



Schools on Board Field Program Lesson Plan Example

Salinity Experiment

Created and presented by:

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Purpose:

- Demonstrate the process salt segregation during the formation of ice.
- Demonstrate the influence of salinity on the formation of ice

Lab Activity

Materials:

- 1 large bottle of sea water (33 –34 g salt dissolved in 1000 g water)
- 1 large bottle of freshwater
- 15 plastic juice bottles (3 replicates for each dilution)
- screen (< 0.5 mm grid size)
- knife to break up ice
- 2 x 500 mL graduated cylinder
- freezer
- stop watch
- hand held conductivity meter or hand-held refractometer

Procedure:

1. Rinse bottles three times with freshwater
2. Label each bottle with the dilution (e.g. 100%, 75%, 50%, 25%, Freshwater)
3. Shake the bottle of sea water prior to measuring out the volume
4. Calculate volumes of sea water and freshwater to create appropriate dilutions
5. Create dilutions for 400 mL. Mix well.
6. Measure the salinity using the conductivity meter or refractometer
7. Carefully measure 300 mL into the appropriately labeled plastic bottle
8. Repeat for the other dilutions
9. Once all the bottles are filled, place them in a cold water bath (water with ice) until all the water bottles are the same temperature (overnight?)
10. Place bottles in the freezer (approximately 2 1/2 hours depending on the freezer temperature) – make sure there is still water in each bottle
11. Place a funnel with the screen into the rinsed 500 mL graduated cylinder. Filter the remaining water in the plastic bottle through the screens. Use the knife to break ice if needed.
12. Measure the volume of water that did not freeze
13. Measure the final salinity of the remaining water

Note: Be sure to rinse all equipment three times with fresh water between testing of each bottle.

Data and Observations:

Students will record their observations in the data sheet provided. They will then use graph paper to produce two graphs: Initial Salinity vs. Final Salinity and Initial Salinity vs. Decrease in Volume).

Discussion of Results:

1. How did the salinity gradient affect the freezing rate?
2. How did the salinity after freezing change over the various dilutions?
3. When sea ice forms, what happens to the freezing point of the remaining water?
4. Why do you need to mix the sea water before measuring the salinity?
5. Compare the appearance of the ice formations in each of the bottles. How did the structure of the ice formation differ in the freshwater bottle and the sea water bottles?

6. What are some sources of error in this lab?

Application:

How can these results be used to determine climatic changes in the Arctic?

Table 1. Raw data values

Percent Salt water	Volume of salt water	Volume of freshwater	Total initial Volume	Final Volume of water	Change in Volume of water	Initial Salinity	Final Salinity	Change in Salinity
100								
75								
50								
25								
0								
100								
75								
50								
25								
0								
100								
75								
50								
25								
0								

Table 2. Averaged data values

Percent Salt water	Change in Volume of water	Change in Salinity
100		
75		
50		
25		
0		