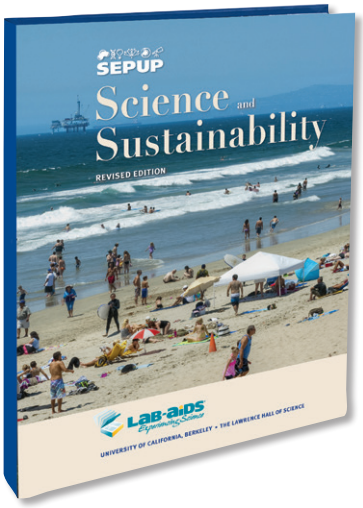
SCIENCE & SUSTAINABILITY

REVISED EDITION

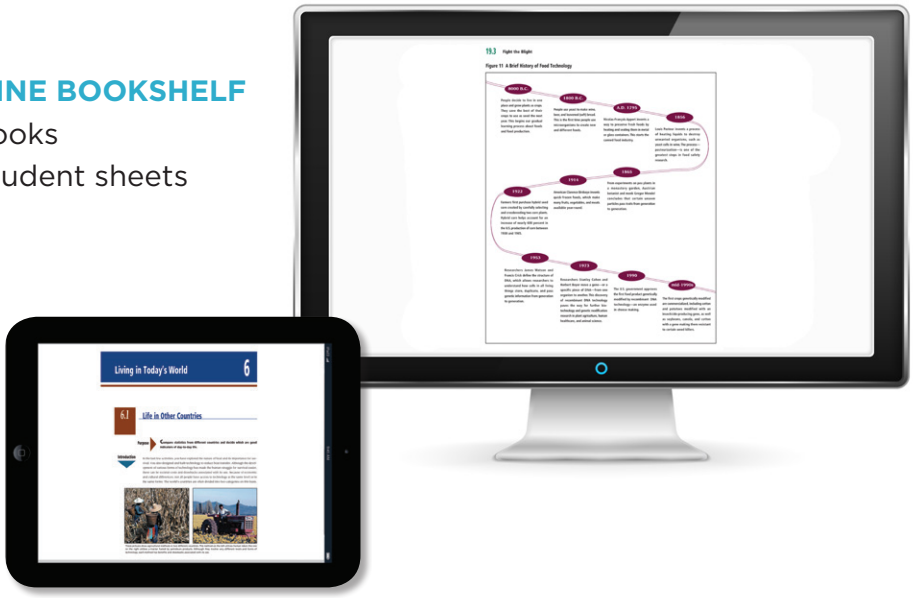


Help your students understand that science is not only a part of their everyday lives, but that the decisions they make play a role in their local communities. The **SCIENCE AND SUSTAINABILITY** (S&S) course uses themes and activities related to local and global sustainability to present key concepts from the life, earth, chemical, and physical sciences. The scientific topics included in this course were chosen because they relate to sustainable development that is, the use of environmental resources in a responsible way to ensure they will continue to be available for use by future generations.

Science and Sustainability may only be purchased as a full-year program in one hard bound book with equipment packages. These can be found on the following pages.

ACCESS TO MY LAB-AIDS ONLINE BOOKSHELF

- Online Student and Teacher books
- Printable and downloadable student sheets and visual aids



STEM LITERACY REFILLABLE AG

SCIENCE AND SUSTAINABILITY FULL-YEAR PROGRAM	ITEM NO.
COMPLETE EQUIPMENT PACKAGE (all materials for up to 5 classes of 32 students, mobile storage cart, TE DVD, My Lab-Aids bookshelf access for one teacher for 7 years which includes e-book versions of the Teacher's Edition, Teacher Resources, and Student Book)	SS-R1000
MY LAB-AIDS BOOKSHELF FOR STUDENTS (access to online book, 7 years)	SS-ROLSP-7
STUDENT BOOK (hardcover)	SS-R1SB
MATERIAL WORLD BOOK (hardcover; not included in Complete Equipment Package)	SS-1MWB
TEACHER'S EDITION AND RESOURCES (printed copy)	SS-R1TE
SCIENCE LAB NOTEBOOK (bulk pricing up to 55% off)	SLN-1
Small class sizes for 5 sections of 16 students might consider our **COMPLETE EQUIPMENT PACKAGE FOR 16 STUDENTS PER CLASS**	SS-R1H-1000

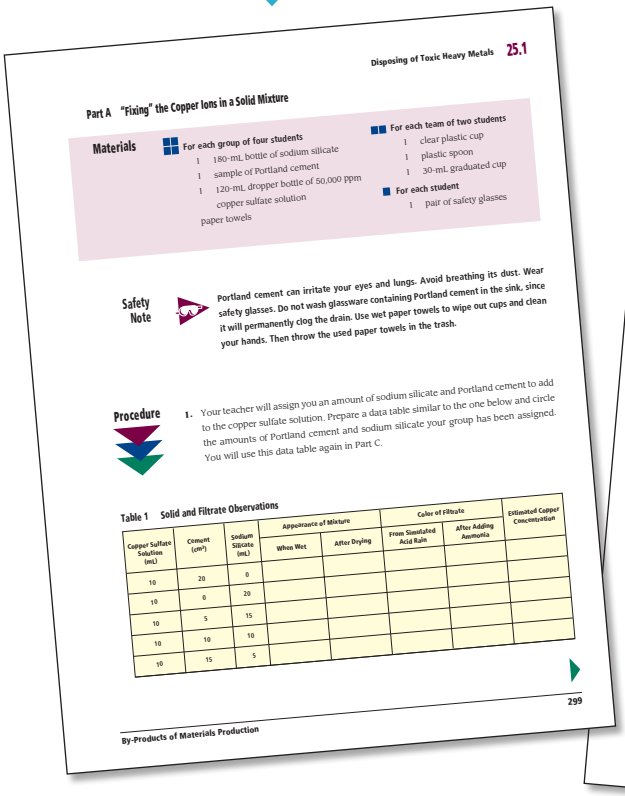
For custom orders and standards correlations by state please see the "Your State" page on **lab-aids.com**

PROGRAM COMPONENTS

Individual components combine to form a complete learning system.

- Student book that seamlessly integrates investigations, labs, and readings into the context of the issue's storyline
- Equipment to carry out each embedded activity for 5 classes of 32 students (in groups of four, pairs or individuals)
- *My Lab-Aids* online student and teacher bookshelf portals
- Student Science Lab notebook

Materials needed for embedded labs and activities are part of the Complete Equipment Package



Disposing of Toxic Heavy Metals 25.1

Part A "Fixing" the Copper Ions in a Solid Mixture

Materials

For each group of four students
- 1 180-mL bottle of sodium silicate
- 1 sample of Portland cement
- 1 120-mL dropper bottle of 50,000 ppm copper sulfate solution
- paper towels

For each team of two students
- 1 clear plastic cup
- 1 plastic spoon
- 1 30-mL graduated cup

For each student
- 1 pair of safety glasses

Safety Note Portland cement can irritate your eyes and lungs. Avoid breathing its dust. Wear safety glasses. Do not wash glassware containing Portland cement in the sink, since it will permanently clog the drain. Use wet paper towels to wipe out cups and clean your hands. Then throw the used paper towels in the trash.

Procedure

1. Your teacher will assign you an amount of sodium silicate and Portland cement to add to the copper sulfate solution. Prepare a data table similar to the one below and circle the amounts of Portland cement and sodium silicate your group has been assigned. You will use this data table again in Part C.

Table 1 Solid and Filtrate Observations

Copper Sulfate Solution (mL)	Cement (cm³)	Sodium Silicate (mL)	Appearance of Mixture		Color of Filtrate		Estimated Copper Concentration
			When Wet	After Drying	From Simulated Acid Rain	After Adding Ammonia	
10	20	0					
10	0	20					
10	5	15					
10	10	10					
10	15	5					

By-Products of Materials Production 299

By-Products of Materials Production 25

25.1 Disposing of Toxic Heavy Metals

Purpose Detect low concentrations of dissolved copper and convert this copper-bearing solution into a solid that can be disposed of safely.

Introduction

As you observed in Activity 24, "Material Resources: Metals," acid solutions can release, or **leach**, metals from their ores. Rain water or groundwater can also leach metals from contaminated soil and landfills. Small amounts of heavy metals, such as copper, lead, and chromium, can be toxic to living organisms. Water moves easily through the environment. If it contains dissolved metals or other toxic chemicals, it can contaminate soil and water supplies and cause health problems for organisms throughout the food web.

In this investigation, you will use the waste solution you produced during Activity 24.1, "Extracting Metal From a Rock." In Part B of this activity you will estimate the amount of copper in your waste solution by performing a serial dilution and then using a test to detect low concentrations of copper in solution. A **serial dilution** is a procedure that creates a series of solutions in which each solution has a concentration that is an exact fraction, such as ½ or 1/10, of the previous one. In Parts A and C you will investigate a method for treating wastewater containing dissolved copper sulfate so that it will resist leaching when disposed of in a landfill.

298 Activity 25

LIVING ON EARTH

Over-arching Issue: Sustainable practices can reduce impact on ecosystems. What are the personal, community, and global perspectives that best inform our actions?

11 WEEK UNIT

Introduces the concept of sustainability by examining survival needs of living organisms and concepts related to these needs. Environmental impacts of human activities - past, present, and future are investigated, as well as the role of science and technology.

Core Science Content: Homeostasis & survival needs, population dynamics, heat & energy transfer, food webs & energy flow, energy use

Key Assessment Task: "What additional information would you like to have before you would be confident in saying that increased levels of CO_2 in the atmosphere definitely do or do not lead to increased surface temperatures? Explain why this information is important."

FEEDING THE WORLD

Over-arching Issue: What are the trade-offs between society's need to provide people with adequate nutrients and the ecological impacts of modern methods of food production?

8 WEEK UNIT

In this unit, students investigate the chemical nature of food, chemical and biological processes involved in food production, and techniques for increasing availability of food.

Core Science Content: Cell structure & function, elements, photosynthesis, plant genetics, genetic engineering

Key Assessment Task: "The current debate over genetic engineering involves healthcare professionals, ecologists, ethicists, social and political thinkers, agricultural experts, officials in government agencies, and political leaders. What can you do in your lifetime to affect the debate on genetic engineering? Use at least one specific example from each side of the debate."

USING EARTH'S RESOURCES

Over-arching Issue: How can we reduce our impact on the environment as we explore and use Earth's resources to produce material goods?

9 WEEK UNIT

In addition to food production, humans use Earth's natural resources for many other purposes. This unit examines how material use affects the standard of living and quality of life.

Core Science Content: Hydrocarbon & polymer chemistry, metal extraction & refining, catalysts & enzymes, degradability, food preservation, gas laws

Key Assessment Task: "If you were responsible for deciding how the World Bank should spend its $100 million among these proposals, how would you spend it? Explain your reasoning, using evidence."

MOVING THE WORLD

Over-arching Issue: What is the critical interplay between energy production, energy use, and sustainable development?

7 WEEK UNIT

Energy drives most aspects of society. This unit investigates energy production and use.

Core Science Content: Energy use & biofuels, exothermic & endothermic reactions, nuclear reactions, electromagnetic waves

Key Assessment Tasks: "Do you think that global societies could be sustained at current and future population levels if everyone in the world used energy at the same rate as an average U.S. resident? Explain."

"How do you propose—on an individual level, a national level, and a global level— that humans prepare to meet future energy demands? What trade-offs are involved in your proposals?"