

Food Color Chromatography Lab

AP Chemistry · Student Procedure

Purpose

You will use paper chromatography to find out which FD&C dyes are hidden in three food colors. You will run the three food colors and a mystery sample side by side in 2% NaCl, plus the red food color in 2% isopropyl alcohol to compare solvents. Your teacher made the mystery sample by mixing two or more of the food colors. Your goal is to identify every dye in it and figure out which food colors were mixed.

Materials (per group)

- Red, blue, and yellow Crayola food colors (a few drops each in a spot plate)
- Mystery sample from your teacher
- Chromatography paper strips, 5
- Toothpicks, 5
- Erlenmeyer flasks, 250-mL, 3, with watch glasses
- Beakers, 100-mL, 2 (one for NaCl, one for alcohol)
- 2% NaCl solution, about 40 mL
- 2% isopropyl alcohol solution, about 20 mL
- Graduated cylinder, 25-mL
- Pencil, metric ruler, paper towels
- Student worksheet with the Reference Table and data tables

Safety

- Wear goggles, gloves, and an apron.
- Isopropyl alcohol is flammable and slightly toxic. Keep it away from flames and keep flasks covered.
- Food dyes stain skin and clothing.
- Do not eat or drink in the lab, even though the food colors are edible.
- Wash your hands with soap and water before leaving the lab.

Day 1: Run the Chromatograms

1. Obtain 5 chromatography strips. Handle them only by the top edge, since oil from your skin interferes with capillary action.
2. Draw a light pencil baseline 2.0 cm from the bottom of each strip. Label the tops in pencil with your group name and: **R** (red), **B** (blue), **Y** (yellow), **M** (mystery), and **RA** (red in alcohol).
3. Obtain your mystery sample from your teacher and record its letter in Data Table 3. Based on its color, predict which food colors were mixed and record your prediction.
4. At the supply station, pour about 40 mL of 2% NaCl into one 100-mL beaker and about 20 mL of 2% isopropyl alcohol into the other. Label each beaker. Using the graduated cylinder, measure about 20 mL of NaCl into each of two flasks and about 20 mL of alcohol into the third. Label each flask and cover it with a watch glass. The liquid must stay below the baseline when the strips are hung.
5. Dip a clean toothpick into the red food color and touch it to the center of the baseline on strip R. Let it dry, then touch once more. Keep the spot smaller than 3 mm across. Repeat for strips B, Y, M, and RA (red), using a new toothpick for each.
6. Remove the watch glass from each flask. Lower strips R and B into the first NaCl flask, strips Y and M into the second NaCl flask, and strip RA into the alcohol flask, spot end down. The bottom edge of each strip should touch the solvent, but the spots must stay above the liquid. Fold the top of each strip over the rim, then set the watch glass on top of the flask so it presses the folded ends against the rim.

The watch glass holds the strips in place, keeps them from slipping into the solvent, and slows evaporation. The strips must not touch each other. Do not move the flasks while the strips develop.

7. Let the strips develop until the solvent front is about 1 cm from the top, about 20 to 25 minutes.
8. Lift off the watch glass, remove the strips, and **immediately** mark the solvent front in pencil. Then put a small pencil dot at the center of each band. The solvent and dyes keep moving as the strip dries, so these marks must be made right away.
9. Lay the strips flat on a paper towel in the drying area your teacher shows you. Clean up your station.

Cleanup (Day 1)

1. Pour used NaCl solution down the drain with plenty of water.
2. Pour used isopropyl alcohol solution into the waste container your teacher provides.
3. Throw away used toothpicks. Rinse the flasks, beakers, graduated cylinder, and spot plate and return them to your station.
4. Wipe down your lab bench and wash your hands.

Day 2: Measure and Analyze

10. Collect your dried strips. Lightly outline each band in pencil and note whether it is strong or faint.
11. Measure the distance from the baseline to the solvent front mark and from the baseline to each band's center dot, in mm. Calculate R_f values and record them in the data tables on your worksheet.
12. Line up strip M next to strips R, B, and Y. Identify each band in the mystery sample by matching it to bands on the food color strips and to the Reference Table. Use which bands are strong and which are faint to decide which food colors were mixed.
13. Answer the post-lab questions on your worksheet. Tape your measured strips to your worksheet or turn them in as directed.