

# RAFT IDEAS

**Topics:** Density, Buoyancy, Properties of Compounds

## Materials List

- ✓ Dry Ice (see Yellow Pages under "ice")
- ✓ Box Lined with a Trash Bag, or an Empty Fish Aquarium
- ✓ Soap bubble solution and wand
- ✓ Safety Goggles
- ✓ Oven Mitts
- ✓ Hammer
- ✓ Ice Chest (to transport and store dry ice)

This activity can be used to teach:

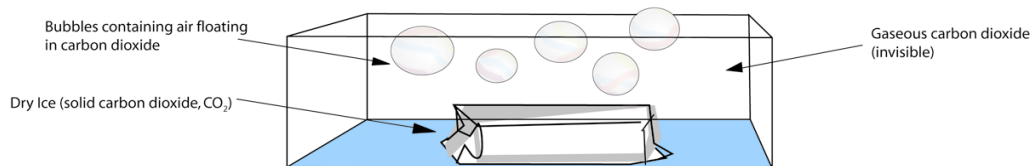
Next Generation Science Standards:

- Structure of matter (Grade 5, Physical Science 1-1)
- Properties of materials (Grade 5, Physical Science 1-3)
- Changes of state (Middle School, Physical Science 1-4)
- Chemical reactions (Middle School, Physical Science 1-2, High School, Physical Science 1-2)



# Fascinating Floating Bubbles

Dry Ice makes bubbles appear to levitate!!!!



Dry ice is frozen carbon dioxide, which is a relatively dense gas. Dense enough to cause air bubbles containing air to appear to levitate.

## To Do and Notice

**Safety Note:** Dry ice is  $-78.5^{\circ}\text{C}$  ( $-109.3^{\circ}\text{F}$ ), cold enough to cause **frostbite**. Practice safe lab procedures during this activity:

- **Avoid contact with bare skin and wear safety goggles.**
- **Do not put dry ice in closed containers or glass containers** (other than the fish aquarium used in this activity).
- Do dry ice activities in a **well-ventilated area**.

1. Put several large pieces of dry ice in a box lined with a trash bag or an empty fish aquarium.
2. Allow dry ice to sit for several minutes in the container. (This allows time for some of the solid dry ice to become carbon dioxide gas and fill the container).
3. Blow some soap bubbles over the container and allow the bubbles to fall in the container. Do not blow the bubbles into the container; it will blow away the carbon dioxide. The bubbles will appear to float in mid air.
4. **Clean Up:** Make sure all the pieces of dry ice are put back in the ice chest at the end of the activity. Store the ice chest in a secure location for a day or so and the dry ice will warm up and become atmospheric carbon dioxide. (Do not pour dry ice down the drain...it could lead to costly repairs).

## The Science Behind the Activity

In this activity, the soap bubbles of air appear to float, but they are actually being pushed by displaced carbon dioxide gas. Dry ice is carbon dioxide ( $\text{CO}_2$ ) in its frozen state. When the dry ice gets warm, it undergoes a phase change known as sublimation, a change in state from a solid directly to a gas or visa versa. When dry ice sits in a container for while, the container will be full of carbon dioxide gas. This activity is a dramatic demonstration of the Law of Buoyancy, which states that a material will tend to rise in the fluid it is immersed in when the material is less dense than the fluid. When the soap bubbles fall into the container, the bubbles are full of air (density = 1.3 g/l), which is less dense than that of carbon dioxide (2 g/l). Because the air bubbles are less dense than the carbon dioxide, the bubbles will fall into the container until the point that they achieve neutral buoyancy. Similarly, the same principal causes helium balloons to float in the air (helium has a density of .2 g/l).

**Web Resources** (Visit [www.raft.net/raft-idea?isid=142](http://www.raft.net/raft-idea?isid=142) for more resources!)

More classroom activities and information on safe handling procedures can be found at: <http://www.dryiceinfo.com/science.htm>