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Classifying Recyclable Plastics



Concept: Differences in physical properties of various plastics

National Science Standards:

A	B	C	D	E	F	G

Objectives: Students will recognize there are differences between plastics.
Students will identify a plastic by number.
Students will understand that the physical properties of plastics differ.
Students will identify a sample of unknown plastic based on observed characteristics.

Suggested grade levels: All

Estimated time:

- Teacher prep: 60 minutes
- Graphing and discussion: 25 minutes
- Classifying activity: 45-50 minutes

Materials needed: *These should be prepared by the teacher at least one day in advance.*

- approximately 1" by 1" squares of plastic to be tested (1 set consisting of 1 piece each of recycling numbers 1, 2, and 6 and the mystery plastic per group)
- water
- saturated salt water solution (prepared as follows: Measure 360 g of table salt per 1 L of water (about $\frac{1}{2}$ cup table salt per 1 quart water), combine, and shake or stir vigorously. After letting stand several hours, additional salt may be added. You may stop adding salt when a small amount remains undissolved on the bottom of the container. This is a saturated salt solution.)
- two large containers per group (for floating the samples)
- food coloring
- wooden sticks (the type found in ice cream bars)
- approximately 1" by 1" square of "mystery plastic" (1 per group; the mystery plastic used should be chosen from the following recycling numbers: 3, 4, 5, 7)

Safety/Disposal: Remind students to thoroughly wash plastic containers before bringing them in to class.
An adult should cut the plastic samples prior to the activity.

Caution students about possible sharp edges of plastic pieces.

Water and salt water can be poured down the drain.

Save plastic pieces for next year. (A suggestion: categorize and label the plastic pieces)

according to recycling numbers.)
Recycle all plastics if they are to be discarded.

Procedure:

1. Give students a one to two week notice to bring in a variety of plastics with different recycling numbers. These should be brought in at least a day in advance of the experiment to allow time for the teacher to prepare them for the experiment.
2. On the day of the experiment, students, in groups, will tabulate and graph the types of plastics that have been brought in.
3. Graphs prepared in small groups are shared, combined, and discussed in the large group.
4. Introduce the classification activity by brainstorming “describing words” to use in the various observations.
5. Students divide into groups and complete the classification activity by following the chart and recording the data. Classify physical properties as to appearance, touch, flexibility, etc. (See chart on page 9.)
6. Determine density by submerging one piece of each plastic in both water and salt water to see if it will float (less dense) or sink (more dense). For best results, plastic pieces should be tapped with the wooden stick when doing float tests.
7. Groups report data to the large group followed by discussion.

Wrap-up:

- Expected results: PET (1) is more dense (about 1.38 g/mL) and thus will not float in water or salt water; HDPE (2) is less dense (about 0.95 g/mL) and will float in water and salt water; PS (6) is in-between (1.05 g/mL) and will not float in plain water (about 1.0 g/mL) but will float in salt water (about 1.20 g/mL).
- Discuss the results of the known plastics. Students defend their group’s classification of the mystery plastic
- Follow up questions: Why did some plastics sink and float? What are some ways plastics are alike? Different? Why do you think there are so many different kinds?

Extensions:

- Test all numbered plastics.
- Test several unknown plastics.
- Use pegboard, Velcro, and golf tees to display and graph samples of each type of plastic.
- Use an alcohol/water solution or sugar water solution to test relative density.

Resources: Sarquis, Jerry L., Mickey Sarquis, and John P. Williams. Teaching Chemistry with Toys. Miami University, Middletown, OH: Terrific Science Press, 1995.