10 Simple, Engaging Demos to Hook Your Students

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1. What Was That?

--Materials needed: 35 mm film canister (Fuji works best)
Water
2 alka-seltzer tablets

Pour about one-quarter inch of tap water in the film canister. Without students noticing, drop in an alka-seltzer tablet and the snap the lid on tight. Place the canister, lid-side down, on a flat surface, away from students. Within 5-10 seconds, the canister will "pop" and fly to the ceiling. Ask students what happened.

After some discussion, ask students what will happen if you place a lot of water in the canister. Now try it. The canister gives a very feeble pop and flies up only a foot or so.

Relevant science discussions: chemical reactions
Generation of CO2
Pressure
Compressibility

2. Rising Candle

-- Materials needed: 1-L Erlenmeyer flask
Plate or flat bottomed bowl
Cork
Tea candle
Water
Matches

Tell students you're going to cause the candle to rise up in the flask. Pour water to a level of about one-half inch in the bottom of the bowl. Place the unlit candle on top of the cork in the center of the water. Light the candle and carefully lower the mouth of the flask over the candle and cork until it rests on the bottom of the bowl. As the flame dies out, the water will begin to rise in the flask causing the candle and cork to float about one-third of the way up the flask.

Relevant science discussions: combustion
Composition of air
Vacuum
Atmospheric pressure
Barometer

3. Burning Steel

Materials needed: Very fine steel wool
Fresh 9-v battery
Noncombustible surface

Begin by asking students whether or not they think steel will burn. Most will say no. Show them the steel wool, explaining that this is steel, composed of 98% iron and 2% carbon. Take a small piece and feather it by pulling it apart. Place the steel wool on a noncombustible surface (an aluminum pie plate works well.) Touch the 2 terminals, at the same time, onto any part of the feathered steel wool. The steel wool will begin to have streaks glowing and spreading all over it. In a minute or two, the burning stops. (Variation: First place the unburned steel wool in a sandwich baggie and determine and record the combined mass of the steel wool and baggie, then remove and burn the steel wool. After the burn, place the residual steel wool back in the baggie and determine the mass. Students will be surprised to see the mass has increased.

Relevant science discussions: oxidation
Combustion
Sufficient oxygen
Conservation of mass

4. How Do I Get the Eggs in the Bottle?

Materials needed: 1 large hard-boiled egg
1 empty Starbuck's frapucinno bottle (or 1-L flask)
Tissue paper
Matches

Have a student peel the hard-boiled egg, trying to keep the egg as smooth as possible. Place the egg on the mouth of the bottle to show it will not fit into the bottle. Ask for thoughts on how to get the egg into the bottle. Have a student get ready to place the egg (pointy side down) on the mouth of the bottle. Light a piece of tissue and shove it into the bottle. Have the student place the egg on the bottle and watch it get "sucked" into the bottle without breaking.

Relevant science discussions: combustion
Composition of air
Atmospheric pressure
Vacuum

5. I Don't Feel So Good

Materials needed: 1000 mL beaker
Universal indicator
White vinegar
Milk of magnesia
Water
Stirring rod

Place 5 mL Universal indicator into a clean beaker. Fill half way with tap water. The red Universal indicator will turn green as the tap water is added. Explain that this represents a pH of between 6 – 7, as when our stomach is at rest. Now imagine eating a greasy pepperoni / sausage pizza (and add 50mL white vinegar). The solution turns red. Pretend you don't feel well and go to the medicine cabinet to get an antacid. You find milk of magnesia and take the prescribed dose (add 50mL). Stir the solution which becomes a serene teal to green color. Now you feel better and decide to eat some Ben & Jerry's ice cream. Pour another 50 mL of white vinegar and stir. You'll get some icky waves of orange, yellow, red – but soon the serene teal / green color returns. The milk of magnesia is still working.

Relevant science discussions: buffering capacity
Acid / base neutralization
pH
pH indicators
acids
bases

6. Fun With Dry Ice

Materials needed: Dry ice (2 – 3 pounds)
Water
Laser point
Bucket
Beaker or bowl
Soap detergent
Strip of cloth six inches longer than diameter of bucket

(CAUTION: Always handle dry ice with gloves.) Using a hammer, break a sizeable chunk of dry ice from the block. Place it in a beaker with warm water. The gurgling and cloudy plume is a crowd pleaser. Use a laser pointer to show the Tyndall effect. Point out that the vapor spills over the sides of the beaker and falls to the table and floor rather than straight up as steam. Since dry ice is solid carbon dioxide, and carbon dioxide is heavier than air, it falls to the floor. Take a small chunk of dry ice and place it on a table surface. When you pick it up, note there is not a wet spot on the table. Dry ice sublimes going from solid to gaseous phase. If the small chunk has an irregular surface, it will "chatter" on the table as the evaporation occurs.

Lastly, place a sizeable piece of dry ice in a bucket. Add water to cover the dry ice; the warmer the water the better. Once the vapor is billowing to the top, take a thin piece of cloth (cut from an old t-shirt works best) and dip it in a 50:50 solution of dish detergent and water. Carefully, and slowly begin to push the cloth over the edge of the bucket and continue across in one complete motion. With a little practice, you should be able to create one enormous bubble over the bucket. This will slowly fill with carbon dioxide until it finally pops and sends a large blast of carbon dioxide to the floor. After doing it several times, some of the soap detergent gets into the water solution and suddenly you have many mini- and midsize bubbles being produced. This can be fun too, but make sure you're near a sink because it just keeps going.

Relevant science discussions: sublimation
Tyndall effect
Composition of dry ice
Density of carbon dioxide

7. Floating / Sinking Candles

Materials needed: 2 identical votive candles (2 – 3 inches tall)
2 600 mL beakers
Water
Alcohol

Fill one beaker two-thirds with tap water; the other beaker, two-thirds with alcohol. Do this in advance so students think both are filled with water. Ask students if candles float. Most will say yes. Have a student verify that the candles are identical. Place the first candle in the beaker with water. It will float. Place the second candle in the alcohol. It will sink to the bottom. Take out both candles and switch. The one still floats – the other sinks. Have students discuss what they think is happening.

Relevant science discussions: density
Scientific method

8. Burning Money

Materials needed:
- US currency (any denomination)
- 2 600 mL beakers
- Ethyl or isopropol alcohol
- Water
- Matches
- Tongs

In advance, fill a 600 mL beaker with 250 mL tap water. Add 250 mL alcohol and stir. Explain to students that teachers are paid so well they have money to burn. Take out a paper money bill (the larger the denomination the better) and place it in the alcohol / water solution. After 5 seconds, pull the bill out with tongs and light it on fire with a match or candle. (It is a better visual if the room is darkened.) The bill will catch fire and then suddenly go out. (CAUTION: Do not drip the water/alcohol mix on the table. Any drops or streams of solution are also combustible.) Fill the second beaker with water to place the bill in, just in case you get nervous.

Relevant science discussions:
- polarity
- Solubility
- Flammability

9. BOO!!

Materials needed:
- white poster board
- Phenolphthalein solution
- Paint brush or q-tip
- Spray bottle with dilute solution of water and ammonia

In advance of class time, "paint" a word with the phenolphthalein solution on the poster board. (BOO!, I Love Chem, etc.) The phenolphthalein will dry clear. Place the poster board in a prominent spot – on the front board is good. Ask a student to volunteer to put on goggles and spray the poster board. The word will instantly appear in beautiful magenta. As the paper dries, the word disappears.

Relevant science discussions:
- pH indicators
- Ammonia
- Bases

10. Defying Gravity

Materials needed : 2 mason jars with lids and screw tops
Mesh screen
2 playing cards
2 16 ounce cups

Show the students the mason jars and explain how they are (were) used in canning homegrown fruits and vegetables. Remove the inner lid from one of the jars and replace the screw top. Fill the jar with water to within about two inches from the top. Take a regular playing card, hold it tightly over the opening of the jar. Invert the jar, and remove your hand from the card. The water stays in the jar, and the card stays in place. Ask a volunteer to try it. Meanwhile, you grab another jar, which just happens to be fitted with a piece of screen mesh (just like used on screen doors and windows) which has been cut to fit the mouth of the jar and is held in place by the screw top. Do your best to conceal this from your volunteer and the rest of the class. Both of you add about the same amount of water. Both put the cards in place. You both remove your hand from the card. Everything is fine. Then you pull the card from your jar – and miraculously the water stays inside. You ask your volunteer to do the same and "splash" out comes the water. You finally show the class the mesh inside, but does that really explain why it didn't come out?

Relevant science discussions: atmospheric pressure
Vacuum
Cohesion of water

For questions or further information, contact Mr. Fuhrman at
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