



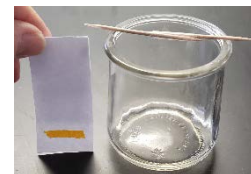
Racing Colors of the Rainbow

The colors of green spring leaves, flower petals and fruit come from particular chemical molecules called pigments. Pigments can be extracted by chopping up and soaking leaves, orange peels or flowers in solvents like rubbing alcohol or alcohol based mouthwash. Magic markers and paints use pigments. They are mixed together to produce many colors. Red, blue and yellow are called primary colors, secondary colors are created by mixing primary colors together for colors like green, orange and purple. One phenomenon used to separate chemical compounds is liquid chromatography. You can experiment with this at home. Depending on the markers you have handy you will be able to see a variety of different colors of the rainbow separate as they race vertically up a paper wick in a layer of liquid. Markers are used to draw on paper and allowed to dry. The paper is hung into shallow liquid which moves up the paper passing by the dry pigment(s) which may or may not be carried along by the liquid moving up the solid layer of paper. What colors do you think are in the ink of your marker? Which separate the most and are the fastest moving?

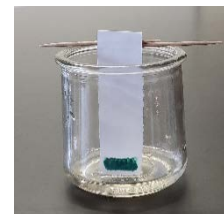
You will need:

- White Paper (coffee filters work)
- Scissors
- Short and narrow glass jar(s) or glasses
- Tooth picks or pencils
- Permanent or water based Markers (orange & green are nice)
- Alcohol based mouth wash, rubbing alcohol, cologne or perfume

Cut the paper or coffee filter into rectangular strips taller and more narrow than the glass jar(s) you have. Draw a horizontal line about 1/16 of an inch above the bottom of a strip of paper. Let it dry. Test how to fold the other end of the paper so to hang and just touch the bottom of the jar. Remove it from the jar so that you can add liquid.



Pour a small amount of alcohol based mouthwash, cologne or rubbing alcohol into the glass so that it just covers the bottom with about 1/16 of an inch of liquid. Place the toothpick or pencil across the top of the jar. Suspend the paper with your ink sample in the middle of the jar so that the bottom of the paper touches the liquid, do not let it fall in or sink! Do not let it touch the edge of jar. It must hang or it will collapse as it gets wet. Depending on the paper and pigments it could take time for the liquid to reach the top of the paper strip, keep checking it. If your ink has multiple compounds with different colors, they will separate as some will quickly dissolve and move, others will take longer, the longer the piece of paper you use the more they can separate.



You can apply liquid chromatography to extracted pigments from orange peels or leaves, chop up and soak in an alcohol based liquid to concentrate. Extract is less concentrated than markers, make a line with drops, dry and repeat a number of times for a dark sample.