Bottle Basics

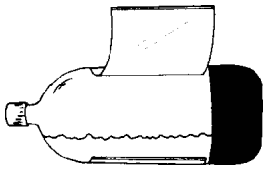
Plastic beverage bottles provide the primary material for Bottle Biology explorations. They are readily available — millions are produced and discarded daily — and they are easy to cut and combine in a wide variety of ways for science projects. These Bottle Basics are meant to get you started, showing how plastic bottles can be taken apart, cut, and connected. Once these basic techniques are mastered, you can use your imagination to combine bottles and parts of bottles (as well as other disposable containers) into the apparatus needed to try out any number of ideas for fascinating projects in the life sciences.

Removing the Label and Base

Both the bottle label and base may be readily removed, but for some projects or parts of projects it might be best to leave the base glued firmly to the bottle. Aquariums and compost columns, for example, will be more stable if the lowest unit has the base attached. In almost all projects the label should be removed. The label and base are held in place with a heat-sensitive glue. To remove them, the glue must be softened with heat.

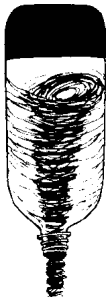
A) Fill the bottle about 1/4 full with very hot (120° - 150° F) water. If the water is too hot (170° - 212° F) the plastic will soften, warp, and may permanently crumple. Screw the cap back on firmly. This will retain pressure inside the bottle allowing you to hold the bottle tightly without crushing or denting it.

B) Tip the bottle on its side so the water warms the area where the label is attached to the bottle — this will soften the glue. Catch a corner of the label with your fingernail and gently peel it from the bottle. If there is resistance, you may need hotter water.



C) To remove the base, tip the bottle upright so the hot water warms the glue holding the bottle bottom to the base. Hold the bottle tightly and slowly twist off the base.

D) Remove the cap and pour the water out slowly. You might try swirling the bottle around as it begins to empty, causing the water to form a vortex resembling a tornado funnel. This lets the water to swirl slowly out of the bottle mouth without buckling the sides.



E) Usually most of the glue from the label and base is left on the bottle. It can be removed by scraping with a sharp-edged piece of metal or plastic while the glue is still warm. It can also be chemically softened and removed with a solvent such as cleaning fluid. Put a small amount on a paper towel and rub. This works best if most of the glue has been removed by scraping. Be sure there is adequate ventilation.

F) Save all parts, bottle, cap, and base. You now have the raw materials to begin fascinating explorations!

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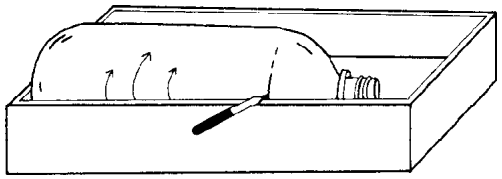
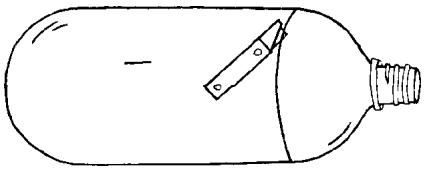
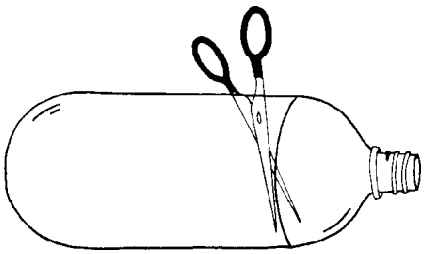
Cutting Techniques

Plastic bottles can be cut and modified in a great variety of ways — but before you begin cutting, plan carefully. Remember that some bottles are wider than others, some have larger bases, and some have more tapered shoulders. The bottle shape and location of the cuts affect how your pieces fit together.







1) Place bottles on their sides in an empty drawer, tray, or box — shallow cardboard flats and computer paper box tops work well. Hold the bottle up against the side and corner of the box to stabilize it while rotating. Brace a felt-tip pen against the box with the tip just touching the bottle and roll the bottle slowly around. This will leave an even line encircling the bottle. Sometimes it's easier to do this cooperatively. One person holds the bottle and rotates, while the other keeps the pen tip touching the bottle.

2) Use a single-sided razor blade or utility knife to begin the cut, slicing along the cutting line about two inches. Insert the tip of the scissors and snip your way around the rest of the cutting line. Because the scissor blades tend to catch in the plastic, it may be easier to snip along with just the tips.

Trim away rough edges and irregularities with the scissors. Once the bottle is cut open, you can snip more from the shoulder, hip or side if you decide shorter lengths are needed. When in doubt about how project pieces may fit, cut them a little too long — you can always remove the extra length. Because it is more difficult to draw lines once a bottle has been cut, draw all intended lines before cutting.

Basic Bottle Anatomy