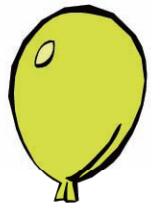
Milli's Super Sorting Challenge

Materials can be grouped or separated by how they look and/or by the material of which they are made. These qualities are called **properties** of the materials. Some recyclers use special properties of materials to group recyclables. In this activity, you will separate materials based on their special properties.



Materials

- Plastic straw
- Blunt-end scissors
- Metric ruler
- 1 latex balloon
- 1 square of aluminum foil (5 x 5 centimeters) (about 2 inches square)
- 1 square of paper towel (5 x 5 centimeters) (about 2 inches square)
- 5 metal paper clips (small ones about 3 centimeters; about 1 inch in length)
- 1 piece of windowscreening (20 x 30 centimeters) (about 8 x 12 inches)
- Rectangular cake pan (about 32 x 23 x 5 centimeters) (9 x 12 inches)

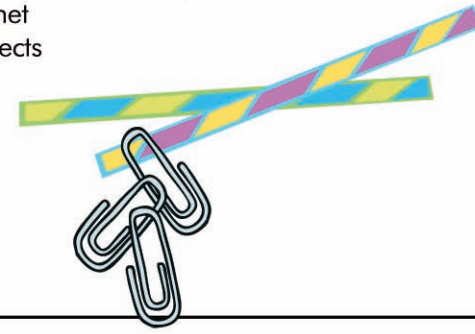
NOTE: A coffee stirrer could be used in place of a drinking straw.

ADAPTATION *The activity could be conducted first separating just two materials and then adding the others. Also, larger pieces of the aluminum foil and the paper towel could be used.*

SAFETY! *Be sure to follow Milli's Safety Tips and do this activity with an adult! Do not eat or drink any of the materials used in this activity. An adult must do all the steps involving the blender or food processor.*

Procedure

1. Cut the plastic straw into five pieces (any size) using the scissors.
2. Cut or tear the aluminum foil and the paper towel into 5 pieces each (any size).
3. Roll each piece of paper towel into a ball between your thumb and index finger.
4. Place the pieces of straw, aluminum foil, paper towel, and the paper clips together in a pile on the screen.
5. Move the magnet through the pile (you may need to bring it very close to the objects). Put any objects picked up by the magnet aside in a pile. Record the objects picked up in the "What Did You Observe?" section.
6. Inflate the balloon and tie it closed (your adult lab partner may need to help you). Rub the balloon back and forth on your hair. Hold the balloon close to the pile and see what happens to the objects. Put everything that is attracted to the balloon in a second pile. Record these items in the "What Did You Observe?" section.
7. Fill the cake pan with water. Take the screen with the remaining objects on it and dip it into the water so that the screen touches the bottom of the pan. Pick off any floating materials and put them in a third pile. Record these items in the "What Did You Observe?" section.
8. Now lift the screen and put the remaining objects in a fourth pile. Record these items in the "What Did You Observe?" section.
9. Thoroughly clean the work area and wash your hands. Reuse/recycle as many of the materials as possible! Check your reuse/recycle plans with your adult lab partner first.



What Did You Observe?

	Attracted to Magnet	Attracted to Balloon	Floated on the Water	Did Not Float
Object				

Try this...

Now try and see if you can separate different materials. On a piece of cardboard, place 4 pennies (metal—copper and zinc), some pencil shavings (wood), four rubber bands (rubber), and three marbles (glass) in one pile. Your job is to figure out a good way to separate them. You may use the following actions or equipment, but not necessarily in this order:

- Use short, gentle bursts of air from your mouth to blow air at the pile.
- Hold a piece of tape (25 centimeters/10 inches long) at one end and lower the other sticky end onto the pile.
- Shake the cardboard back and forth in short fast movements.

Experiment with these methods to figure out in what order to do them so the materials can be separated easily.

Where's the Chemistry?

Materials have different chemical and physical properties that make them easy to separate. Recycling plants use machines that vibrate to sort paper from wood and cardboard. They use magnets to pull out tin and steel that is mixed with aluminum and plastic. Paper, glass, plastic, and metal each has its own chemical make-up and its own way of being recycled. It is important that each is separated from the other items before recycling. Paper is cut up, bleached and pulped. Some metals can be picked up by magnets and other metals cannot. Some materials are attracted to each other because of static electricity, which involves positive and negative charges.

The hollow plastic straw pieces float because they spread their weight out and can float on the water's "skin." This skin forms because water tends to stick to itself, which is called cohesion. Materials with properties that are alike get cleaned, cut up, melted down and then made into new products. Some recycling plants are starting to use these different properties to help them sort out materials. They make machines to separate out recyclable materials just like you did but their process is on bigger scale!

The American Chemical Society develops materials for elementary school age children to spark their interest in science and teach developmentally appropriate chemistry concepts. The *Activities for Children* collection includes hands-on activities, articles, puzzles, and games on topics related to children's everyday experiences.

The collection can be used to supplement the science curriculum, celebrate National Chemistry Week, develop Chemists Celebrate Earth Day events, invite children to give science a try at a large event, or to explore just for fun at home.

Find more activities, articles, puzzles and games at www.acs.org/kids.

Safety Tips

This activity is intended for elementary school children under the direct supervision of an adult. The American Chemical Society cannot be responsible for any accidents or injuries that may result from conducting the activities without proper supervision, from not specifically following directions, or from ignoring the cautions contained in the text.

Always:

- Work with an adult.
- Read and follow all directions for the activity.
- Read all warning labels on all materials being used.
- Wear eye protection.
- Follow safety warnings or precautions, such as wearing gloves or tying back long hair.
- Use all materials carefully, following the directions given.
- Be sure to clean up and dispose of materials properly when you are finished with an activity.
- Wash your hands well after every activity.

Never eat or drink while conducting an experiment, and be careful to keep all of the materials used away from your mouth, nose, and eyes!

Never experiment on your own!

For more detailed information on safety go to www.acs.org/education and click on "Safety Guidelines".