

Details



Completion Time: About one period

Permission: Download and Share

Is There Salt in a Glacier?

Overview

For this experiment, we are going to melt dirty ice (ice with lots of sediment/dirt in it) and clean ice (ice without sediment) from the Taylor Glacier. After we melt the ice, we are going to test the melt water for pH and conductivity, and then determine how much salt is actually in our ice samples. There are two ways that you can do this activity: 1) Watch the video clip of our team performing the experiment in the field (see Resources section) or 2) Make your own ice cubes with varying amounts of salt and have your students do the tests.

Objectives

1. All students should be able to describe pH and conductivity and how they are used to measure the amount of salt in a substance.
2. All students should be able to identify whether there is more salt in clean or dirty glacier ice and identify where those salts come from.

Lesson Preparation

Prior to the lesson there are several concepts that might help the students better understand what is going on. The basic knowledge of what a glacier is and how they form would be helpful. A prior investigation (see pre-lab questions) of pH and conductivity measurements and what they tell us about a substance would also help.

Procedure

Describe the steps needed to complete the lesson.
For the Teacher:

1. Prepare ice samples the day before, adding varying amounts of sediment and salt to create dirty and clean ice samples.
2. Gather materials for the student experiment.
3. Follow the directions on the student handout.

Extension

Materials

- Student Worksheet
- Video of Experiment
- pH and Conductivity Meters
- 2 Beakers
- Burner or Hot Plate
- Ice Cube Trays
- Salt
- Sediment
- Calculator
- Balance



n/a

Resources

Video and pictures of experiment done in the field: <http://www.polartrec.com/expeditions/microorganisms-in-antarctic-glacier-ice/journals/november-3-2009-is-there-salt-in-a-glac>

Assessment

See questions on student handout.

Credits

Lindsay Knippenberg. PolarTREC 2009. lknippenberg@solake.org

National Science Education Standards (NSES):

Content Standards, Grades 5-8

Content Standard A: Science As Inquiry

- a. Abilities necessary to do scientific inquiry
- b. Understandings about scientific inquiry

Content Standard B: Physical Science

- c. Transfer of energy

Content Standards, Grades 9-12

Content Standard A: Science As Inquiry

- a. Abilities necessary to do scientific inquiry
- b. Understandings about scientific inquiry

Content Standard B: Physical Science

- b. Structure and properties of matter
- f. Interactions of energy and matter

Content Standard D: Earth and Space Science

- b. Geochemical cycles

Name: _____

Hour: _____

Is There Salt in a Glacier???

For this experiment, we are going to melt dirty ice (ice with lots of sediment/dirt in it) and clean ice (ice without sediment) from the Taylor Glacier. After we melt the ice, we are going to test the melt water for pH and conductivity and then determine how much salt is actually in our ice samples.

Pre-Lab Questions:

1. What is pH? What does it tell us about a substance?

2. What is conductivity? What does it tell us about a substance?

Problem: Which contains more salt, dirty ice or clean ice?

Your Hypothesis: (Which one do you think and why?)

The Experiment:(Make your own ice or look at our results on www.polarartrec.com)

1. Collect two large beakers and put a chunk of dirty ice in one and a similar sized chunk of clean ice in the other.
2. Let the ice chunks melt or warm gently over a burner.
3. Measure and record the pH and conductivity of the melt water in both beakers.

The Results: (Record your own results or copy down ours)

Clean Ice			Dirty Ice		
	pH	Conductivity		pH	Conductivity
Reading #1			Reading #1		
Reading #2			Reading #2		
Reading #3			Reading #3		
Average			Average		

Interpreting the Results:

1. Were the pH values of the dirty and clean ice the same? Explain using data from above.
2. Were the conductivity values of the dirty and clean ice the same? Explain using data from above.
3. Based on your results, does dirty ice or clean ice contain more salts? How do you know this?
4. Where do you think the salts in the ice came from?

Taking it further...

New Problem: How much more salt is in the dirty ice than in the clean ice?

Hypothesis: (estimate in grams how much more salt the dirty ice has than the clean ice)

_____ grams

The Experiment:

1. Measure the conductivity of the dirty ice.
2. Place the clean ice on a balance and record the initial mass.
3. Slowly add salt to the clean ice and stir until the conductivity in the clean ice is the same as the dirty ice.
4. Record the final mass of the clean ice in grams.

Results:

Initial Mass of Clean Ice = _____ Final Mass of Clean Ice = _____

Equation for the Mass of the Salt: Final - Initial = Mass of Salt

Mass of Salt = _____

Interpreting the Results:

1. Why do you think there is such a big difference in the amount of salt between clean and dirty ice?

2. Where do you think the dirtiest ice is in the glacier, near the top or near the bottom? Why?