



Seeing Is Believing!



Topic: Density, Isotopes

Courses: General Chemistry

Text References: McMurray Fay 10.1, Oxtoby, Freeman and Block 8.7

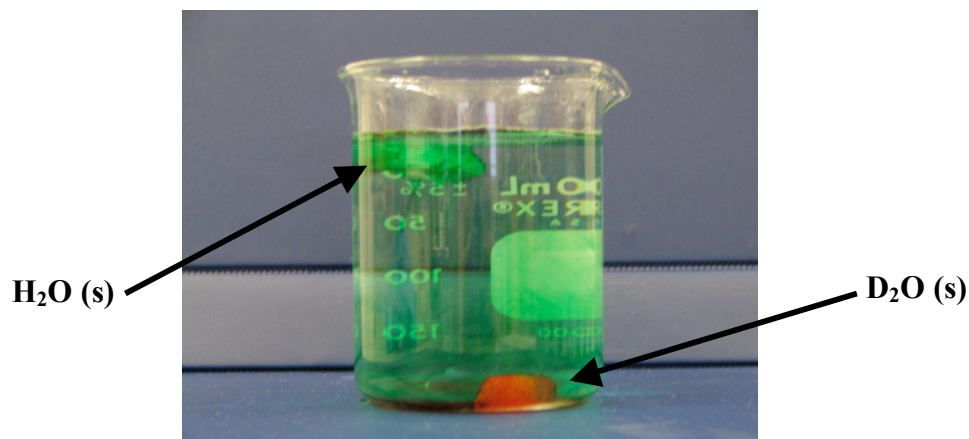
Setup: Preparation time is < 5 minutes plus the time required to freeze ice cubes.

- Ice cube tray
- Water
- Deuterium oxide (D_2O)
- Food coloring (two colors)
- Freezer
- Beaker

Procedure: Demonstration time is <5 minutes.

1. In the ice cube tray, add water to make one cube and D_2O to make another cube.
2. Add a different color food coloring to each cube and mix.
3. Freeze cubes.
4. Add both cubes to a beaker of water (room temperature or colder) and observe.

Observation: The ice cube made of water will float, and the cube made of D_2O will sink.



Explanation: Most chemical properties of isotopes are the same. However, physical properties of isotopes are different. The density of water (liquid) is 1.00 g/cm^3 . The density of ice (solid water) is 0.92 g/cm^3 . Because the density of ice is less than the density of water, ice floats. The density of $D_2O (s)$ is 1.11 g/cm^3 . (Deuterium is heavier than hydrogen, but the number of molecules in a volume element is the same as for ice.) Because the density of $D_2O (s)$ is greater than the density of water, $D_2O (s)$ sinks.