



## Classroom Teacher Preparation

### Chemistry 9: Electrophoresis

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

#### Description:

This lesson provides an exploration in electrophoresis using wet and dry activities. The wet activity is to run an agarose gel electrophoresis, which is typically done to separate macromolecules (such as DNA) in a laboratory setting. The dry activities are designed to convey the concept that migration of molecules during electrophoresis is size-dependent, and to have students predict the results of their agarose gel electrophoresis. This lesson is geared towards older (8<sup>th</sup> grade) students. It is recommended to conduct this lesson in classes at least 60 minutes long.

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

8<sup>th</sup>

- Use electrophoresis to separate charged molecules
- Predict the relative separation of charged molecules during electrophoresis based on their sizes

#### Disciplinary Core Idea (DCI)

PS1 Matter and its Interactions – PS1.A. Structure and Properties of Matter

- (6<sup>th</sup>-8<sup>th</sup>) 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)

Analyzing and Interpreting Data

- (6<sup>th</sup>-8<sup>th</sup>) Analyze and interpret data to provide evidence for phenomena
- (6<sup>th</sup>-8<sup>th</sup>) Analyze and interpret data to determine similarities and differences in findings

#### Crosscutting Concept (CCC)

Patterns

- (6<sup>th</sup>-8<sup>th</sup>) Macroscopic patterns are related to the nature of microscopic and atomic-level structure

#### Preparation:

This lesson can be used as an introduction to electrophoresis, a laboratory technique used to separate molecules based on size and electrical charge. It does require that students possess a basic understanding that molecules have characteristic physical and chemical properties that can be used to identify them.

#### Room Set Up for Activities:

Students will work in eight small groups during this lesson to prepare samples for the wet electrophoresis.

We will also requires an ELMO projector and two electrical outlets next to a table or desk, in a low-traffic area of the room.



## Safety:

As in every laboratory setting, there is no eating or drinking at any time (including the samples). This lesson uses live conductive current in the gel electrophoresis, so for the safety of all, no fingers or other objects should enter the gel electrophoresis chamber while the gel is running. Additionally, the gel electrophoresis apparatus and the micropipettors are delicate and expensive equipment; proper care and precautions should be taken.

## Related Modules:

This lesson may be taught as part of a sequence or group of related modules on *Chemical Separation*. Modules include:

*Chemistry 4: Separation of Substances* – After an introduction to elements, compounds, and mixtures, common methods and reasons for separating mixtures are discussed. Students then work in groups to design and implement a multi-step process to separate iron, sand, and rice based on their physical properties

*Chemistry 8: Paper Chromatography* – Students will learn about chromatography in general and use paper chromatography to explore the composition of various inks. We begin with a discussion about chromatography and its various forms and explain how this powerful tool can help distinguish between two or more compounds.

For other module sequences and groups, look here: [www.sciencefromscientists.org/sequences](http://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/](http://www.sciencefromscientists.org/standards/)

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

## After Our Visit:

*Extend this lesson by completing a virtual exploration of gel electrophoresis.*

Access this Extension activity by visiting the Classroom Post found on our website at [sciencefromscientists.org/cohorts](http://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](http://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.