to what you know about a real glacier.

- 6. Compare to Your Hypothesis.** Does the behavior of this model glacier support your hypothesis? Explain.

Name _____

Date _____

7. What other data would be useful to further test your original hypothesis, or a new hypothesis?

8. **Design your own run.** Design your own experiment using glacier goo. Describe the conditions and the results. Be sure to note how it relates to a real glacier.



10 cms start here

10 cms stop here

POLAR I.C.E. (Interactive Climate Education)

GLACIER GOO

For Use in Modeling Glaciers

Mix#1:

One 20 oz cup
1 stirring stick
3/4 cup warm water
1 cup Elmers white glue

Mix#2:

one 8 oz cup
1/2 cup warm water
one stirring stick (for the 8 oz cup)
2 tsp. Borax powder
1 qt plastic zip lock bag

Mix # 1:

In the large cup, add 3/4 cup warm water and 1 cup glue. Stir until well mixed.

Mix # 2:

In the smaller cup, measure 1/2 cup warm water. Add 2 tsp. of Borax powder.

Stir

until the powder is dissolved.

Pour Mix 2 (the powder mix) into the glue mix. Stir until a glob forms and most of the water is mixed in. This happens quickly! Knead and work the mix for 2 – 3 minutes. Most, if not all, of the water will be incorporated into the mixture.

Place the glacier goo in the zip lock bag.

The mixture will store for a few months.

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More Activities: <http://www.ldeo.columbia.edu/polareducation>