



Classroom Teacher Preparation

Chemistry 4: Separation of Substances

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

Description:

Students design and implement a multi-step process to separate three different materials. They then assess the effectiveness of their separation techniques by comparing the recovered vs. initial mass of materials. After discussing their results, students compare their techniques to the methods used for separation at recycling facilities.

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

3rd-8th

- Apply different methods of separation in order to separate a three-material mixture
- Identify sources of error and loss in each separation method used

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)

Planning and Carrying out Investigations

- (3rd-5th) Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
- (6th-8th) Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.

Crosscutting Concept (CCC)

Energy and Matter: Flows, Cycles, and Conservation

- (3rd-5th) Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems
- (6th-8th) Matter is conserved because atoms are conserved in physical and chemical processes.

Preparation:

This module serves as an introduction to the topic.

Room Set Up for Activities:

Students will work in small groups (3-4 students). Tables or a cluster of desks are ideal for this activity.



Safety:

This lesson has no safety concerns.

Related Modules:

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

Chemistry 2: Chemical Identification - Students investigate the physical and chemical properties of six similar-looking, but chemically different, substances, and use these observations to attempt to identify the substances.

Chemistry 3: Polymer Investigation - In groups, students will make cross-linked polymers (slime) and then test them (differs depending on age). Groups will then get to present their findings to the class.

Chemistry 14: Viscosity - Students investigate viscosity by using falling sphere viscometers to examine the speed at which a marble drops through tubes of common household liquids with varying viscosities.

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 by challenging students to create (and separate) their own mixtures of substances similar to those utilized in class.

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:

- How single stream recycling works: <https://www.youtube.com/watch?v=hdGjjKJsgRk>
- SciShow – How recycling works: <https://www.youtube.com/watch?v=b7GMpJx2jDQ>
- How to separate the seemingly inseparable: <https://www.youtube.com/watch?v=q8Ent5CXhfY>