Density Demos

Volume is the amount of space that an object occupies. Imagine a cube that measures 10 cm on each edge. The *length* of each edge is 10 cm. The *area* of each side is 100 cm^2 (10 cm x 10 cm). The *volume* of the cube is 1,000 cm^3 (10 cm x 10 cm x 10 cm). The metric unit for volume is liters (L) and one liter is defined as 1,000 cm^3. This means that one milliliter (mL) equals 1 cm^3. Thus, it is possible to use mL and cm^3 interchangeably.

Density is the amount of mass in a given volume. A very dense object has a lot of mass in a given volume. One that isn't very dense has only a little bit of mass in the same volume. For example, the density of water is 1.00 g/mL. This means that every milliliter has a mass of 1.00 g. The density of gold, on the other hand, is 19.3 g/mL. This means that every milliliter of gold has a mass of 19.3 g. Gold is much more dense than water, so gold sinks in water. The density of cork is 0.24 g/mL. This means that every milliliter of cork has a mass of 0.24 g. Cork is much less dense than water, so cork floats on water.

Body Language:

Prior to the presentation, the presenter marks off the tiles on the floor to get a square area, allowing one square tile per student. The presentation is started by asking students to step into the square, each standing in a square. The presenter discusses the three states of matter: solid, liquid, gas, indicating that each student represents a molecule. For each state, the presenter asks half the student "molecules" to leave the square.

Introduction:

The presenter discusses the meaning of density, sharing the definition: Density=mass/volume. The presenter calls for a volunteer and hands him/her two foil-covered "bricks." One is Styrofoam; the other is authentic brick. When the student responds in surprise (not expecting the difference), the presenter interacts with the students to bring meaning to this definition, based on their experience with the Body Language activity, and elicits student ideas about what makes the bricks different.

Demonstration of Matter:

The presenter begins with questions: Why do some objects float and some objects sink? Do large objects float more easily than small ones? The presenter goes on to share that everything is made up of matter. Matter is the term used to describe the "stuff" that is around us. To show this, the presenter passes around several clear liter bottles, all filled with various items: water, cotton balls, kitty litter, water, iron filings, so students can again relate the variation of mass related to a fixed volume (1 liter in this case).

Does Wood Float:

Two blocks of wood (balsa and lignam), cut to be identical volume are displayed to the students. They are asked how they think the blocks will behave if dropped in water. The presenter then places the wood blocks in water, where balsa floats and lignam sinks.

Floating Root Beer, Eggs, Ice:

Densities can be compared in several ways. Students are asked to consider the difference between changing the density of the object being floated and changing the density of that in which the object is being floated.

Density Straws:

What happens to the density of water when varying amounts of salt are added to the same amount of water? Since density is the amount of matter in a given volume, it is easy to see that the more salt dissolved in a 2-liter container, the higher the density.

Since heavier objects sink, it stands to reason that if you attempt to combine two or more salt solutions with differing densities, they will separate and stack with the heavier layering on the bottom.

Standards Met:

3.1.2, 3.1.4, 3.1.5, 3.2.2, 3.2.4, 3.2.6

4.1.3, 4.2.2, 4.2.4, 4.2.5

5.1.2, 5.2.1, 5.2.2, 5.2.5, 5.2.6, 5.5.1, 5.5.2, 5.5.7

6.1.3, 6.2.2, 6.3.20

7.1.4, 7.2.2.

8.1.1, 8.2.2, 8.2.7, 8.5.7