

Name: _____
Date: _____ Period: _____

Analysis of Grape Kool-aid by Paper Chromatography

Leading Question: Which food dyes are found in grape kool-aid?

Background :

Chromatography (Chroma=color and graphia=writing) is an ancient method used to separate and identify parts of a mixture. Chromatography is one of the most important analytical techniques used by chemists.

Ink is a mixture of several colors used to produce one. Using chromatography, the colors in ink can be separated. If ink is exposed to certain liquids, called solvents, the colors will dissolve and separate within the liquid. If the solution is then allowed to soak into a piece of chromatography paper, the different colors will create bands on the paper. They will remain in solution. Inks of the same type will always produce the same banding pattern when this technique is used. The resultant paper with bands on it is called a chromatograph.

The technique is based on the fact that paper contains a thin film of water around the cellulose fibers of the paper, called a **stationary phase**. A mixture of the compounds to be separated is placed in a small spot at one end of a strip of paper, and a solvent (**mobile phase**) is passed over the spot and across the paper. Since each compound present has a different size, shape, and distribution of electrical field, each compound will dissolve in the water and organic solvent to a different extent.

The net result is that if two compounds are started at the same place and solvent passed over them, one compound will move along the paper faster than the other. After a period of time, the flow of the mobile phase is stopped. The front of the mobile phase must be marked immediately in order to calculate a value used to identify the substance. The paper is dried and then sprayed sometimes with a reagent that will produce colored spots, if the compounds are not already colored.

Purpose:

1. To practice paper chromatography.
2. To use paper chromatography to find the R_f values for different components in food dyes.

Materials and Equipment needed:

400 mL beaker, distilled water, chromatography paper, stirring rods or pencils, tape, a pencil for marking the paper, aluminum foil or plastic wrap to cover the beaker, pure food dyes, sodium chloride.

Procedure #1 Separation of the pigments in ink

1. Cut the chromatography paper into strips 10 cm x 5 cm. Be careful not to touch the paper, touch it only on the sides.
2. Balance a stirring rod or pencil on top of the beaker. This will hold the chromatography paper in place. Fit the paper in place and trim if necessary so that the paper edge just hangs above the bottom of the beaker.
3. Using a straight-edge, draw a line using a pencil across the bottom of the chromatography paper 2 cm from the bottom.
4. Take each of the food dyes and mark on the pencil line in order Red 3, Red 40, Blue 1, Blue 2 , a sample of grape Kool-aid as a small dot of dye using the capillary tubes. See instructor for complete directions. Allow to dry. You may have to spot again to get enough dye on the line.
5. Tape the chromatography paper to the stirring rod and make sure it fits hanging just above the bottom of the beaker. Remove the stirring rod and paper. Now add the water to each of the beaker filling about 1 cm from the bottom. Sprink a few grains of sodium chloride into the water.
6. Place the chromatography paper into the water making sure it does not rest on the bottom of the beaker. Do not let it touch the sides of the beaker either.
7. Cover the beaker with aluminum wrap and allow sitting undisturbed as the solvent rises on the paper. Each different mobile phase moves at a different rate.
8. When the solvent reaches near the top, remove the paper and mark the leading edge of the solvent with your pencil. **This step is one of the most important steps!** Allow the chromatograph to air dry.
9. Once the chromatograph is dry, you may analyze it.

Chromatography Lab
Lab Sheet

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Analysis of chromatogram.

1. Calculate the Rf for each of the 4 pure dyes.
2. Calculate the Rf for your spots on the grape kool-aid.
Show your work below.

3. Match the Rf values of the grape kool-aid spots to the pure dye samples. Which food dyes are found in Grape Kool-aid?

