

# Is it possible to change water into cola?



Explore the concept of displacement using a simple 'magic' trick.

**Setting:** Indoors

**Time:** < 30 minutes

**Concepts:** displacement, liquid

**Skills:** building, communicating

## Subject(s):

- ✓ Physics
- ✓ Engineering

## Ages:

- ✓ 6-8
- ✓ 9-11
- ✓ 12-14

## Materials:

- 2L pop bottle
- Glitter
- Craft knife or scissors
- Water
- Cola
- Short piece of plastic tubing or a very large straw (approx. 10cm long)
- Glue
- Modelling clay
- Plastic cups (2)
- Construction paper
- Paint
- Styrofoam plate

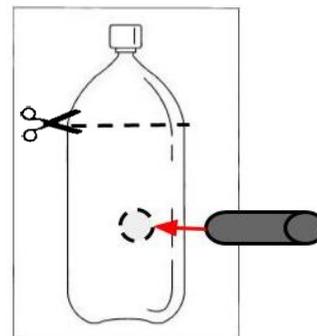


## Safety First!

Adults should assist when cutting out the 2L pop bottle and creating a hole in it for the plastic tubing.

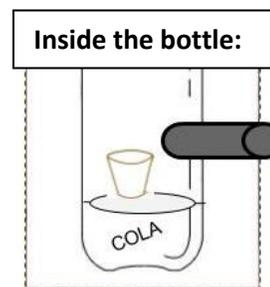
## What to do!

1. Cut off the top of an empty pop bottle about  $\frac{1}{4}$  of the way down.
2. Cut a small opening in the plastic bottle about halfway down, just big enough for the plastic tubing to fit in. Wrap modelling clay around the inside of this hole to hold the tubing in place.
3. Cover the outside of the bottle entirely (using the glitter, paint, construction paper)
4. Fill the bottle halfway with cola (this can be diluted); the cola should not go as high as the hole. Place one cup inside the bottle and the other cup outside of the bottle, under the outer end of the plastic tubing. If the cup inside the bottle will not stand on its own, cut out a circle out of the Styrofoam plate large enough to fit inside the pop bottle. Place the Styrofoam circle on the top surface of the cola, and then put the plastic



## Is it possible to change water into cola?

- cup on top of the Styrofoam.
- Announce that you will change water into cola.
  - Pour water into the floating cup inside the bottle. Cola will begin to come out the tube into the other glass.



### What's happening?

As water is poured into the floating glass, the glass gets heavier and sinks further down into the cola, pushing the cola out of the way. The level of the cola rises until it reaches the level of the tubing and then it flows out. The amount of cola that is pushed out is the same as the amount of water that has been poured into the bottle. This is called displacement.

### Why does it matter?

Displacement is an important concept in fluid mechanics, which is a topic in physics that deals with the properties of fluids and the forces that act on them. One of the most important concepts in fluid mechanics is Archimedes' principle, which states that when an object is in a fluid, there is an upward force, called buoyancy, which acts on the object. The magnitude of the upward force is equal to the volume of the fluid that was displaced by the object. Archimedes' principle plays an important role when designing ships because if the volumes are not properly calculated, the ship will sink!

We also see the displacement of fluids when we jump into a pool or put ice in any liquid. By knowing the volume of the fluid that was displaced, we can actually figure out the volume of the initial object.



### Investigate further!

- What happens if we added ice into the cola before filling the plastic cup?
- Can you make up any other 'tricks' that use displacement?