

WHELMERS Student Activity | Grades 3–5

Sandwich-Bag Dart Board

WHAT YOU NEED:

- Several pint- or quart-sized sealable plastic storage bags
- Several sharpened pencils
- Tap water
- Sink or spill pan

DESCRIPTION

Sharp pencils and water-filled sandwich bags demonstrate the nature of certain polymers.



NEXT GENERATION SCIENCE STANDARDS

- **PS2.A: Forces and Motion**
 - Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) (3-PS2-1)
 - The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and

direction to be described is developed.) (3-PS2-2)

- **PS2.B: Types of Interactions**

- Objects in contact exert forces on each other. (3-PS2-1)

- **PS3.C: Relationship Between Energy and Forces**

- When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS3-3)

WHAT YOU DO

1. Fill a bag three-fourths full with tap water and seal it shut.
2. While holding the bag by the seal and allowing it to hang vertically, quickly thrust a sharpened pencil through both walls of the bag below the water line. **BE CAREFUL!** Do not pull the pencil out of the bag. With practice, you should be able to do this and only lose a few drops of water.
3. Repeat the action with several pencils. See how many pencils you can poke through one bag. You will be amazed!

WHAT HAPPENS

Most materials commonly known as plastics are made of very long molecules called polymers. Chemists design polymers to have different characteristics, making them useful in a variety of situations. The material used to make sandwich and storage bags, polyethylene, consists of polymer molecules intertwined and linked to form a weblike matrix. That molecular web, with all its connections between molecules, gives polyethylene its characteristic resistance to tearing. That's why the bag does not tear and holds tight against the sides of the pencil. No (or very few) leaks!

WHERE IN THE WORLD

Did you know that scientists have even made silicone heart valves using polymers? There are a lot of very common products made of polymers. It is likely that you have several of these products in your home and school.

- Plastic cups
- Fiberglass
- Plastic bags
- Epoxy glue
- Sandwich bags
- Styrofoam cups
- Credit cards

How many of these polymer products have you seen? Can you think of any more items to add to the list?