# Buoyancy

# Lesson Plan

## ~ No. 2 ~

Buoyancy: Positive and Negative (What's Up?)

**Subject Area:** Science

**Objectives:** Students will have a basic understanding of the role of positive buoyancy in the photodegradation of six-pack carriers.

**Methods:** Students will observe characteristics of positive and negative buoyancy as they pertain to various types of plastics, and understand why it is important that photodegradable six-pack carriers have positive buoyancy.

**Materials:** Clean, clear, empty one- or two-liter plastic pop containers with their caps, six-pack carriers, green or other colored one- or two-liter pop bottles, school approved scissors, a dark permanent marker, water.

**Vocabulary:** Buoyancy (positive and negative), photodegradation.

## Procedure:

1. Divide the class into two groups of two or three students. Each group should have one set of the materials listed above (a clear pop bottle and cap, a green pop bottle, a six-pack carrier, scissors, water).

2. Explain to the students that when something floats we say it has positive buoyancy. When something does not float, it sinks, we say it has negative buoyancy. Different plastics have different properties. For this activity students will determine if various plastic samples have positive or negative buoyancy.

3. Cut up one photodegradable six-pack carrier into pieces small enough to fit into the clear one-liter or two-liter pop bottle (approximately one-half inch squares). Place a dark permanent mark on each piece. Set aside. Cut up an equal amount of pieces from a green one- or two-liter plastic pop bottle. Set aside. Fill the clean, one- or two-liter pop bottle three quarters full with water. Put the two types of cut up plastic into the bottle with the water in it, noting that the six-pack carrier pieces are the whitish plastic, and the pop bottle pieces are green. Replace the cap. Gently shake the bottle and set it down on the desk. What do you observe? Which plastic demonstrates negative buoyancy? (the green plastic). Which plastic demonstrates positive buoyancy? (the photodegradable six-pack carrier plastic).

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## Use the following questions for discussion and to possibly encourage further research:

4. **What is photodegradable anyway?** Photodegradation is the process by which the sun's ultraviolet rays cause a chemical change in the physical make-up of certain plastics. This change causes the plastic to become brittle and therefore break apart easier. In a matter of weeks, the six-pack carrier can be broken down to the point where it is nothing more than small pieces.

5. **Why might it be important for the six-pack carrier to have positive buoyancy?** For the sun's UV rays to break down the plastic six-pack carrier, the sun's rays have to reach the plastic. If the plastic has negative buoyancy, it sinks, then the sun's UV rays cannot reach the plastic and begin breaking it down. Therefore it is important that the plastic be everyone's responsibility. If a six-pack carrier floats, it can be more easily seen and recaptured for proper waste handling.

6. **Why is it important that the six-pack carrier plastic break down or degrade?** Although it is the goal, not all six-pack carriers make it to proper waste handling (i.e.: recycled or landfilled). For this reason, six-pack carriers have a tear tab designed to break the can loop when pulled by the consumer. Breaking the loop reduces the risk of animal entanglement if the carrier is carelessly discarded. When discarded and exposed to sunlight, the photodegradation process begins.

## Extensions:

1. Test other plastics for buoyancy. Record observations in a chart form.

2. Conduct a litter pick-up on grounds with a body of water, i.e. an area park with a pond. While picking up litter, notice the buoyancy in the water cleanup. Students may wish to list or chart the used containers most commonly littered in their area.

## Vocabulary

**Buoyancy:** the relative power to float (positive buoyancy) or sink (negative buoyancy) in a liquid.

**Photodegradation:** the process of breaking down into smaller pieces as a result of exposure to ultraviolet rays, i.e.: from the sun; the absorption of high-energy radiation in the UV portion of the light spectrum, which activates the (plastics') electrons to higher activity and causes oxidation cleavage, and other degradative reactions.

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