

Bonds

Question

What holds a substance (chemical) together?

Setting the Stage

- Tell students that chemicals are substances held together by bonds. Tell them some bonds are stronger than others.
- Tell students two types of bonds include *covalent bonds* (bonds formed by the sharing of electrons) and *ionic bonds* (bonds formed by the attraction of oppositely charged ions (charged atoms)).

Materials Needed for Each Group

- one sheet of each of the following:
 - newspaper, typing paper, construction paper, writing paper, and cardboard
- gummy candy
- candy containing chewy caramel
- marshmallow
- standard (metric) ruler
- data-capture sheet (page 25), one per student

Procedure (*Student Instructions*)

1. Hold the sheet of newspaper so that it looks as if you are holding a rectangle. With your hands, pull (in opposite directions) both ends of the paper. Note what happens.
2. Rip the sheet of newspaper in half. Note how easily it rips and the shape formed on each piece of paper (after it is ripped).
3. Repeat steps 1 and 2 with each type of paper.
4. Carefully and slowly stretch a marshmallow to the point where it is ready to separate into two pieces.
5. Using the standard (metric) ruler, measure to the nearest inch (centimeter), the farthest distance that the bonds in the marshmallow stretched. Record your observation.
6. Repeat steps 4 and 5 with a piece of gummy candy and with a piece of candy containing chewy caramel.
7. Complete your data-capture sheet.

Extensions

- Have students determine the bond strengths and stretch distances of other items. Display the results on a bulletin board.
- Give students three pieces of typing paper, each containing a 3" (7.5 cm) scissor cut in a different place. Have students pull on the ends of each piece of paper (as done in the activity called Bonds) and note what happens. Discuss the results in class.

Closure

In their simple chemistry journals, have students list the marshmallow and candies in order, starting with the shortest stretched-bond length. Also, name the type of tested paper with the strongest bonds. (Hint: This paper is the hardest to rip.)

The Big Why

This activity provides student experiences in observing and stretching bonds. Students actually see how substances are held together.

Bonds *(cont.)*

After testing the bonds in the different types of paper, candy, and the marshmallow, complete the charts.

Paper			
Paper Type	Result of Pulling on Ends of Paper	Did Paper Rip Easily? Yes/No	Picture of the Shape Formed After Paper is Ripped in Half

Candy/Marshmallow	
Item Name	Longest Stretched-Bond Distance-Inches (cm)