

Lesson Plan - Making a Hydrometer

Grade Level: Grade 8

Learning Objectives:

- to learn how a hydrometer is beneficial to the production of maple syrup
- to have the opportunity to construct a hydrometer and test it out
- have the opportunity to calculate densities for different solutions

Expectations:

Earth and Space Systems

- compare the physical characteristics of salt water with those of fresh water (e.g. movement, density, buoyancy of objects in water)

Matters and Materials - Fluids

- design, make, and calibrate a hydrometer and use it to compare the density of water with that of another liquid

Materials:

Ruler, drinking straw, plasticine, small nails, graduated cylinders (each student needs these materials if they are all making their own hydrometer)

Procedure/activities:

1. Start the lesson off by discussing what a hydrometer is. (A hydrometer is a device used to compare the densities of liquids and to indicate the specific gravity of a liquid. This is done using a Brix scale)
2. Before starting the experiment, have the students identify which solution they believe would be more dense (tap water, salt water and sap) and why?
3. Insert the nails into the drinking straw and have one end of the straw sealed shut with plasticine.
4. Using a ruler, mark a scale on the drinking straw. Place a mark every 2 millimetres. Make every 5th mark darker. This will make it easier to accurately judge how low it floats in different liquids
5. Lower the hydrometer into a graduated cylinder with 100 ml of water in it. The density of water is 1.0 gram/ml.
6. If the hydrometer sinks to the bottom, you may have to remove one nail, if it floats to the top, a nail may need to be added. Add and/or remove nails as needed until the hydrometer floats with the second darkened line equal to the water line. This means that the hydrometer has been calibrated
7. Once the students have made their hydrometers, give them the opportunity to test them out on different solutions. These solutions can include tap water, salt water and sap. Remember that the lower in the solution the hydrometer goes the higher the density of that solution.
8. Make sure you test one solution at a time. Fill the cylinder with 100ml of salt water and place the hydrometer in the solution. Read the density on the hydrometer and record the results in the attached chart. Take the hydrometer out and repeat the step, on the same solution, two more times. Repeat the steps for the water and sap as well
9. Record all results in the attached chart and answer the attached questions
10. When finished the experiment, talk to the students about how a hydrometer may be beneficial to the production of maple syrup. For more information on the use of a hydrometer in the production of maple syrup, please refer to the following website:
<http://www.omafra.gov.on.ca/english/crops/facts/05-019.htm>

Assessment:

- Assess the finished chart and the answers to the questions included with the chart.

Extension Activities:

- Take the class on a field trip to the sugar bush, where they actually get to see a hydrometer used.

Making a Hydrometer

| Solutions | Tap water | Salt water | Sap |
|---------------------|------------------|-------------------|------------|
| 1 st try | | | |
| 2 nd try | | | |
| 3 rd try | | | |

1. Describe the level the hydrometer sinks in tap water, salt water and sap.
2. Why is there a difference in the level each solution sinks?
3. Which solution is most dense? Least dense?
4. How might the hydrometer be useful when making maple syrup?