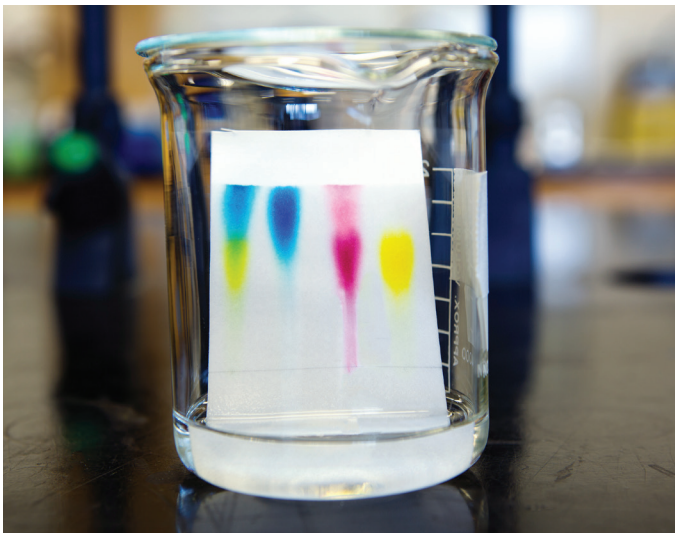
Paper chromatography



Materials

Tip: Send your child on a scavenger hunt for the following items so they can conduct the experiment. See the last page for a list you can hand to them.

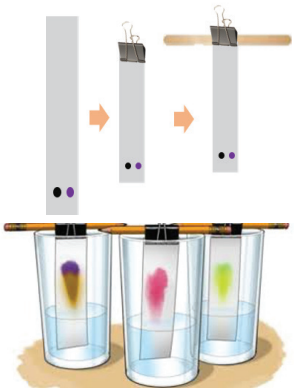
- Coffee filter
- Scissors
- 3–5 different colored water-based markers, food coloring, or candies
- 3–5 tall, clear glasses or plastic cups
- 3–5 pencils, pens, or coffee stirrers (longer than length of cup)
- 3–5 small binding clips, clothespins, or tape
- Ruler (optional)
- ½ cup (~100 mL) of water

Preparation

1. Gather your materials.
2. Cut your coffee filter into 3–5 strips the height of your cup.

Activity instructions

1. Choose 3–5 different colored markers, food coloring, or candies and place a colored dot approximately 2 cm from the bottom of each paper strip (candies may need to be wet prior to pressing onto the paper to allow for color transfer).
2. Loop the opposite side of the paper without the colored dots over the pencil/pen/coffee stirrer and fasten with a binding clip, clothespin, or piece of tape; repeat for each strip of paper.
3. Add 1–2 cm of water to the bottom of your cup(s).
4. Place the paper into the cup so that it is supported by the pencil/pen/coffee stirrer; the paper should touch the water (if it doesn't, add additional water to your cup).
5. Observe as the ink is drawn upward with the water along the paper.



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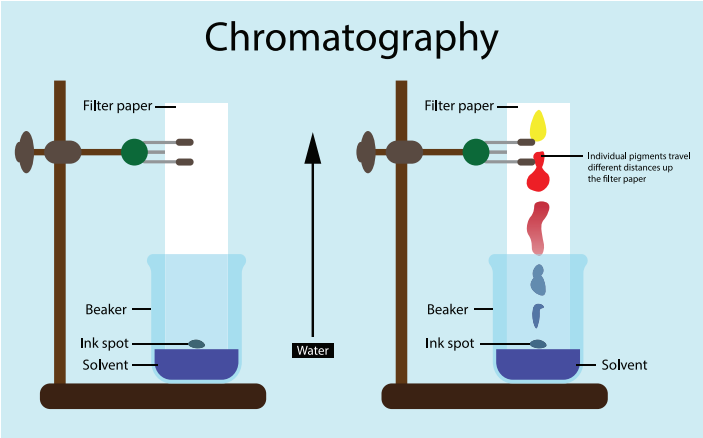
The science behind the activity

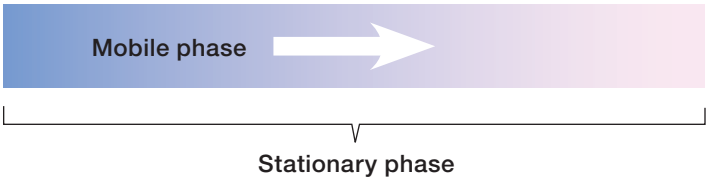
Chemistry is the study of matter, which is defined as anything that has mass and takes up space. There are many different kinds of matter and they can be described using their properties. There are two different kinds of properties: chemical properties and physical properties. Chromatography is a scientific process that separates a mixture into its components. Mixtures can be separated because their components each have unique chemical properties that cause them to behave differently. Chromatography has a number of real-world applications, including pregnancy tests, and blood or urine tests that look for the presence of drugs or infection.



Discussion questions

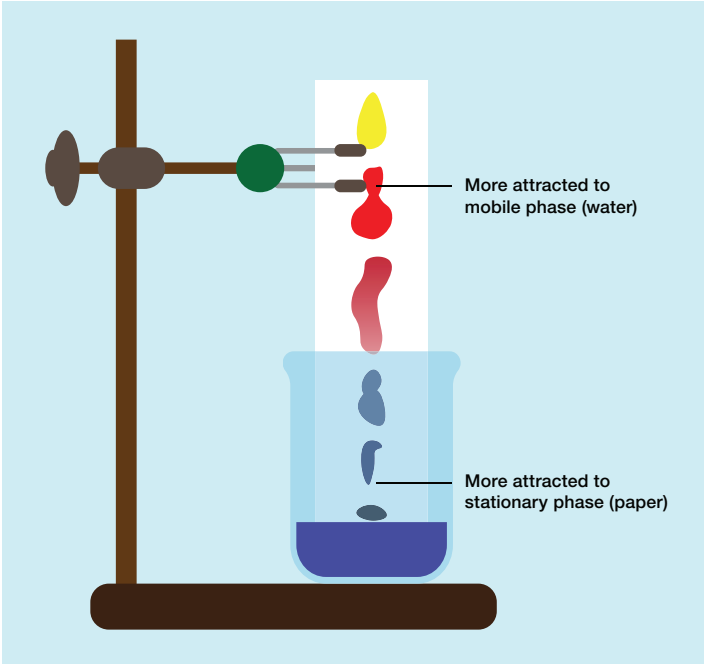
How does chromatography work?

Chromatography utilizes two phases to separate components of a mixture: a stationary phase, which is typically a solid material such as paper, resin, or thick liquid that stays in one place; and a mobile phase, which is typically a liquid or a gas that is able to move along the stationary phase.



Why do some colors travel further up the paper?

When a sample is added to the stationary phase (e.g., coffee filter), each component has a certain amount of attraction to it. Each component also has a certain amount of attraction to the mobile phase (water). Components that are more attracted to the mobile phase will move with it along the stationary phase, and components that have a higher attraction to the stationary phase will stay behind. This means that the colors that travel the furthest up the paper are more attracted to water.



Careers in chemistry

Personality traits that make a good chemist

- Someone who likes learning and using knowledge to solve problems
- Someone who enjoys experimenting with materials
- Someone who enjoys math
- Someone who is curious about how matter works

Careers as a chemist

- **Analytical chemist**—studies matter to determine its structure, composition, and nature, and the way substances interact with each other; some analytical chemists work in food safety, pharmaceuticals, and pollution control
- **Organic chemist**—studies molecules that contain carbon; some organic chemists even make new carbon-containing substances for everyday products, such as medications and plastics
- **Quality control (QC) chemist**—analyzes chemical raw materials and manufactured drugs to ensure that they are pure and safe, and that they work as intended

Careers with an education in chemistry

- **Manufacturing operator**—mixes and tests the final formulation of chemicals before they are sold
- **Sales person**—uses knowledge of chemistry to help customers identify the right products to do their experiments
- **Marketing/product manager**—uses understanding of laboratory chemicals to identify potential customers and help them realize their need for a particular product

Chemistry helps us explain why some of the physical things in our world behave the way they do. It also helps us explain the biological processes—like converting sun or food into energy—that plants and animals use to grow and move. When chemical reactions contribute to pollution or someone gets sick with a disease, chemists can help us come up with environmentally friendly solutions and new medicines.

People who study and work in chemistry are discovering ways to make the world healthier, cleaner and safer for everyone.

Scavenger hunt

Find the following items around your house
so that you can perform this experiment

- [ ] 4 oz (~120 mL) school or wood glue containing PVA
(you can use clear glue or glitter glue)
- [ ] Coffee filter
- [ ] Scissors
- [ ] 3–5 tall, clear glasses or plastic cups
- [ ] 3–5 different colored water-based markers,
food coloring, or candies
- [ ] 3–5 pencils, pens, or coffee stirrers
(longer than length of cup)
- [ ] 3–5 small binding clips, clothespins, or tape
- [ ] Ruler (optional)
- [ ] ½ cup (~100 mL) of water

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