



Classroom Teacher Preparation

Chemistry 8: Design a Chromatography Experiment

Please use the following to prepare for the next SfS lesson.

Description:

Students are introduced to the technique of chromatography as a way to separate compounds. In the activity, students will consider what type of questions this technique can be used to answer, and design and carry out at least one chromatography experiment. While the experiment is running, the students will participate in a discussion of chromatography and interpreting chromatograms. After the chromatograms have developed, students will draw conclusions about the pigments making up each marker ink, and, time permitting, design and execute a follow-up experiment.

Lesson Objectives – SWBAT (“Students Will Be Able To...”):

3rd-8th

- Formulate a question that can be answered by chromatography
- Design and execute an experiment to answer that question

Disciplinary Core Idea (DCI)

PS1 Matter and its Interactions - PS1.A Structure of matter

- (3rd-5th) Because matter exists as particles that are too small to see, matter is always conserved even if it seems to disappear. Measurements of a variety of observable properties can be used to identify particular materials.
- (6th-8th) The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter.

Science & Engineering Practice (SEP)

Asking Questions

- (3rd-5th) Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
- (6th-8th) Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.

Crosscutting Concept (CCC)

Patterns

- (3rd-5th) Patterns can be used as evidence to support an explanation.
- (6th-8th) Macroscopic patterns are related to the nature of microscopic and atomic-level structure.

Preparation:

This is intended as an introductory lesson to paper chromatography and/or practice in experimental design.



Room Set Up for Activities:

Students will work in partners at their desks. Instructors will need an empty table for preparing materials to pass out to students.

Safety:

No special safety precautions are needed.

Related Modules:

This lesson may be taught as part of a sequence or group of related modules on **chemistry techniques for separation of materials**. Modules include the following:

Chemistry 4: Separation of Substances - After an introduction to elements, compounds & mixtures, common methods & reasons for separating mixtures are discussed. Students then design and implement a multi-step purification process, the effectiveness of which is gauged by calculating the recovered fraction of components

Chemistry 9: Electrophoresis – This lesson provides an exploration in electrophoresis using wet and dry activities. The wet activity focuses on running food dyes through agarose gel electrophoresis, while the dry activities are designed to convey the concept that migration of molecules during electrophoresis is size-dependent.

Alternatively, the extended version of this lesson may be part of a series on **Forensics**. Other modules to consider include the following:

Anatomy/Physiology 22: Fingerprinting - Students learn how fingerprints are formed, the forms friction ridges take and the prints they can leave behind, before investigating the various ways of studying fingerprints. Students will experiment with fingerprint dusting, lifting, inking, and will also practice analyzing prints.

This module could also be paired with the following module to teach **Experimental Design**:

Scientific Practices 8: Experimental Design -- Using a ruler drop procedure (testing reaction time) as a starting point, students will develop a testable hypothesis and design an experiment around it.

For other module sequences and groups, look here: www.sciencefromscientists.org/sequences

Standards Covered:

Please click the following link to our website to review the standards covered by this lesson, listed by state: www.sciencefromscientists.org/standards/

Lessons are matched to both national NGSS and local state standards.

After Our Visit:

Extend this lesson with tasty chromatography, examining the food dyes used in candy!

Access this Extension activity by visiting the Classroom Post found on our website at sciencefromscientists.org/cohorts. Use the name of your school/cohort and password to log in.

To help Evaluate, check out our Open Response questions online at sciencefromscientists.org/open-response-questions. They are freely available for all of our lessons for current teachers. Use the password supplied by your instructor to log in.

Additional Resources:

- Leaf chromatography: <http://www.education.com/science-fair/article/find-color-pigments-hidden-green/>
- Video of leaf chromatography: <https://youtu.be/jiPd5CkCkkU>
- Candy chromatography: http://www.education.com/science-fair/article/chemistry_paper-chromatography/

