



The Cartesian Diver toy has been known to scientists for hundreds of years. It was first described in writing in 1648 by Raffaello Maggiotti, a student of Galileo. Cartesian is a term that is thought to be from the last name of René Descartes, a French scientist, mathematician, and philosopher. Descartes is famous for saying, "I think, therefore I am". This is a toy that will make you think. In this activity you will make a science toy and use a change in pressure to make an object move.

Materials

- * Disposable plastic transfer pipettes
- * Blunt-ended scissors
- * Squid fishing lures (plastic lures for decoration—no hooks)
- * Grease or soap (to lubricate fishing lures)
- * Steel nuts to fit pipette stem
- * Plastic soda bottle with lid (1–2 Liter)

NOTE: This activity may be done as a demonstration using an eyedropper, top half of a matchstick or a condiment pack instead of a pipette and squid fishing lure.

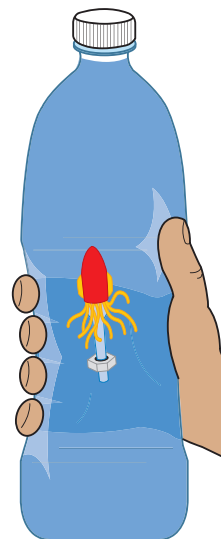
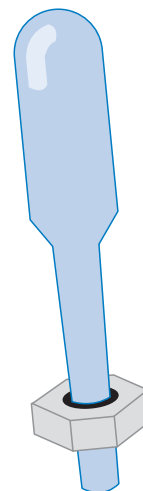


Be sure to follow Milli's Safety Tips and do this activity with an adult! Do not drink the water used in this activity!



Procedure

1. Cut off the stem of the pipette about 1/2 inch (1–1.5 cm) below the end of the bulb and discard the cut portion of the stem.
2. To decorate the pipette, grease the squid fishing lure and stretch it over the pipette bulb.
3. Thread a nut onto the stem of the pipette. It should be a tight fit.
4. Fill the plastic bottle almost to the top with water.
5. Carefully transfer the diver to the bottle. The diver should just barely float. If necessary, add another nut to the pipette stem and/or take up some water into the pipette.
6. Add water to the bottle until it is filled completely and screw the lid on tightly.
7. Squeezing the bottle should cause the diver to move downward, and the release of pressure should cause it to float back up again. If the diver will not submerge, remove the diver and add more water to the pipette or another nut to the pipette stem.
8. Draw a picture of your Cartesian diver in the "What Did You Observe?" section.
9. Thoroughly clean the work area and wash your hands.



Where's the Chemistry?

This experiment shows what happens when the pressure on a gas increases and decreases. When you squeeze the bottle, the air bubble inside of the diver is forced into a smaller space making it more dense. The more dense the air becomes the further the diver sinks. When you release the bottle, the air expands and the diver rises to the top.



What Did You Observe?

Draw a picture of your Cartesian Diver:



What happened when you squeezed the outside of the bottle?

What happened when you released pressure on the bottle?



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".

