	the surface of glass Not only does acid rain harm buildings, it damages trees and kills aquatic life and other organisms. To fight these effects, people around the world are applying a great deal of ingenuity to solve the problem of acid rain. In many countries, fossil-fuel-burning power plants and other industrial plants now remove some acidic gases from the waste products that would otherwise be dispersed through smokestacks. Also, special devices are being fitted to car tailpipes to remove some of these gases from exhaust fumes. Until the source of the pollution is completely removed, any efforts to restore ancient buildings will be only stopgap measures. The team of workers on the Acropolis in Athens, in other words, is dealing with the symptoms, but not the cure. STUDENTS ANSWER THE FOLLOWING QUESTIONS- 1. How is acid rain formed? Write a short paragraph describing this process. 2. Do an Internet search to find additional information on acid rain and its effects. What Can You Do About Acid Rain? Use the car less. Carpool, use public transportation, ride a bike, or walk.				

	Conserve electricity. Most electricity is produced by coal-burning power plants, and coal emits a high amount of sulfur when it burns. Study historical sites, buildings, or cemetery headstones in your area. Try to find out how they have been affected by acid rain. Contact a local environmental group to see whether it has taken action about acid rain.				
How Much Solute Dissolves In a Solvent?/13					
Lesson Title/Number: How Much Solute Dissolves In a Solvent?/13		**Learning Objective(s):** 1) Make solutions using different amounts of solute. 2) Discover what is meant by the term “saturated solution.” 3) With your class, design and conduct an experiment to determine the solubility of two different substances. 4) Discuss the design of your inquiry. 5) Discuss solubility as a characteristic property of matter.			**Lesson Duration:** 3 Periods

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	KWL-Ask students what do they know or want to know about what happens to substances when they are mixed.	Students will utilize a KWL Chart to record their initial knowledge. Students will also be directed to sheets of poster paper on which to write basic mixture-related words. Lesson 13.	Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations	Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.	Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Teacher states- Solid soluble salt and water are seen next to each other in this lake in Namibia, Africa. How can solid soluble salt and water exist in the same place? INTRODUCTION As you know from Lesson 12, solutions are made from solvents and solutes. When you add a spoonful of common salt (sodium chloride) to a pan of water, it dissolves. Salt is soluble in water. Add a second spoonful, and that also dis- solves. But what would happen if you kept adding salt? Would it continue to dissolve? Could you add more salt than there was water, or would the salt eventually stop dissolving? What would happen if you used a soluble sub- stance other than salt? Would the same amount of that substance dissolve? These are some of the questions you will try to answer in this les- son. You will start by	Properties of Matter Module-Lesson 13	Develop and/or use a model to predict and/or describe phenomena	Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.	Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes

	examining a blue liquid and explaining your observations of the liquid on the basis of what you already know. You will then investigate two white crystalline sub- stances. One is sodium chloride, and the other is sodium nitrate. They look almost the same, but as you will discover, they have different characteristics when they are added to water. Could these different characteristics be used to help identify these two substances?				
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Getting Started 1. One student from each group should collect the plastic box containing the materials. 2. Students-Take out the test tube rack and the test tube containing the blue liquid. Pass the test tube around each group so that each member of each group can examine it closely. Discuss with other members of each group precisely what is observed in the tube. Write your observations in your science notebook. What can you conclude from your observations? 3. Participate in a class discussion of your observations. 4. Before proceeding with Inquiry 13.1, hand in the test tube containing the blue liquid. Clean the remaining test tube. Return the test tube rack to the plastic box. MATERIALS FOR LESSON 13 For you 1 copy of Student Sheet 13.1: Saturating a Solution				

	1 copy of Student Sheet 13.2: Determining Solubility 1 pair of safety goggles For you and your lab partner 1 100-mL graduated cylinder 2 test tubes 1 test tube rack 2 rubber stoppers 1 lab scoop 1 jar containing sodium chloride 1 jar containing sodium nitrate Access to an electronic balance For your group 1 test tube containing a blue liquid PROCEDURE 1. Check the materials in your plastic box against the materials list, and divide them equally between the two pairs in your group. 2. How much salt (sodium chloride) can you get to dissolve in a test tube filled halfway with water? Fill one test tube halfway with water. Add one level lab scoop of salt to the test tube. Shake the mixture to help the salt dissolve faster. If it completely dissolves, add more salt. Keep adding salt until no more dissolves. 3. Answer the following questions on Student Sheet 13.1: How many scoops of sodium chloride dissolved in the water? How did you know that no more would dissolve? 4. After a short class discussion, write your definition of a saturated solution on the student sheet. 5. Think about how you could adapt the technique you used in Step 2 to find out how many				

	grams of sodium chloride dis-solved in water. 6. Rinse the test tube with water. Put the test tube in the test tube rack. Inquiry 13.2 Determining Solubility PROCEDURE 1. Using the apparatus you have been given, how could you compare how much of each of the two substances (sodium nitrate and sodium chloride) will dissolve in water? Here are some questions you need to discuss with your partner: A. What will you need to measure? B. How will you know when you have a saturated solution? C. How will you calculate the amount dissolved? 2. Your teacher will conduct a short brain- storming session. Be prepared to con- tribute to the discussion. By the end of the brainstorming session, the class will have agreed on a procedure for determining solubility. 3. Answer the following questions on Student Sheet 13.2: What are you trying to find out? What materials will you use? What is your procedure? 4. Under Step 4 of Student Sheet 13.2, design a data table to record your results and calculations. 5. Follow the class procedure for determining solubility, and record your results in the data table. When you have finished, pour the solutions down the drain with lots of water. Clean the test				

	tubes and return the materials to the plastic box.				
Explain: How will you help students connect their exploration to the concept/topic under investigation?	SOLUBILITY AND SATURATED SOLUTIONS At room temperature, a solvent (such as water) can dissolve only a certain amount of solute. For example, in Inquiry 13.1, after adding a few lab scoops of sodium chloride to the water, you could see a white solid (undissolved sodium chloride) at the bottom of the tube. The white solid indicated that the water could not dis- solve any more sodium chloride. When this hap- pens, the solution is called saturated. The mass of solute dissolved in a given volume or mass of a solvent is its solubility. Solubility is usually measured in grams of solute per unit volume of solvent (for example, grams per liter) or in grams per 100 g of solvent.		.		
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	REFLECTING ON WHAT YOU'VE DONE 1. Students will have an opportunity to look at the results of other pairs. Be prepared to discuss how these results could give a more accurate measure of the solubility of these two substances. 2. Answer the following question on Student Sheet 13.2: How could you use the property of				

	solubility to help you identify a type of matter? 3. Read “Solubility and Saturated Solutions.” The solubility of a solute changes with changing temperature. For example, sodium nitrate becomes more soluble as the temperature rises. It is about twice as soluble at 80 °C as it is at 1 °C. There are some substances that become less soluble as the temperature rises. When you heated water in Lesson 7, you may have noticed that bubbles appeared, even though the water was well below the boiling point. These were bubbles of gases, such as oxygen and nitrogen, that were dissolved in the water. The gases became less soluble as the water was heated, and they were released from solution. OBJ OBJ				
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	INQUIRY 13.1 1. Answer the following questions on Student Sheet 13.1: 1.How many scoops of sodium chloride dissolved in the water? 2. How did you know that no more would dissolve? 3. After a short class discussion, write your definition of a saturated solution on the student sheet. 4. Think about how you could adapt the technique you used in Step 2 to find out how many grams of sodium chloride dis-solved in water. I NQUIRY 13.2 1. Answer the following questions on Student Sheet 13.2: What are you trying to find				

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Extend: How will students deepen their conceptual understanding through use in new context?	Students read this article- SOLUBILITY AND SATURATED SOLUTIONS At room temperature, a solvent (such as water) can dissolve only a certain amount of solute. For example, in Inquiry 13.1, after adding a few lab scoops of sodium chloride to the water, you could see a white solid (undissolved sodium chloride) at the bottom of the tube. The white solid indicated that the water could not dis- solve any more sodium chloride. When this happens, the solution is called saturated. The mass of solute dissolved in a given volume or mass of a solvent is its solubility. Solubility is usually measured in grams of solute per unit volume of solvent (for example, grams per liter) or in grams per 100 g of solvent. The solubility of a solute changes with changing temperature. For example, sodium nitrate becomes more soluble as the temperature rises.				

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