

In this activity, we separate two different colors of ink. This is an example of column chromatography, which uses different chemical characteristics — pH, salinity, size, or in this case, electrical charge (polarity) — to separate the items.

DIY Column Chromatography



Materials:

- 1 10ml oral dosing syringe (*available online or at a local pharmacy*)
- 1 tsp each: red & blue food coloring
- 12 oz 70% isopropyl (*rubbing*) alcohol
- 1 cotton ball
- 4 ounces tap water
- 3 plastic 8-ounce cups
- 3 eyedroppers
- 1 teaspoon
- 2 popsicle sticks or 2 pencils
- Extra pencil with eraser on end
- Masking tape
- Tall glass
- Ultra-fine, **dry**, natural sandbox sand (*e.g. My Little Sandbox Refill package*)
- Small funnel to fit syringe opening
- Cookie sheet or tray to work on
- 2 white plastic ice cube trays that each hold 16 cubes, OR about thirty 3-ounce white paper cups (*bathroom size*)

Instructions:

Work on cookie sheet or tray.

1. Make dye mixture: 1 teaspoon each of red and blue food coloring in plastic cup + a bit less than 8 ounces 70% isopropyl alcohol. Mix/set aside.
2. Prepare the cups:
 - a. Fill second plastic cup halfway with water and label it.
 - b. Fill third cup halfway with isopropyl alcohol and label it.
 - c. Add eyedropper to each cup.
3. Prepare the syringe:
 - a. Discard plunger from oral dosing syringe.
 - b. Tear off a pinkie-sized piece of cotton ball; stuff into syringe bottom.
4. Set up the chromatograph:
 - a. Put 2 popsicle sticks or pencils across the mouth of a tall glass, just far enough apart to hold syringe.
 - b. Tape sticks in place with masking tape.
 - c. Hang syringe between sticks and with an eyedropper, add enough water to wet cotton.
 - d. Tamp cotton down with eraser end of pencil. The cotton should not be above 1ml mark.
 - e. Using funnel & teaspoon, add dry sand to syringe to between the 8- & 10-ml mark, with no air pockets.
 - f. Add enough water to syringe to soak sand; let it all drip into cup.
 - g. Use eraser end of pencil to tamp sand down so there are no air pockets.
 - h. Add alcohol & let it all drip out.

Set ice cube trays (*or about 30 small white paper cups*) in front of you.

5. Run the experiment!
 - a. Add 1ml (1/4 teaspoon) of dye mixture to top of syringe.
 - b. Move syringe to hold over the leftmost & backmost ice cube slot/cup & count 20 drops.
 - c. Then move syringe right & collect a new specimen
 - d. Keep adding alcohol to syringe so it doesn't go dry
 - e. Every 20 drops move to next slot
6. Make observations:
 - a. Observe color changes in sand.
 - b. Observe color changes of drops: colorless, pink, dark purple, light blue, colorless.

What we've learned

Before scientists can test a chemical to learn more about it, they often have to separate it, just as we did with the dyes, because it is in a mixture. By running the mixture as a solution through a column filled with special beads, they can do the same thing. The column beads use those same characteristics — pH, salinity, size or electrical charge — to make the chemicals move through the column at different speeds. That way each chemical leaves the column at a different time and can be collected into individual samples or “fractions” for testing.

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