Candle with wet feet

Could you...

Suck up all the water with the vase?

Challenge

- Light the candles.
- Cover the burning candles with the vase.

Explanation of the experiment: Candle with wet feet
Burning candles stand in a bowl of water. A glass vase stands upside down over it. After a while the candle dims and the candle gets wet feet.
Theory: When you light the candle and place the vase over the candle, the flame uses up the oxygen from the vase. At a certain point, the oxygen is almost gone and the flame will go out. Then the water rises. Many explanations claim that the water rises 20% because air consists of approximately 20% oxygen. This 20% will be used to burn the candle. Unfortunately, this is not entirely correct. Carbon dioxide and other substances replace the 'lost' oxygen. The water only starts to rise when the flame starts to go out, the temperature drops. The air in the vase cools down and shrinks. This place is taken by water.

The upside down glass

Could you...

Keep the water upside down?

Challenge

- Fill the glass with water.
- Put the card on top.
- Turn the glass upside down while holding the card.
- Take your fingers off the card.

Explanation of the experiment: Glass upside down
A glass with water with a card on it. You can turn the glass completely upside down and then let go of the card without the water falling out of the glass.
Theory: There is air all around us. You don't notice it much, but air takes up space and also has mass. (Just weigh an empty football and then a football inflated with air). This air presses against everything. Air is on all sides and therefore also presses against all sides. If you hold the glass upside down, the water in the glass presses against the card. You will think that the water pushes the card away and the water will fall down. But nothing could be further from the truth, the air presses against the card from the other side and keeps the water in the glass. The air presses harder against the card than the water does. Air presses against everything with approximately 1 kg/cm2. So you can hold back 1 kg of water per cm2. A glass of water is about 250 ml, which is about 250 grams, so it can be easily held back by the air around it.

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Tornado

Could you…

Get the water from top to bottom?

Who is the quickest?

Explanation of the experiment: Water tornado

Two bottles are screwed together with a hollow connector. One bottle is filled with water and the other is empty. You can place the bottles in such a way that the water remains in the upper bottle.

Theory: You will see that if you ‘simply’ hold the bottle upside down, the water flows downwards in bursts. It seems as if the bottle is sucking in air. The water and the air are trying to hold each other back. You ensure that the water is present in the upper bottle. By spinning the bottle, a vortex is created in the water with a narrow opening to the other bottle. You have probably seen this same vortex, tornado, when draining a full bath of water or in a full sink. The air is sucked from the lower bottle into the tornado and is transported upwards where it fills the space of the draining water. The water flows downwards in a rotating motion via the outside of the opening.

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The Cartesian diver

Could you…

Bring the diver to his treasure?

Explanation of the experiment:
A small glass figure floats in a bottle of water. If you squeeze the bottle hard, the diver sinks to the bottom. If you stop squeezing, the diver rises again and spins around its axis.
Theory: The diver has a small hole at the end of its tail, and is slightly more than half filled with water. The diver floats in the water and therefore has almost the same density as the water. If you squeeze the bottle, the pressure everywhere in the bottle and also in the diver increases. This squeezes the air in the bottle and the diver together, more water fits in the diver and becomes heavier, the diver sinks. If you stop squeezing, the air expands again and water flows out of the tail. The thrust of the water also makes the diver spin!

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Underwater paper

Could you...

Keep the wad of paper dry underwater?

Explanation of the experiment:
Air always wants to rise in water. But the air cannot pass through the glass. The paper remains dry, because no water fits in the glass if there is already air in it.

Fountain

Could you...

Point the water source of the fountain?

And the source of the airbubbles?

Explanation of the experiment:
Two bottles are screwed together with a connecting piece. Two tubes are inserted into the connecting piece. One bottle is three quarters full of water and the other is empty. If you put the bottles down with the water in the upper bottle, the water flows through one of the tubes to the lower bottle. This creates a fountain above the upper tube. You can then turn the bottles over and over again, always with the same fountain.
Theory: If you turn the bottles over, the water flows from the upper bottle to the lower one. The air in the lower bottle flows upwards through the other tube. There are very small holes at the beginning of both tubes. If you turn the bottles over, a small amount of water flows into the tube through which air flows. The air takes this water upwards and sprays out like a fountain!

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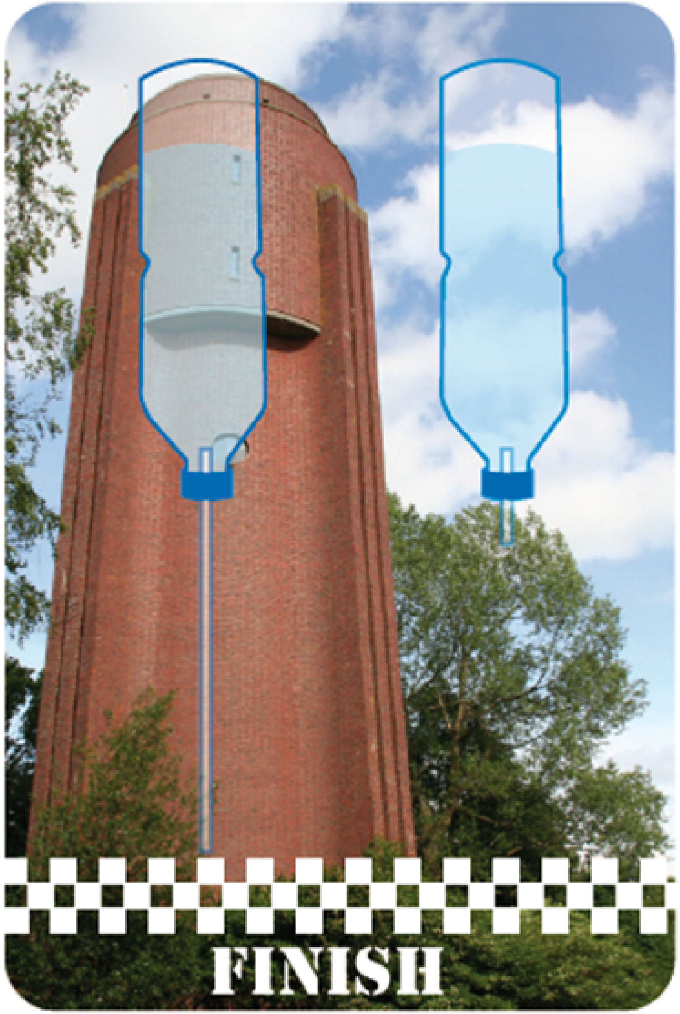
Shortcut or long route

Could you...

Predict which bottle empties the quickest?



Challenge

- Keep both bottles upside down.
- Keep the end of the tubes closed with your finger.
- Fill both bottles with the same amount of water.
- Count down and let the water flow!

Explanation of the experiment: shortcut or long route

Two bottles of water are emptied. One bottle via a short tube, the other bottle via a long tube. The long route is quicker than the shortcut.

Theory: The speed at which the water flows out of the bottle is determined by the water pressure at the outlet and by the resistance in the hose. If this hose is not too thin, the resistance plays a minor role. The water pressure is determined by the height of the water. With the long hose, the height is much larger and the water flows out faster. This is especially visible when the bottle is almost empty.

Sticky coffee

Could you...

Glue the cups together with the use of water?

Challenge

- Wetten the coffee filter.
- Light the candle.
- Place the filter on the cup, and put the other cup upside down on top of it.
- Now carefully try to lift the upper cup.

Explanation of the experiment:
When the cups are placed on top of each other, the air is hot. Due to lack of oxygen, the candle dims and then the air cools down quickly and shrinks. A vacuum is created, causing the cups to stick together. The water ring between the cups maintains the vacuum.

Siphon suction

Could you...

Get the water to flow by itself?

Challenge

- Make sure the filled bottle stands higher than the empty one.
- Put the hose in the higher bottle.
- Suck water from the hose using the syringe.
- Quickly remove the syringe and transfer the end of the hose in the lower bottle.

Explanation of the test:
During the operation of the siphon, the liquid flows out of the bottle without help, as a result of the difference in hydrostatic pressure between the inlet and outlet. The driving force behind the siphon is a pressure difference that is present in the hose. The inlet of the hose is at a higher place than the outlet of the hose, and this difference in height is the driving force of the siphon.

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Prepare for events

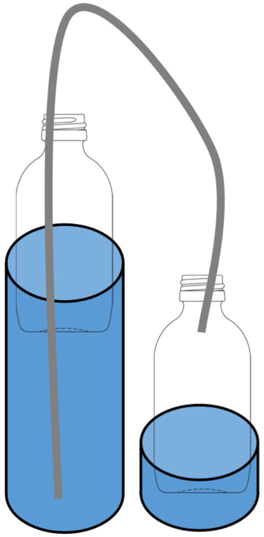
Set up each experiment with an explanation sheet and possibly a cloth. Place banners and/or flags. Have the supervisor wear a lab coat. If it is busy, you can give visitors a sticker card and have them perform a maximum of 4 experiments, for which they will then receive a sticker.

The siphon

Needed: 2 bottles; hose; syringe; height difference

(PVC tubes)

Prepare: fill one of the bottles with water



Upside down glass

Needed: bak met water; 3 bekers; 3 stukjes placemat

Prepare: fill the plastic box with 10cm water; place a towel

Tornado

Needed: 4 PET-bottles with 2 tornado-lids

Prepare: fill 2 of the bottles with water and screw together with the empty ones.

Underwater paper

Needed: large box or cup; small cup fitting in the large one; paper

Prepare: will the large box/cup with water.

Cartesian diver

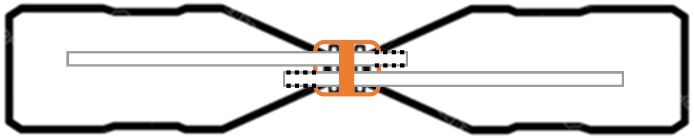
Needed: the bottle with the glass-diver and the treasure, already filled.

Note: don’t shake the bottle. When the diver drowns, take him out and shake some water out of its body till it floats again.

Fountain

Needed: 2 PET-bottles with fountain-lid and 2 tubes

Prepare: check it the tubes are placed in the right position. Fill one of the bottles for 3/4th and screw together.



Shortcut or long route

Needed: box, 2 measuring cups, 2 open bottles, lids with short and long tubes.

Prepare: fill the box with water and screw the lids on the bottles

Candle with wet feet

Needed: glass dish; vase; bundle with 3 candles; matches

Prepare: pour 1,5 cm water in the dish

Sticky coffee

Needed: 2 cups, candle, matches, pre-cut coffee filters

Prepare: wet a set of filters