



Classroom Teacher Preparation

Chemistry 2: Chemical Identification

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

Description:

In this lesson, students will perform several experiments to determine the identities of six different household white powders (baking soda, cornstarch, sugar, salt, chalk, and borax) based on their solubility in different solvents and simple chemical reactions with acetic acid and iodine. After the testing, students will learn how to distinguish between physical and chemical properties of substances and how these can be used to identify substances.

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

5th-8th

- Analyze experimental data to determine the identity of an unknown sample
- Distinguish between chemical and physical properties of substances that can be used for their identification

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.

PS1 Matter and its Interactions - PS1.B Chemical reactions

- (3rd-5th) Chemical reactions that occur when substances are mixed can be identified by the emergence of substances with different properties; the total mass remains the same.
- (6th-8th) Reacting substances rearrange to form different molecules, but the number of atoms is conserved. Some reactions release energy and others absorb energy.

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)

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 lesson can be used as an introduction to chemistry concepts for older students, but for younger students it may be beneficial to teach *Chemistry 4: Separation of Substances* before this lesson.

Room Set Up for Activities:

This experiment can be performed at tables or desks. Students will work in groups of 3-4 to examine multiple white powders (8 groups max). Access to water will be important for cleaning up.

Safety:

None of the substances in this lesson are dangerous as we are using them. However, as always, no substances should be ingested. Likewise, iodine isn't dangerous as we are using it, but it can stain clothing and surfaces, so we'll work very carefully with that substance.

Related Modules:

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

Chemistry 4: Separation of Substances – Students work in groups to design and then implement a multi-step separation/purification process to separate iron, sand, and rice based on their physical size and properties.

Chemistry 5: Introduction to Acids & Bases – Using the Arrhenius theory of acids and bases, students will use a universal indicator and pH strips to test the pH of various common household liquids.

Chemistry 6: Acid and Base Titration – Designed for 7th-8th graders, this advanced lesson allows students to perform a simple titration to neutralize a base with an acid using a color indicator to determine the endpoint.

Chemistry 14: Viscosity – Students work in groups to examine the viscosity of five liquids (honey, shampoo, corn syrup, pancake syrup, and olive oil) using falling sphere viscometers.

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: <http://www.sciencefromscientists.org/standards/>

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

After Our Visit:

Extend this lesson by using chemical properties to discern the ingredients of baking powder!

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

- Comparing physical and chemical properties (7:17): <https://www.youtube.com/watch?v=7zyiW-13jzk>
- Demo and explanation of the iodine starch test (1:34): <https://www.youtube.com/watch?v=SgDeHXWm8Hk>

