Density of Liquids

Summary

In this lesson, students will measure the mass and volume of several types of liquids. Based upon these measurements, students will then calculate the density of the liquids and make a prediction of how the liquids will layer once they are mixed together. Students will observe that even though same volumes are used, that liquids can have different densities.

Main Core Tie

SEEd - Grade 8 Strand 8.1: MATTER AND ENERGY INTERACT IN THE PHYSICAL WORLD Standard 8.1.2

Time Frame

1 class periods of 90 minutes each

Group Size

Pairs

Life Skills Thinking & Reasoning

Materials

Worksheet, fish tank or other large clear tub, warm water, colored ice cubes, 2 tea light candles, 95% alcohol, 1 scale per group, 1 graduated cylinder per group, 1 test tubes per person, water, dish soap, karo syrup, vegetable oil.

Background for Teachers

Density of an object is mass per unit volume. Two objects the same volume or size can have different mass. For example, an cubic inch of wood will be less dense than a cubic inch of lead. The reason why objects have different masses per unit volume is dependent upon how packed the atoms are in that unit of space. Another good example that hot water is less dense than cold water. With heat, the atoms become more excited and there is more space in between these atoms, whereas the atoms are closer together in cold water.

Warm ocean water cools as it makes its way north, and begins to sink. As ice caps form, the surrounding water becomes saltier. The cold salt water is more dense than the surrounding water and starts to sink.

Student Prior Knowledge

Before conducting this lab, students should know how to calculate density based upon the mass to volume ratio of an object. They should also know that the reason why similar sized objects have different densities is because of how tightly packed the atoms are in that space.

Intended Learning Outcomes

Instructional Procedures

Start this lesson by giving the students a real world example of density such as how the variations in temperature and salinity of ocean water are affected by density.

Demonstration 1

Fill the fish tank or other clear tube up with warm water. Place 1-2 ice cubes on one side of the tank. Watch how the cold water sinks to the bottom and begins to rise on the opposite side of the tank. Discuss why this happens with the students.

Demonstration 2

In one beaker add water. In another beaker add the same volume of 95% alcohol. Place a tea light candle on top of each liquids. The tea light candle on the water will float and the tea light candle on the alcohol will sink. Discuss why this happens with the students.

Lab Part I

Have students measure mass and volume of each liquid used in the lab, water, dish soap, karo syrup and vegetable oil. Then have the students calculate the densities for each of the liquids. Lab Part II

Based upon the densities of the liquids the students just calculated, the students make a prediction on how the liquids will layer in the test tube. The students then test their hypotheses. Note that the students should put the most dense liquid in first and the least dense liquid on top. The students then record the observed layers and answer the assessment question.

Bibliography

NOAA ocean service education http://oceanservice.noaa.gov/education/kits/currents/06conveyor2.html

Authors

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