

Science Wizardry



The purpose of this Try-It is to help girls appreciate the wonders of chemistry and physics.

Complete four activities.

1. Make a simple pH indicator out of safe, readily available materials. A simple indicator that can be used to test for acids and bases can be made from red cabbage. Boil some chopped red cabbage in a steel pan until it is tender. The cabbage will look a little bluish, and the water will be a blue-red. Strain the water into a glass jar and label the jar "INDICATOR." (The cabbage can be eaten.)

You may use the indicator test on a wide variety of things, including ammonia, vinegar, mashed bananas, Clorox, milk, baking soda, detergent, lemon juice, apple juice, sour pickle juice, cola drinks, and egg whites. Place a drop of the substance to be tested on a paper towel or blotter paper. Add a drop of the indicator solution. The indicator should turn blue with a base and red with an acid.

2. Play a trick with the red cabbage indicator. Pour some cabbage water into a clear glass. Add a little white vinegar, just until the liquid turns a bright red color. (The indicator proves that the vinegar is an acid.)

In a second glass, mix one or two teaspoons of baking soda in water until it dissolves and the liquid is clear. (To make the trick more mysterious, this solution can be prepared ahead of time and will look like ordinary water. See if the girls can figure out how the trick was done.)

Pour the baking soda water into the red liquid in the first glass. The water will foam and turn very dark blue. (The foam is carbon dioxide released when the acid (vinegar) and the base (baking soda) mix.) The liquid is now basic, and the indicator is blue.

3. Another acid-base trick to enjoy:

Prepare an indicator from turmeric, which is a spice used to flavor curry and to give mustard its deep yellow color. Mix one teaspoon of turmeric in one-fourth cup of rubbing (isopropyl) alcohol. Let the solution set until the alcohol is a bright yellow color. Label the jar "POISON: TURMERIC INDICATOR."

Mix one or two teaspoons of baking soda in water in a clear glass. Gently pour a little of the turmeric indicator down the side of the glass. Since the baking soda is a base, the indicator will turn a bright red color. The alcohol solution will float on top of the water, so the red line will form right where the two solutions meet. (If you add a little vinegar, the solution will foam and turn pale yellow to indicate acid.)

4. Produce some carbon dioxide and demonstrate how a fire extinguisher works. Sprinkle two to four tablespoons of baking soda into a mixing bowl. Place a short, fat candle in the middle of the bowl and light it. Carefully pour vinegar into the bowl without touching or splashing the candle. See how long it takes for the candle to go out.

ALSO

Place the candle on a flat surface and light it. Put two tablespoons of baking soda in a clean glass. Add vinegar to the glass and quickly "pour" the invisible gas onto the candle. (Tip the glass above the candle, making sure that none of the vinegar-baking soda mix spills out.) The carbon dioxide is heavier than the air and will spill out of the glass and smother the flame.

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5. Show how an ice skater actually skates on water.

Suspend a heavy ruler or yardstick between two piles of books or between two chairs. Place an ice cube (about one and a half inches square) on the ruler. Lay a piece of strong, narrow wire across the ice and tie a heavy object on the wire so that the weight is suspended below the ruler.

The wire will slowly cut its way through the ice cube. However, the ice will not be cut in two; it refreezes after the wire passes. An ice skate works the same way in that the metal melts the ice and glides on the water. After the skate moves on, the ice refreezes.

6. Show that sometimes water has to warm up in order to freeze.

This experiment demonstrates supercooled water, which can be very dangerous for airplanes, as ice can rapidly form on the wings in flight.

Place distilled water in a small container such as a test tube. Place a thermometer in the test tube. Place the test tube with the thermometer in a larger container filled with ice with salt added to it. (The ice-salt bath can be kept in the freezer until you are ready for the demonstration so that it is kept as cold as possible).

Observe the temperature of the water in the test tube. It is important that the test tube not be moved or vibrated, as the water will freeze too soon. If the test tube and thermometer are left totally still, the temperature will be seen to drop as low as 9 °F and still be a liquid.

Tap the test tube or lift it while observing the thermometer. The liquid will freeze instantly while the temperature rises to 32 °F! If you don't believe it the first time, the water in the test tube can be thawed and the experiment can be repeated as long as the ice-salt bath is very cold.



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