



#9668

SEPARATING MIXTURES

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Grade Levels: 6-13+

13 minutes

DESCRIPTION

Chemistry experiments demonstrate four distinct ways to separate chemical mixtures: filtration, crystallization, distillation, and sublimation.

ACADEMIC STANDARDS

Subject Area: Science – Physical Sciences

- ★ Standard: Understands the structure and properties of matter
 - Benchmark: Knows that atoms often combine to form a molecule (or crystal), the smallest particle of a substance that retains its properties (See Instructional Goal #1.)
 - Benchmark: Knows methods used to separate mixtures into their component parts (boiling, filtering, chromatography, screening) (See Instructional Goal #1.)

Subject Area: Science – Nature of Science

- ★ Standard: Understands the nature of scientific inquiry
 - Benchmark: Uses appropriate tools and simple equipment (e.g., thermometers, magnifiers, microscopes, calculators, graduated cylinders) to gather scientific data and extend the senses) (See Instructional Goal #2.)
 - Benchmark: Establishes relationships based on evidence and logical argument (e.g., provides causes for effects) (See Instructional Goal #3.)

INSTRUCTIONAL GOALS

1. To demonstrate the processes of filtration, crystallization, distillation, and sublimation.
2. To show lab equipment used to perform experiments in the school chemistry laboratory.
3. To point out methods of scientific inquiry.

VOCABULARY

- | | |
|------------------------|------------------|
| 1. apparatus | 11. distillation |
| 2. aqueous | 12. filtrate |
| 3. calcium carbonate | 13. filtration |
| 4. components | 14. flask |
| 5. concentrated | 15. iodine |
| 6. condenser | 16. naphthalene |
| 7. copper (II) sulfate | 17. particles |
| 8. crystallization | 18. solvent |
| 9. crystals | 19. strainer |
| 10. distillate | 20. sublimation |

BEFORE SHOWING

1. Review the difference between a mixture and a compound.
2. Display beakers containing the following mixtures and discuss how to separate the substances:
 - a. rocks and sand
 - b. iron and sand
 - c. salt and sand
 - d. rocks, iron, salt, sand, and water
3. Put a small amount of white anhydrous copper (II) sulfate into a small beaker of water. Note the appearance of a blue liquid. Discuss possible ways to separate this mixture.

DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause at the section showing the filter paper being folded properly. Why is a small section of the filter paper torn off?
3. Pause at the section showing the murky water being poured into the funnel. Why is a glass rod used in the process?
4. Pause at the scene showing the copper (II) sulfate. Identify the solvent and the solute.
5. Pause at the scene showing water being passed through the condenser. What is the reason for this?
6. Pause at the section showing the iodine and calcium carbonate. What is the purpose of the calcium carbonate?
7. Pause at the scene showing the mixture of the iodine and calcium carbonate being heated. Why is the flame tilted sideways?

AFTER SHOWING

Discussion Items and Questions

1. What lab equipment was used in the filtration demonstration? What might happen if the filter paper pores were larger? What is the liquid that collected in the bottom of the filtration apparatus called?
2. How was the crystallization experiment set up? What does crystallization mean?
3. What color is an aqueous solution of copper (II) sulfate? What happens to the amount of solvent as the heating continues?
4. What equipment was used in the distillation demonstration? What is the liquid that is collected at the end of the condenser called?
5. What lab equipment was used in the sublimation demonstration? What does sublimation mean? Why was water passed through the flask?
6. What color and shape were the pure iodine crystals?

Applications and Activities

1. Prepare herbal or regular tea by boiling loose tea leaves in water. Discuss methods of separating the tea leaves from the water. Investigate how some teapots are equipped to do this.
2. Perform an experiment to show how to separate the parts of a mixture.



- a. Put a mixture of .5 grams of iron filings, 7 grams of rocks, 4 grams of salt, and 15 grams of sand into a beaker of water and stir.
 - b. Devise a method to separate all the substances. (remove rocks with a screen, remove iron with a magnet, separate sand from salt through filtration, remove salt from water by evaporation)
 - c. After each substance is completely dry, weigh them again and compare with the original weights.
 - d. Calculate the percentages of recovery. List possible reasons for not getting 100% recovery.
3. Find a recipe for rock candy and make it in class.
 4. Report on the invention of the Liebig condenser.
 5. Research fractional distillation and its use in the petroleum industry.
 6. Report on the sublimation of snowflakes, dry ice, mercuric oxide, and naphthalene.
 7. Report on chromatography as a means of separating mixtures.

RELATED RESOURCES



- [Chemistry: The Basics #3350](#)
- [What is Chemistry? #3534](#)



World Wide Web

The following Web sites complement the contents of this guide; they were selected by professionals who have experience in teaching deaf and hard of hearing students. Every effort was made to select accurate, educationally relevant, and "kid safe" sites. However, teachers should preview them before use. The U.S. Department of Education, the National Association of the Deaf, and the Captioned Media Program do not endorse the sites and are not responsible for their content.

• LINKS TO CHEMISTRY EXPERIMENTS, DEMONSTRATIONS

http://www.chemistrycoach.com/Links%20to%20chemistry_experiments.htm



Contains links to numerous experiments and demonstrations listed by sites and topics.

- **ROCK CANDY**



CAUTION

When making candy, the syrup gets **very** hot. Kids, don't try this without the help of an adult!

<http://www.exploratorium.edu/cooking/candy/recipe-rockcandy.html>

Contains a recipe for rock candy which is made through evaporation rather than filtration.

- **SEPARATING MATERIAL MIXTURES**



<http://www.schoolscience.co.uk/content/3/chemistry/materials/match3pg1.html>

Focuses on methods to obtain salt from salt water. Includes a diagram of the distillation procedure and vocabulary related to solutions.