

Burp Bottle

Have you ever burped before? Burping is caused when there is an accumulation of gas in the digestive system. The “burp” occurs when the gas is released through the mouth. You can construct a “burp bottle” to imitate this action. Try this activity to find out how.

Materials

- 2 plastic soft drink bottles of the same size
- 1 of the following 2 sets of materials:
 - Set 1
 - potato
 - 3-inch piece of rigid plastic tubing (aquarium tubing), or barrel of a Bic® pen (can try another brand that has a removable tapered end)
 - tape
 - 8-inch piece of wire
 - Set 2
 - 2 one-hole #3 stoppers
 - 3-inch piece of rigid plastic tubing that fits tightly into the one-hole #3 stoppers, or barrel of a Bic pen (can try another brand that has a removable tapered end) and tape
- water
- shallow tray or sink
- (optional) narrow-necked glass (or other rigid) bottle
- (optional) food color

Getting Ready

Step 1 Cut one of the soft drink bottles to make a funnel as shown in Figure 1.

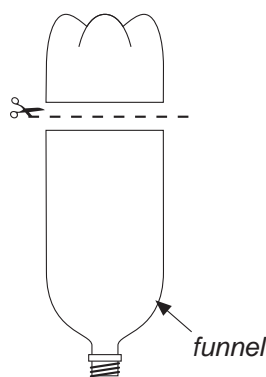


Figure 1: Make a funnel from a soft drink bottle

Step 2 Half-fill the uncut bottle with water.

Step 3 Use one of the two connectors described below to create an airtight seal between the funnel and the uncut soft drink bottle.

Potato connector:

If you are using a pen barrel that has a hole in the side, wrap tape around the barrel to cover up the hole. Carefully push the rigid plastic tubing or pen barrel all the way through the potato. If any potato (that would restrict air or water flow) becomes lodged inside the tubing, use a wire to push it out. Slide one end of the tubing into the mouth of the funnel all the way up to the potato and gently screw the potato onto the threads of the funnel. Lower the other end of the tubing into the mouth of the uncut bottle. Screw the potato onto the threads of the uncut bottle as you did with the funnel. (See Figure 2.)

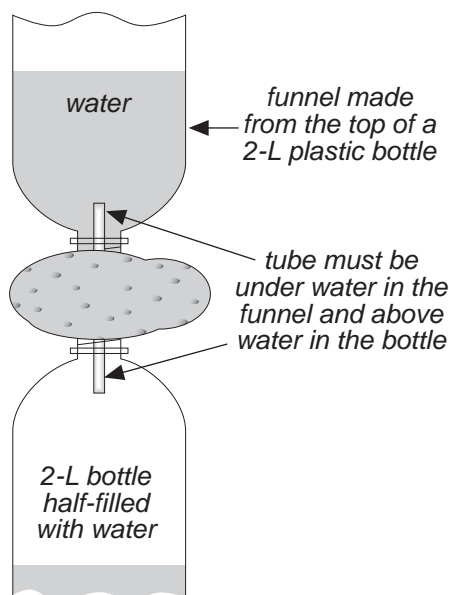


Figure 2: Assemble the Burp Bottle.

Stopper connector:

If you are using a pen barrel that has a hole in the side, wrap tape around the barrel to cover up the hole. Push one end of the tubing or pen barrel through the top of a stopper. Push the other end through the top of the other stopper. (See Figure 3.) Insert one stopper in the funnel and one in the uncut soft drink bottle.

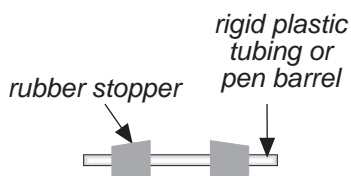


Figure 3: Assemble the stopper connector.

Exploration

- Step 1 Place the apparatus in a shallow tray or sink. Fill the funnel 3/4 full with water (colored water is easier to see). Give the half-filled bottle a slight squeeze. Watch for several minutes. What do you observe? Explain your observations.
- Step 2 Gently unscrew the potato connector from the bottle (if using the stopper connector, twist to remove). Pour water out of the bottle until it is again only 1/2 full. Screw the potato connector

back onto the bottle (if using stopper connector, twist to insert) and fill the funnel with water. Do not squeeze the bottle to start the burp. Does it burp on its own? (Don't wait more than 3–4 minutes.)

Step 3 Experiment to determine the minimum amount of water in the funnel and the minimum amount of water in the uncut soft drink bottle that is needed for the burp phenomenon to begin without squeezing the bottle. What is the importance of water in these two locations? Why is it important that all seals be airtight?

Step 4 Try to make a burp bottle using a glass (or other rigid) bottle instead of the uncut soft drink bottle. Why were you able (or not able) to get it to burp?

Challenge

What factors are responsible for the behavior of a burp bottle?

Burp Bottle

Concepts

fundamental properties of matter, density, air pressure

Expected Student Responses to Exploration

Step 1 (a) When the bottle is squeezed slightly, a bubble of air rises out of the connecting tube (from the bottle). Then, water flows out of the connecting tube (from the funnel into the bottle). This process repeats until the funnel is empty.

(b) The air trapped above the water in the bottle fills the space available to it. However, squeezing the bottle pushes some air out and allows water to take its place.

Step 2 The time that it takes to begin on its own will vary with the size of bottles used, the diameter of the connecting tube, and the amount of water in the bottle and funnel.

Step 3 (a) The amount of water needed in the funnel and the soft drink bottle will vary with the size of the bottles used.

(b) The water in the uncut bottle serves to decrease the amount of air that needs to be compressed. The water in the funnel exerts an additional pressure on the air in the bottle.

(c) All seals must be airtight to prevent outside air rather than water from flowing into the bottle.

Step 4 A rigid bottle will not burp because there must be flexibility to allow for changes in pressure.

Expected Student Answer to Challenge

A burp bottle operates by an initial lowering of the pressure inside the bottle. This is followed by water being pushed into the space of lower pressure. The process repeats.

Acknowledgment

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