

# RAFT IDEAS

**Topics:** Color, Pigments, Chemistry

## Materials List

- ✓ Paper coffee filter
- ✓ 2-4 water soluble, black marking pens (different brands)
- ✓ Pencil
- ✓ Jewel cases (CD or DVD) w/o insert
- ✓ Watertight container (a 50 CD case lid works well)
- ✓ Water
- ✓ Optional: stopwatch
- ✓ Optional: ruler

This activity can be used to teach:

CO Science Standard 1:  
Physical Science

- Chromatography
- Separating Mixtures
- Properties of Solids and Liquids
- Science process/lab skills

21<sup>st</sup> Century Skills

- Critical Thinking and Reasoning
- Information Literacy

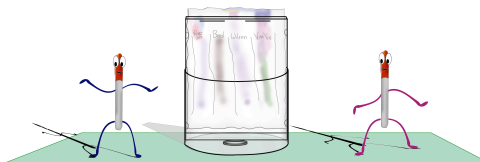
Grades: k, 1, 3, 4, 6, 7, 8, HS



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# Chromatography

Find the hidden rainbows in black marking pens!



Use water to separate the different colors used to create the “black” in black markers.

## To Do and Notice

1. Cut a coffee filter into a rectangle, 12 cm (5”) wide by 17 cm (6.5”) tall.
2. Use each marker to draw a 4 mm (3/8”) diameter dot along the bottom of the piece of coffee filter paper. The dots should be about 2.5 cm (1”) apart, 3 cm (1 1/4”) from the bottom of the coffee filter, and at least 2.5 cm (1”) from the sides. Use a pencil for labeling purposes.
3. Place the filter paper in the jewel case (without insert) with the ink dots near the hinge and close the case. The filter paper should be held in place within the case.
4. Place the closed jewel case with the gap downward into a watertight container.
5. Add a 1 cm (~1/2”) of water to the container. The end of the filter paper must be in the water, but the dots must be above the water.
6. Observe over the next few moments and notice the colors that separate from the black dots! Which colors travel the farthest? After several minutes remove CD case from the water and continue to observe the separated inks. Record results. Optional: time and/or measure results.

## The Science Behind the Activity

The color “black”, as a single color, does not actually exist; but pen manufacturers can create black using mixtures of colors. Each pen manufacturer uses a different combination of color pigments to create their “black”. Chromatography is a process used to separate out the substances contained in a compound, and scientists commonly use a variety chromatography to study and identify substances. The bands of color are formed because different color molecules have different shapes, weights, sizes, and electric charges that can affect their solubility. The color molecules dissolve in water and are moved due to capillary action. A color molecule that has greater solubility will be transported farther than molecules that have less solubility. Each substance (e.g.- ink from a certain marker) will have its’ own unique print.

## Taking it Further

- Try doing chromatography with plant pigments (leaves), or even with candy.
- Use permanent markers and rubbing alcohol in place of water.
- With young children, use uncut coffee filters, a variety of colors, and spray bottles to make beautiful, and surprisingly colorful, creations.
- Make this into a great “Solve the Mystery” activity by challenging students to figure out which pen was involved in a crime.

**Web Resources** (Visit [www.raft.net/more](http://www.raft.net/more) for how-to videos and more ideas!)

- Chromatography with plant pigments and leaves: <http://www.sciencemadesimple.com/leaves.html>
- Biotech applications: <http://www.rpi.edu/dept/chem-eng/Biotech-Environ/CHROMO/chromintro.html>