Demo: Density Tubes

FOR THE TEACHER

Summary
In this demonstration, students will have the opportunity to observe and analyze the density of a solution. Students will interpret their observations as they compare the density of the solution with plastic components.

Grade Level
Middle and High School

Objectives
By the end of this demonstration, students should be able to
- Understand that solutions have different densities.
- Interpret observations in order to compare density values of components in a mixture.

Chemistry Topics
This demonstration supports students’ understanding of
- Density
- Solutions

Time
Teacher Preparation: 5-10 minutes
Lesson: 10 minutes

Materials
- Preform tube and cap
- HDPE Pellets (10-20 pellets)
- Fuse Beads (~10 beads)
- ~30 ml of 91% Isopropyl alcohol
- ~30 ml of water

Safety
- Always wear safety goggles when handling chemicals in the lab.
- Students should wear proper safety gear during chemistry demonstrations. Safety goggles and lab apron are required.
- Students should wash their hands thoroughly before leaving the lab.

Teacher Notes
- Teachers can use this demonstration to investigate or introduce the concept of density with students. In addition, this could be easily done as a classroom lab, and allow students to follow the procedure themselves.
- This demonstration requires students to interpret their observations, and will help to gain a better understanding of density.
• Procedure:
  1. Add approximately 10 fuse beads to the preform tube.
  2. Add approximately 10-20 HDPE pellets to the preform tube.
  3. Shake the tube so that the beads and pellets are interspersed in
     the bottom of the tube.
  4. Add water to the tube until it is approximately half full. Cap
     the tube. Notice the both the HDPE pellets and the fuse beads
     will remain in the bottom of the tube. Shake the tube so that
     students can clearly see that the pellets and beads sink in
     water.
     o *Teaching Focus:* Ask students to interpret this observation in terms of *density.*
       They should be able to determine that both the pellets and the beads are denser
       than water, since they both sink in the water.
  5. Remove the cap, and fill the remaining half of the tube with 91% isopropyl
     alcohol. Secure the cap again, and shake the tube in order to mix the alcohol and
     water. It should be noticeable that some of the fuse beads are
     floating, but mostly they are suspended in the solution. The
     HDPE pellets will remain at the bottom of the solution.
     o *Teaching Focus:* Ask students to interpret this observation in
       terms of *density.* They should be able to determine that the
       density of the solution has changed. The pellets are still
       denser than the solution, and also denser than the fuse beads.
       The fuse beads are very similar in density value to the
       solution since they are suspended in the center. Note: if the
       fuse beads float (depending on the ratio of water to alcohol
       used) then the fuse beads have a lower density value than the
       solution.

• Extension: Students may also benefit from this *Density Simulation* in order to better
  visual density on the particulate level.