

Separating Mixtures Laboratory: Veatta Berry

Teacher's Guide

Goals

- To bring the students to a certain level of knowledge regarding chemistry concepts
- To teach the ways of scientific investigation: asking questions, discovering, and concluding

The Laboratory

In this laboratory, chemical concepts in mixture separation are brought about in an easy activity with water-based chromatography of colorful markers. The students get a chance to experiment and investigate various conditions and trials, and thus they learn the chemistry of markers, an everyday product which they constantly use.

Materials for Each Group

- Vis-a-Vis black marker
- Different markers in different colors and different brands
- Test tubes in well plate or test tube rack
- Chromatography papers
- Pencils and rulers

Lecture Notes

There are many types of chromatography, which are used to separate all kinds of mixtures and solutions.

We are doing paper chromatography. What happens to paper when it touches water? It absorbs it by capillary action.

As the water moves up we hope it will pull some of the colors of the marker with it. Some of your markers are mixtures of colors, and we may be able to see those mixtures of colors.

We need the pencil mark at the bottom so we know where we started. Sometimes the marker will move totally, and you will not know where you started unless you mark it.

If the ink mark is not moving much, the water may not be the best solvent to use.

Discussion Questions

Why don't a couple of the dots move at all? They are formed by permanent markers.

When we look for permanent markers why do we use them? Because they don't come off in rain, and if they get on our clothes, it is very hard to get rid of them.

Did you use the same brand with different colors, or the same color with different brands? What did you see?

What happened when the paper touched the side of the test tube? It gave a swirly line, because of the water drops.

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Teaching Tips From Ms. Berry

Today we are looking at separating mixtures again, except that this time they are markers, which most of the time students are not aware that they can separate.

We are going to talk about "like-dissolves-like," how polar substances dissolve other substances. We will use this to identify different markers and to show that quantitative data can be obtained from separation, through identifying the different markers.

We will also look at different solvents, so that students will come with their own research questions.

We sometimes start out the investigation more open than that: Here are some markers and water, here is some paper. Put them together and see what happens. That's it.

Or give them some guidelines: You must have ten qualitative observations and ten quantitative observations, so they are willing to try more and more things to get these observations. And from that we have enough different observations and trials to make discussions, and they can make some conclusions regarding they have seen and lead us to the next step in where we are going.

We also grade their lab book, and their observations must be significant. Don't tell me that the test tube is made of glass. That's not an important observation when you do paper chromatography. And it helps them focus on what they are doing, and look for observations that they didn't look for.

We often lead to new research questions.

There are two things that we are trying to teach them. One, is that there are certain concepts in chemistry that they must learn in order to pass the standards of their state test, and those are the things that they are supposed to show that they understand by the end of the course in order to get credit.

We also think that it is important that they learn how to do science. Why is it important to ask questions about the world around you. And that's what the investigation is supposed to teach them. It is a process of thinking, deduction, and we help them through this process, and get them to a point where by the end of the semester they can do their own research project.

I try to find as many possibilities as I can because they feel empowered, and that it's their project, and they feel more involved that way.

References: Links

<http://chemscape.santafe.cc.fl.us/chemscape/catofp/chromato/paper/paper.htm#description>
Paper chromatography explained, with illustrations and video.

http://www.yesmag.bc.ca/projects/paper_chroma.html
Directions for using paper chromatography in the classroom.

References: Readings

JCE Editorial Staff (2000) "The Write Stuff: Using Paper Chromatography To Separate an Ink Mixture," *Journal of Chemical Education*, Vol. 77, No. 2, pp: 176A-176B.