

Floating in the Great Salt Lake: A Density Experiment

Summary

We'll create salt (NaCl) solutions of various salinities, and then make 'floaters' that are neutrally-bouyant at these salinities. We will then investigate how these 'floaters' behave in other salt concentrations.

Time Frame

2 class periods of 45 minutes each

Group Size

Small Groups

Life Skills

Thinking & Reasoning

Materials

For each group: 4 1 liter beakers (or equivalent) 4 100 ml beakers (or equivalent) Food coloring (four colors) 1 pound of rock salt. 4 1 dram (2cc) clear glass bottles

Background for Teachers

Density is a measurement of the mass per unit volume of a given material. The density of fresh water is 1.00 gram/cc. The density of salt (NaCl) is 2.2 gram/cc. The density of a salt solution varies continuously between these two values.

Intended Learning Outcomes

Student should acquire a practical knowledge of how density varies from one object to another. The mechanics of floating is investigated.

Instructional Procedures

I use two rocks of equal volume: One is very heavy (any rock!) that sinks, and one is pumice, very light volcanic rock. I have the students feel the weight of the heavy rock. After this, I toss the light rock (carefully!) to a student. This generates a stir. I also show how the light rock floats... Have each group make colored water (four colors) in the four 100ml beakers. Then make a 5 salt solution by measuring out 950 grams (cc) or water and 50 grams of salt. Take one of the small bottles and fill it with colored water till its *barely* floats in the 5 salt solution. Then put this first 'floater' aside. Repeat step 1 by making a 10 salt solution (900 gr water, 100 grams salt) and making another 'floater' for this solution. This 'floater' should be of a different color. Repeat for 15 solution (850 grams water and 150 grams salt) and 20 (800 grams water and 200 grams salt) solution. You should end up with a set of four 'floaters' that are neutrally bouyant at 5,10,15, and 20 salt solutions. Have the students determine which floater floats in which solutions. The best way to display this is in a table, with the vertical axis having an entry for each of the salt solutions (5,10,15,20) and the horizontal axis having an entry for each of the 'floaters'. In the grid, indicate in which solutions each 'floater' floats or sinks. Give the students the volume of small bottle used for the 'floater' (or they can measure this!). Then have them measure the mass and compute the density of each floater. Compare this to the density of 5,10,15 and 20 salt solutions (1.05,1.10,1.16 and 1.22 gr/cc). They should be close to equal! Empty one of the 1 liter beakers. Put 1 inch (2.5 cm) of salt at the bottom of the beaker, then slowly (!) fill with fresh

water. Ask the students to guess how the floaters will react to this environment? Then place all four floaters in the beakers. They will all sink to the bottom. Allow the students to stir it (gently) and the 'floaters' will rise in an interesting way!

Extensions

Tie the lesson in with floating on the Great Salt Lake. Ask how many students have actually done this (not many!) and then have them make the connection between this experiment and that activity.

Assessment Plan

Make sure that the students successfully complete: Creation of the 5,10,15,20 solutions. Creation of the 'floaters'. Creation of the Floatation Table. Measurement of the densities of the 'floaters'.

Authors

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