Balloon Inside a Bottle

What is Needed

* One small party balloon

* One small bottle. A 16 ounce pop bottle works well.

What to Do

Put approximately 1 tablespoon of water into the empty pop bottle. Then put the bottle into a microwave oven and turn the oven on high. Boil the water in the bottle until the water is almost gone. The bottle will be very hot and full of steam at this point. Using and oven mitt or other protection for your hands, carefully remove the bottle from the microwave oven and set it on a counter. Immediately take off the oven mitt and stretch the opening of the party balloon over the mouth of the bottle. Now stand back and let the bottle cool off with the balloon covering the opening.

Notice that as the bottle cools, the balloon gets sucked into the bottle. If you had just the right amount of water left when you put the balloon on the bottle, the balloon will actually 'inflate' into the bottle until it fills the whole inside!

What is Happening?

When you boiled the small amount of water inside the bottle, the water became steam. As the water boiled away, the steam filled the whole inside of the bottle. If you had just taken the bottle and set it on the counter to cool at this point (doing nothing else) the steam would have cooled and condensed back into a very small amount of water and air would have pushed into the open neck of the bottle to fill the space left by the condensing steam. What you did in this experiment then was to put a rubber balloon in the way of the air as it was pushing into the bottle to fill the space left by the condensing steam.

IMPLODING CAN

What is Needed

* One aluminum can

* One oven mitt or other hand protection

* Some tap water

* A stovetop burner (electric or gas is OK)

* One bowl of cold water. The bowl must be able to hold at least 20 ounces of water. Try using a sauce pan that holds a few quarts of water.

What to Do

First of all, do this experiment with adult supervision. If you are not careful with this experiment, you can burn yourself or someone else. This experiment can be done in a safe manner if some common sense is used.

Take the empty aluminum can and put about two tablespoons of water in it. Then set the can on a burner on the stove. Turn the burner on. Leave the burner on until the water in the pop can boils. When you start to see steam come out of the can opening turn off the burner. When the burner is off, pick up the can with the hand that has the oven mitt on it. Immediately take the can and turn it over into the bowl of cold water. You will hear an immediate pop, as the can implodes.

What is Happening?

What you are doing is turning the water in the can into steam. This steam fills the can and replaces almost all of the air inside the can. When you invert the can into a bowl of cold water, the steam condenses into water very quickly. The can is then left with very low pressure inside of it and...(more later)

CARESTIAN DIVER

What is Needed

- Condiment Packet (Ketchup from Carl's Jr. is what we use)
- Two liter bottle

What to Do

Place the condiment packet in the two liter bottle, and fill it up, all the way to the top. Screw the top of the bottle on, hard. If the packet floats, you are probably OK. If it sinks, you are going to need to try a different packet. Ketchup packets seem to work well for us, so you may need to try something else depending on what part of the country you live in - your local air pressure makes a difference!

Next, squeeze the bottle. If you squeeze it hard enough, the packet should sink. If you can't make it sink (mayonnaise packets seem to float no matter how hard you squeeze), you will need to try another packet.

Once you get just the right packet, it will float when you aren't squeezing the bottle, and sink when you do. You can make it go up and down with very little effort.

What is Happening?

There is a small air bubble inside the packet. When the packet is inside the bottle and you are not squeezing, the bubble is large enough that it will make the packet float very nicely. However, when you squeeze the bottle, you increase the pressure inside the bottle. This will compress the air bubble, which will increase the density of the packet. The packet will now sink.

This is a classic experiment called the Cartesian diver, updated for a modern flair in the spirit of the Little Shop of Physics. Submarines use a similar principle to control their buoyancy, as do some fish.

Other Things to Try With our packet, the buoyancy is also affected by temperature. We are a travelling program, so our experiments get left out in the van overnight frequently. When the bottle gets too cold, the packet will not float and more. Can you see why this might happen?

Science Experements for Children

Science is fun for everyone of all ages.

Put a teaspoon of baking soda in a cup of water. Also put in a small amount of dish soap about 1/4 teaspoon. Stir well. If you like color add a drop of Red, Green or Blue food coloring. Now add about 1 teaspoon of vinegar. The mixture makes colored bubbles.

This experement works great in the winter when the temperature outside is about 20 degrees or less. Get some toy bubbles. Go outside to the south side of the house on a clear day after the sun has been shinning on the side of the house for several hours. The sun will warn the side of the house and create a small up draft next to the house. Stand close to the house and blow some bubbles. The up draft will carry the bubbles up into the sky. The cold air will freeze the water in the bubbles. The frozen bubbles will fall to the yard. The yard will be covered with frozen bubbles. The frozen bubbles are about like egg shells.

Put a plastic bag on a table top and put several books on the bag. Bunch the open end of the bag with you hand and blow air into the bag. Notice the air pressure has the power to lift all the books.

Place an ice cube in a bowl of water. Lay a string across the ice cube. Sprinkle salt on the ice cube and string. Wait about 30 seconds and the string will freeze to the ice cube. The ice cube can be lifted out of the water with the string.

Put a plate on the kitchen table. Put about 1/2 inch of water in the plate. Put a candle in the center of the plate. Light the candle and put a jar of glass over the candle. As the oxygen burns up it creates a vacuum and sucks all the water from the plate into the jar.

Put a round bottle on a table. Stand a straw on the back side of the bottle about 1/2 inch from the bottle. Now blow on the bottle. As the air travels around the curved surface of the bottle it creates a vacuum on the other side and sucks the straw up against the side of the bottle.

Light a candle. Fill a glass about 1/4 full with water. Add about 1/2 teaspoon of vinegar and baking soda. The mixture will foam a minute then stop. The air in the glass is pushed out by the heavy carbon dioxide. The glass is now full of carbon dioxide. Carbon Dioxide is heaver than air. Carefully pour the carbon dioxide on the candle flame. The flame will go out.

Boil 1 egg in a pan of plain water. Boil another egg in a pan of salt water. After 10 or 15 minutes remove both eggs from the water. Notice the egg that was boiled in plain water is broken while the egg that was boiled in salt water is not broken. Salt lowers the water boiling point. The egg that was boiled in plain water got too hot and the shell could not hold the steam pressure created by the heat and the shell broke.

Boil and egg in salt water for 15 minutes. Then put it in the refrigator to cool with all the other eggs in the box. When the egg is cool take the box of eggs out of the refrigator. Ask someone to find the hard boiled egg among the 12 eggs in the box. They will all look exactly the same. Spin all the eggs one at a time on a smooth table top and see if you can find the hard boiled egg. The hard boiled egg will spin like a Top and the other eggs will not spin.

Fill a glass with water. Put a sheet of paper or cardboard over the glass. Hold the paper on the glass and carefully turn the glass up side down. Remove your hand from the paper. Notice the paper does not fall off and the water does not spill out. The weight of the water creates a vacuum inside the glass. The higher air pressure on the outside of the glass holds the paper on the glass and keeps the water in.

Put a book on a table top. Push the book with your finger. Notice that friction prevents the book from sliding. Now place several round pencils under the book. Push the book and notice friction has been reduced and the book is easy to push.

Hold out both hands. Place a 36 inch yard stick on your index fingers in the center with one finger on 16" and the othe finger on 20". Now try to slide one finger to the end of the yard stick while keeping the other finger where it is.. Notice that both fingers will slide at the same time. Gravity and friction will not allow you to move only one finger.

Put some water in the bottom of a small bucket. Now swing the bucket around and around over your head by the handle. The water will not fall out because centrifugal force holds the water in the bucket.

Fill a pan with water and place a penny in the bottom of the pan. Now use a straw to try and tough the penny. Light travels at a different speed in water than it does in air and the straw appears to be bent. The penny if very hard to touch.

Stand a pencil on end on a table. Now look at the pencil by looking through a glass of water. You will see 2 pencils.

Hold a magnifing glass between a candle and a sheet of paper. Notice the image of the candle is projected to the paper. The image on the paper is up side down.

Place a mirror in a pan of water at a 45 degree angle so half the mirror is in the water. Place the pan of water next to the window so the sun can shine through the water and reflect off the mirror onto the wall. The water acts like a prism and reflects a rain bow on the wall.

Put some hot tap water in an empty 2 liter plastic soda bottle. Shake it up with the hot water in the bottle. Quick dump out the water and screw the cap on tight. Set the bottle on a table top and watch what happens. In about 30 seconds the bottle will begin to contract. After about 2 minutes the bottle will be flat. The hot air inside the bottle cools and

contracts. The air pressure outside the bottle is higher than the air pressure inside the bottle.

Fill a glass right up to the top edge with hot water. Now slowly pour 1/4 cup of salt into the hot water. Stir the water very slowly and try not to spill the water. Do you think you can pour all the salt into the water without over flowing the water. The salt molecules are smaller than water molecules and fill in the space between the molecules. The water will not overflow.

Put some oil in a glass. Now slowly pour water into the glass. The heaver water will go to the bottom and the lighter weight oil will float on top of the water.

Get 2 apples and tie a string to the stem of each apple. Hang the apples by the string so the apples are about 1/2 inch apart. Now blow between the apples. What happens? The air traveling around the curved surface of the round apples creates a low pressure area between the apples. The higher air pressure on the outside of the apples pushes the apples together until they touch.