

RAFT IDEAS

Topics: Phase Changes,
Density, Measurement

Materials List

- ✓ Water
- ✓ Small graduated freezable container such as a graduated preform
- ✓ Freezer

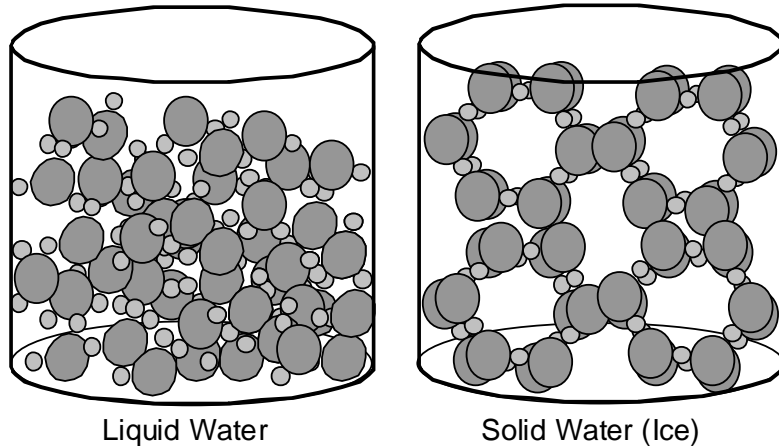
This Activity can be used to teach:
Next Generation Science Standards:

- Energy can be transferred from place to place and converted from one form to another (Grade 4, Physical Science 3-2)
- Structure of matter (Grade 5, Physical Science 1-1; Middle School, Physical Science 1-1)
- Property of materials (Grade 5, Physical Science 1-3)
- Thermal energy transfer (Middle School, Physical Science 3-3)



Freezing Water into ICE

Experimenting with Density of Liquids and Solids



Water is the foundation of life on Earth, partly due to an unusual collection of properties that are not duplicated by any other substance. One of those properties is the fact that solid water, or ice, is less dense than cold liquid water. This property is what enables fish and other creatures to continue living in a lake or river that has frozen over. The ice floats on the surface of the liquid water, rather than choking the bottom of the lake or river.

This activity demonstrates that ice is less dense than water.

To Do and Notice

1. Measure a small amount of water, such as 15 ml (1 Tablespoon), into a graduated container (such as the graduated preforms created using the RAFT Idea Sheet *Graduated Preforms*)
2. Place the container into the freezer overnight. The next day, measure the volume of the frozen water.
3. Is it different? How?
4. Calculate the how much it changed as a percentage of the original volume. Divide the ending volume by the beginning volume; multiply by 100). The ending volume should be greater than 100% of the beginning volume.

The Science Behind the Activity

Ice consists of an orderly array of hexagonal cells, where the angles between the hydrogen and oxygen atoms dictate that there is quite a bit of empty space between oxygen neighbors. Liquid water is less ordered, so water molecules can fit together more tightly. It is because of this tighter packing that liquid water is denser than ice. Water is actually most dense (1 g/ml) at 4°C (39°F); the density of Ice is 0.91 g/ml.

Taking it Further

Try the water modeling activity in the RAFT Idea Sheet *Water in an ICE Box*. Try the experiment with different liquids, such as sugar syrup, soda, very salty water, melted butter, and so on. Do you get different results? Why?

Web Resources - (Visit www.raft.net/raft-idea?isid=68 for more resources!)