Open and Closed

Purpose
To observe the effect of air pressure on a liquid’s surface pressure.

Materials
Small plastic soda bottle    Pushpin    Tap water

Procedure
1. Use the pushpin to poke a hole in the side of the bottle near the bottom.
2. Fill the bottle by holding it under a faucet. Then set the bottle on the counter and water will flow out the hole pointing toward the sink.
3. After a few seconds, cover the mouth of the bottle with your palm.

Results
Water streamed out of the hole in the bottle when the bottle’s mouth was open. When you covered the bottle’s mouth with your palm, water continued to come out of the hole for a short time, then stopped.

Why?
Air in Earth’s atmosphere is made up of billions of molecules moving around in every direction and constantly bumping into everything around them. These collisions result in what is known as air pressure. Air pressure is also called barometric pressure or atmospheric pressure.

In the open bottle, air inside and above the bottle is pressing down on the surface of the water in the bottle. Air outside the bottles is also pressing against the water through the hole in the side of the bottle. But the air pressure on the water’s surface, plus the weight of the water itself, creates a pressure greater than the air pressure outside the hole, so water streams out the hole. When the bottle is closed, water continues to stream out of the hole until the combined air pressure and water pressure inside the bottle is less than the air pressure outside. The water pressure decreases as water leaves the bottle, and the air pressure inside the bottle decreases as the air inside the bottle spreads out, thus the water stops pouring out of the hole.