Physical Science Readers:
Investigating the Chemistry of Atoms

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ISBN 978-0-7439-0569-5

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Nature's Building Blocks

This book has something important in common with the breakfast you ate this morning. Your breakfast has something in common with your hands holding this book. In fact, everything around you has it in common. Can you guess what it is?

All things are made of **matter**. Matter makes up everything. Scientists say that matter is anything that takes up space. Even if the space is too small to see, matter is still there.

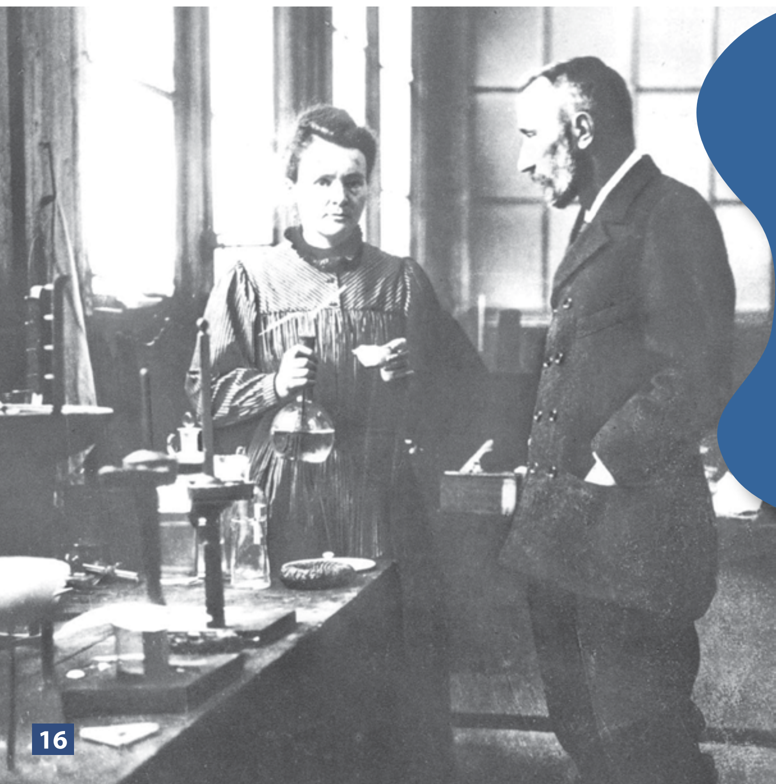
But what is matter made of? No matter what, matter is made of tiny **particles**. They are called **atoms**. Atoms are the building blocks of everything. They are everywhere. They are the air you breathe. They are the food you eat, the things you touch, and the clothes you wear. They are every part of you.

Radioactivity

Thomson learned that corpuscles could expose film to take pictures. It could even expose film when the tube was wrapped in black cloth. Other scientists studied the same glow that Thomson did. They called this energy source **X-rays**.

Scientists were curious about X-rays. One found that the element **uranium** (yoo-RAY-nee-uhm) made energy even stronger than X-rays. Most scientists ignored this. But a Polish scientist named Marie Curie didn't. She wanted to learn more about uranium and its energy. She and her husband Pierre tested many elements. They found several that made this energy. They named the energy **radioactivity**.

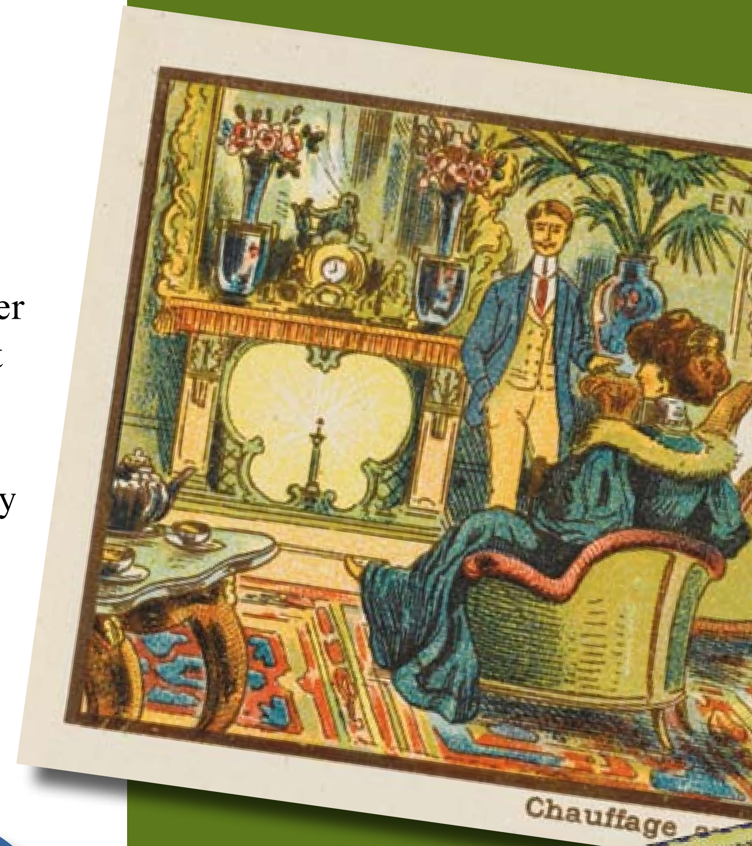
The Curies wondered where the energy came from. Something was happening inside the atom. It held many mysteries.



Pierre and Marie Curie in their laboratory

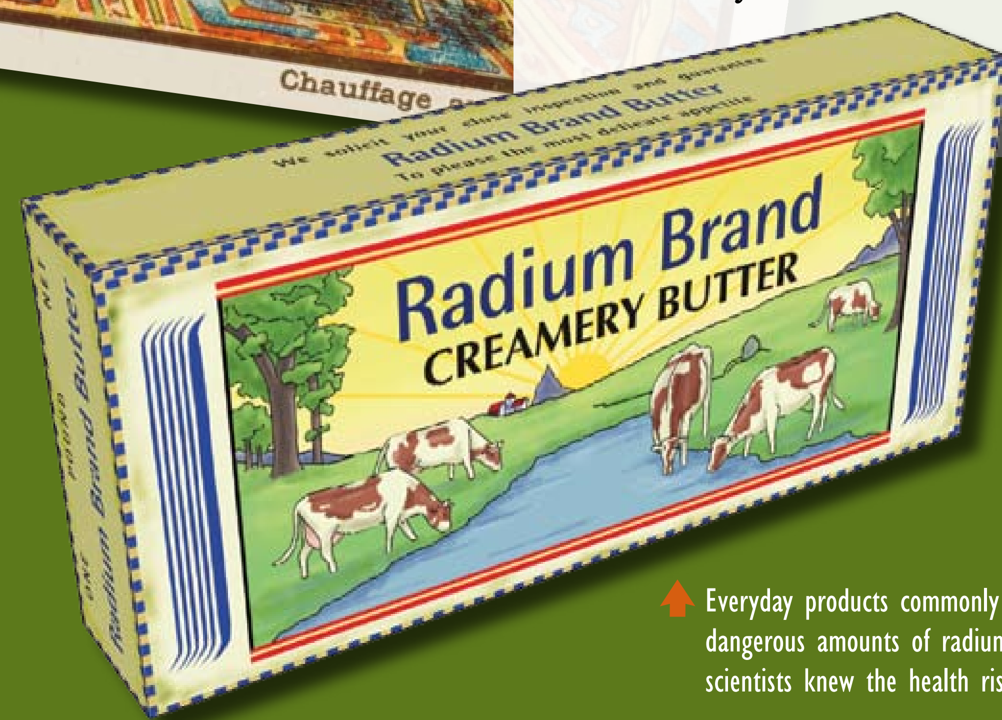
An Important Use

Marie and Pierre Curie handled radioactive materials for many years. This made them very ill. Their hands were always numb, and they lost weight. The radiation from these substances killed the cells in their bodies. Then they realized that radiation could also kill unhealthy cells like cancer. Today, radiation is widely used to help treat cancer.



Radium Girls

Before scientists realized the dangers of handling **radium**, people used it for all kinds of things. There was radium butter and radium toothpaste. A paint made with radium was used on watches and airplane instruments to make them glow in the dark. Women known as "Radium Girls" worked in factories, using the radium paint. Just for fun, they painted their teeth to make them glow in the dark. The Radium Girls became very sick and died of cancer.



Everyday products commonly contained dangerous amounts of radium before scientists knew the health risks.

Lab: *Indirect Evidence*

Pioneers in atomic science often had to work with things that they could not see or touch themselves. They couldn't see atoms one at a time. Instead, they had to use indirect evidence. Indirect evidence is when you observe the effects of something. Then you make conclusions about the thing itself. It's like studying footprints in the mud to figure out who walked through the garden.

Materials

- empty boxes, labeled with letters or colors
- a collection of ordinary classroom or household items
- scale
- table

Procedure

1 Ask someone else to prepare a number of mystery boxes. If you are doing this experiment in school, your teacher will prepare the boxes. In each mystery box there should be one or more items from your classroom or home.

2 On a table, set out a number of items including those that have been placed in the mystery boxes. In this way, the items in the boxes will have a match somewhere on the table.

3 Without opening the mystery boxes, try to figure out what is inside each one. You can use your senses as well as any scientific instruments, such as a scale, you have available.

4 Record your hypothesis and the reasons for your hypothesis for each mystery box.

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Why This Kit?

This kit was developed to provide teachers with a way to integrate their teaching of language arts and science while making accommodations for differences in student reading abilities and levels of understanding. Whether your students are above level, on level, or below level, or even English language learners, this program offers lessons and activities designed to meet standards for reading, writing, and science.

For each of the eight units provided in this kit, you'll find two different readers related to the topic. One reader is designated for students who are on- or above-level and the other is designated for students who read below-level.

Unit Organization

Each unit is structured in a similar manner. First, you'll find an overview of the unit with a suggested time line. Then you'll see the reading, writing, and science objectives for the unit. These objectives are the same for both readers, but the activities themselves have been adapted to be appropriate for struggling learners or for those who need more of a challenge.

Following the time line and objectives, you'll find a section that provides a whole-class introductory activity and other components of the unit, as well as a whole-class concluding activity for the end of the unit. Each unit includes a lab activity related to the topic featured in the readers. The lab provides detailed instructions for conducting the activity. There is also a lesson plan that serves as a guide for you as you lead students through this exciting activity.

Next in the unit, you'll find differentiated lesson plans for the two readers. These provide step-by-step instructions for leading the students through the process of reading the text. This instruction highlights the specified objectives. Each lesson also incorporates the use of data analysis activities on reproducible pages as well as a follow-up quiz to check for comprehension.

All Together: Science, Language Arts, Inquiry, and Literacy

As the expectations for student achievement in both science literacy and reading skills continue to rise, so does the need for quality materials that teach content area knowledge and critical reading skills through meaningful literature. The *Sally Ride Science: Science Readers* address both these needs through a series of leveled readers each focused on a single strand: physical, earth and space, and life science. Students journey through a complete and comprehensive unit of study which includes all the components of complete guided reading instruction and concept application through data analysis and hands-on lab activities. Students see, hear, read, touch, and think the concepts presented in each lesson. They are offered numerous opportunities to explore the ideas presented and build upon their previous experiences to gain new knowledge. Students then construct and share personal insights and opinions regarding the advancements in science and their effects on the Earth and society. By participating in the lessons in these units, students will become scientifically literate.

Why a Focus on Science?

Over three decades ago, the American Association for the Advancement of Science began a three-phase project to develop and promote science literacy: Project 2061. The project was established with the understanding that *more* is not *effective* (1989, 4). Shortly thereafter, in 1993, the Association developed benchmarks for science literacy. Since every state has its own science standards, these benchmarks were prepared as a tool to assist in the revision of the states' science, mathematics, and technology curricula (XV).

Values, Attitudes, and Skills

Scientists work under a distinctive set of values. Therefore, according to the American Association for the Advancement of Science, science education should do the same (1989, 133). Students whose learning includes data, a testable hypothesis, and predictability in science will share in the values of the scientists they study. Additionally, "science education is in a particularly strong position to foster three [human] attitudes and values: curiosity, openness to new ideas, and skepticism" (134). *Sally Ride Science: Science Readers* addresses each of these recommendations by engaging students in thought-provoking, open-ended discussions and projects. Throughout their study, students continuously reflect on the contributions of important scientists and the advancements they have brought to society.

Within the recommendations of skills needed for scientific literacy, the American Association for the Advancement of Science suggests attention to computation, manipulation and observation, communication, and critical response. These skills are best learned through the *process* of learning, rather than in the knowledge itself (135). This is exactly what happens when students engage in lesson labs and review labs conducted by others in the *Sally Ride Science: Science Readers* program. Students follow formulas and calculations to compute numbers; they use calculators to apply computation skills quickly and accurately; they manipulate common materials and tools to make scientific discoveries; they express findings and opinions both orally and in writing; they read tables, charts, and graphs to interpret data; they are asked to respond critically to data and conclusions; and they use information to organize their own data and draw their own conclusions.

Inquiry-based Learning

Project 2061 recommends pedagogical practices where the learning of science is as much about the process as the result or outcome (147). Following the nature of scientific inquiry, students ask questions and are actively engaged in the learning process. They collect data and are encouraged to work within teams of their peers to investigate the unknown. This method of process learning refocuses the students' learning from knowledge and comprehension to application and analysis. Students may also formulate opinions (synthesis and evaluation) and determine whether their processes were effective or needed revision (evaluation). The National Science Education Standards view inquiry as "central to science learning" (2 in Overview). In this way, students may develop their understanding of science concepts by combining knowledge with reasoning and thinking skills. Kreuger and Sutton (2001) also report an increase in students' comprehension of text when knowledge learning is coupled with hands-on science activities (52).

Each unit in the *Sally Ride Science: Science Readers* program provides an engaging lab activity at the end of the reader, complete with a lesson plan that includes activities before, during, and after the lab. In addition, the data analysis activity pages reconstruct related experiments and share data the students can analyze to apply their learning from the readers. This program offers students multiple opportunities to engage in both personal hands-on activities and related experiments described in full detail.

Nonfiction ≠ Textbooks

As Project 2061 began, researchers questioned the appropriateness and effectiveness of science textbooks and methods of instruction. Since textbook instruction puts more emphasis on learning correct answers and less on exploration, collaboration, and inquiry, the Association asserts that this manner of instruction actually "impedes progress toward scientific literacy" (1989, 14). This same concern resurfaced over a decade later by Daniels and Zemelman (2004) who call textbooks "unfriendly." Most adults, when choosing literature, do not pick up their son or daughter's science textbook. Daniels and Zemelman assert that today's textbooks are best used as reference books when students need large amounts of information on a particular topic within a subject area. Instead they recommend the use of "authentic, real-world nonfiction."

Likewise, researchers and educators alike suggest using quality nonfiction materials, which "provide the reader with a sense of discovery" (Nevett 2004). Nevett also cautions teachers to consider the design of the books, the author's style, and the author's ability to excite the reader. Each of the leveled readers in *Sally Ride Science: Science Readers* provides just that. Both the on- and below-leveled readers for each unit include real-life photos, charts, illustrations, and sidebars. Although the books present facts and information, they are written to tell a story about their subject. The information is presented in an interesting manner to foster students' curiosity and encourage continued exploration of a concept.

Videos from The Futures Channel

On the included DVD, you can find eight short videos from The Futures Channel. These videos are ideally suited to introducing concepts, activating prior knowledge, and inspiring interest in sometimes complex and abstract concepts.

Concert Acoustics

Running Time: 1 minute, 23 seconds

Elizabeth Cohen is an acoustic engineer who "tunes" concert halls to make concerts sound better. Use this video to show students how the science of sound is something that can impact their everyday lives.

Discussion Question: Brainstorm with the class other ways in which science deals with sound.

Flights of Imagination

Running Time: 3 minutes, 7 seconds

Aeronautical inventor Paul MacCready describes how he built a human-powered airplane. Use this video to discuss weight, lift, drag, and discouraging setbacks.

Discussion Question: What dreams have the students had that they have worked to accomplish?

Geometry and Structural Engineering

Running Time: 3 minutes

A structural engineer explains how shapes are used in structural engineering to create strength in buildings. Use this video to introduce concepts of material and structural strength, weight, and support.

Discussion Question: Identify shapes used in the classroom building and in other nearby buildings.

Maglev Trains

Running Time: 4 minutes, 14 seconds

Two engineers introduce the concept of magnetic levitation. Lorenzo Royball demonstrates magnetic levitation in the laboratory. Peter Glaser introduces the idea of building maglev trains in tunnels with no air resistance.

Discussion Question: Have students indicate interest in maglev trains by a show of hands. Count how many girls and how many boys raised their hand. Point out that the video interviewed four white men and no women; ask the students if this may have had an effect on the numbers of interested boys and interested girls.

Making Sparks 1

Running Time: 3 minutes 24 seconds

Two engineers describe the importance of electricity, the national power grid, and where electricity comes from. The drawbacks of fossil fuels and nuclear power are introduced, and renewable sources are presented as an alternative. Use this video to introduce different sources of electrical power.

Discussion Question: Activate students' prior knowledge by creating a cluster map on the board with different kinds of power plants and the pros and cons of each.

Making Sparks 2

Running Time: 2 minutes 50 seconds

Two engineers introduce solar power and photovoltaic cells, including basic construction, history, and uses. Use this video to introduce solar power.

Discussion Question: Solar power has a lot of advantages compared to other sources of electricity, but it is not in widespread use. Have students suggest reasons why this is so, and whether the benefits of solar power are worth overcoming those obstacles.

Rollercoasters

Running Time: 2 minutes

Dal Freeman and Ed Dangler, rollercoaster engineers, describe how a rollercoaster is made and what science and physics understanding goes into the design and construction.

Discussion Question: The engineers mentioned a lot of different science concepts. How might potential energy, kinetic energy, drag, and friction play into how a rollercoaster works?

Solar Powered Cars

Running Time: 3 minutes, 28 seconds

The "Sunraycing" team from Cal State Los Angeles discusses the solar powered car that they built for international racing. The hard work, team effort, and satisfaction of success feature prominently.

Discussion Question: Have students share times when they had to work together to solve a difficult problem.

For more information on The Futures Channel, visit their website at **http://www.thefutureschannel.com.**

Unit 2: *Investigating the Chemistry of Atoms* and *Marie Curie: Pioneering Physicist*

Time Line for the Unit

	Investigating the Chemistry of Atoms	*Marie Curie: Pioneering Physicist*
Day 1	Complete the **Introductory Activity** (page 46) as a class.	
	Before Reading (page 51) in reading groups.	**Before Reading** (page 59) in reading groups.
Day 2	**During Reading** (page 52) in reading groups. Use: *Inside an Atom* worksheet (page 54) *Inside an Atom* transparency	**During Reading** (page 60) in reading groups. Use: *What Does That Atom Weigh?* (page 62) *What Does That Atom Weigh?* transparency
Day 3	**After Reading** (page 53) in reading groups. Use: *What's My Number* worksheet (page 55) *Radioactive Day* worksheet (page 56) *Reader Quiz* (page 57)	**After Reading** (page 60) in reading groups. Use *The Power of Nuclear Energy* (page 63) *Nobel Prize Time line* worksheet (page 64) *Reader Quiz* (page 65)
Day 4	Complete the **Lab Activity** (page 49) as a class.	
Day 5	Complete **Concluding Activities** (page 47) as a class.	

Unit Learning Objectives

- Students will use strategies to monitor comprehension. (Nonfiction Reading Objective)
- Students will organize and present information in a logical manner, including an introduction and conclusion. (Expository Writing Objective)
- Students will explore different aspects of atomic theory. (Science Content Objective)

Unit Overview

Introductory Activity

1 Ask the students to consider something they know now that they didn't know before beginning school. For example, did they believe there really was a pot of gold at the end of a rainbow? Or that their older brother was as strong as Superman?

2 Discuss how their views changed as they got older, and what helped shape their ideas. Illustrate this concept by drawing three stacked rectangles on the board. Write a statement in the top box that describes information from someone's preschool years. In the middle box, write the facts, discoveries, or episodes that worked to change the student's idea over time. Then write the true statement in the bottom box.

Example:

Airplanes flap their wings to fly.
Watching news stories of airplanes, seeing airplanes take off and land at a local airport; watching airplanes in the sky.
Airplanes use force and motion to lift off the ground.

3 Have each student complete a similar organizer. Allow time for a few students to share their ideas.

4 Explain to the students that the alchemists of the Middle Ages were the scientists of their time. They believed they could change lead into gold. As a class, begin a graphic organizer similar to the one described above. Use this idea in the top box. What events have led modern scientists to discover the truth? Explain that the class will read about these discoveries during their reading.

Using the Readers

5 Divide students by reading levels into reading groups. Students on or above a fifth-grade reading level should read *Investigating the Chemistry of Atoms*. Students needing a lower-level book should read *Marie Curie: Pioneering Physicist*.

6 Within these groups, complete the activities described in each lesson plan.

Investigating the Chemistry of Atoms (pages 51–57)

Marie Curie: Pioneering Physicist (pages 59–65)

7 At the end of the unit, bring the students back together as a group to complete the concluding activities on the next page.

Unit Overview *(cont.)*

Using the Transparencies

8 One transparency per reader (two in all) supports an interactive class activity guided by student worksheets (pages 54 and 62 for the readers in this unit). Use these transparencies to support and extend the information and concepts presented in the before, during, after, or concluding activities, as presented in the lesson.

Completing the Lab

9 Following the **After Reading** activities, students complete a lab activity. Each reader includes a themed lab activity on pages 28 and 29. See page 49 in this Teacher's Guide for the lab of this unit.

Concluding Activities

Complete these concluding activities as a whole class following completion of the lab activity.

10 After the students have completed the activities for the two levels of readers, review the information they learned and allow students from different reading groups to share specifics from the readers.

11 Instruct the *Investigating the Chemistry of Atoms* group to take out the comprehension questions they created and share them with the class. Encourage discussion as the questions are answered.

12 Remind students of the transparency they used in the lesson and then instruct them to work in pairs or small groups to create their own renditions of an atom on poster board. Have them use a marker to label the drawing and record information they learned from the unit.

Unit Overview *(cont.)*

Differentiation Strategies

Above Grade Level—Student Directed

For those students who have a solid understanding of the science concepts in this unit, encourage them to apply the knowledge and information they have. Suggested enrichment activities include:

When conveying the information about atomic theory, provide above level students with materials for additional research such as reference books, CD-ROM encyclopedias, and the Internet. Have these students include their new information in the content of their writing assignment during this unit.

Encourage students to pose higher-order thinking questions after conducting the lab experiment. Ask one or two students to share their questions with the class. Discuss the questions with the entire class as a way to wrap up the lesson.

ELL and Below Grade Level—Teacher Directed

Encourage your English language learners to participate in activities with partners who are proficient in English. Emphasize the need for all students to be sensitive to their partner's understanding and work together to decipher difficult words and phrases.

When questioning students, continue to ask higher-level thinking questions to below-level readers. While they may struggle with the process of reading, they will likely welcome the challenge of entertaining the big ideas presented in the reader.

Pair ELL students with others during the lab experiment. Encourage full participation and allow them to be involved hands-on in order to increase understanding.

As students read, circulate the room and ask students to model their reading process. Ask them how they picture the events in their mind's eye, what clarifying questions they are asking themselves, and what information they expect to find on a page given its title and headers.

Lab Lesson Plan: Mystery Boxes

Find full-color step-by-step illustrations of the lab on the Teacher's CD-ROM.

Before the Lab

1 Remind students how atomic scientists could not see the atoms that they worked on. Review with them the various ways that different scientists learned new things about atoms using experiments and indirect evidence.

Introduce the Lab

2 Read the introductory paragraph with students.

3 Read the list of materials. Provide each lab group with the necessary materials, or have them ready to complete as a demonstration lesson in front of the class. You might create the mystery boxes before class, or have different groups create mystery boxes for each other.

4 Read through all the procedures with the students at least once before they engage in the lab. Check for understanding of the required steps.

Conduct the Lab

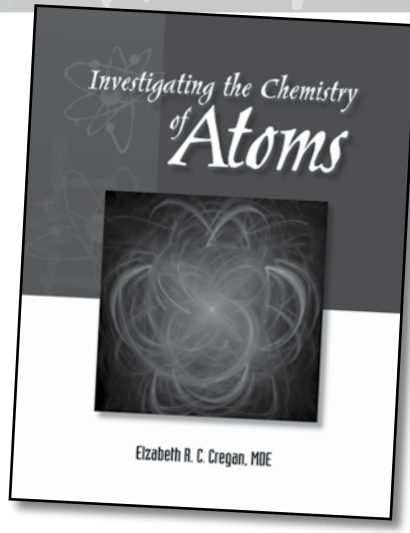
5 Allow time for lab groups to conduct the lab, or follow the steps as a class if conducting a demonstration lab.

6 Instruct students to write a response to number 4. Be sure they use descriptive language so that anyone who did not conduct the experiment will be able to "see" what they did to find out what was in the box.

After the Lab

7 Have each lab group share their results. Were all the lab groups correct in their hypotheses? Lead a class discussion to summarize the results of the lab in a short paragraph.

Investigating the Chemistry of Atoms Reader



Learning Objectives

Students will use strategies to monitor comprehension. (Nonfiction Reading Objective)

Students will organize and present information in a logical manner, including an introduction and conclusion. (Expository Writing Objective)

Students will explore different aspects of atomic theory. (Science Content Objective)

Resources

- adhesive notes
- paper and pencils
- reference materials (library books, Internet, etc.)
- *Inside an Atom* transparency and worksheet (page 54)
- *What's My Number* worksheet (page 55)
- *Radioactive Day* worksheet (page 56)
- materials for Lab (see page 49)
- reader quiz (page 57)

Before Reading

1. Complete the Introductory Activity (page 46) with the whole class. Then divide the students into reading groups. The students who read this book should be reading on or above level.

2. Remind students of the previous unit and the *Inside the World of Matter* book they read. Distribute *Investigating the Chemistry of Atoms* and ask students to read the title and think about the content of the reader. Explain that when writing, it is important to present information in a logical sequence. It is also important to write a clear introduction and conclusion. Tell students that they should pay attention to the author's use of these elements as they read.

3. It will be necessary for the students to understand the new vocabulary presented in the reader, so take time to review the words as a group. Write each of the words on the board and discuss the word meanings. Then take turns using each word in a sentence. Encourage students to think of their own sentences to share with the class. When discussing words that represent complex concepts, attempt to briefly explain, but let students know that their understanding will be enhanced once they read the text.

Before Reading *(cont.)*

4 Ask students the following questions:

What do you think **Atomic Theory** is?

What do you suppose a scientist studies about **Atomic Theory**?

5 Instruct the students to read pages 4 and 5. Then ask:

Have your thoughts changed about the meaning of **Atomic Theory**?

How do you think this reader will relate to *Inside the World of Matter*?

During Reading

6 Instruct the students to read the text. You may want to have the students read independently or with partners. Ask students to pay attention to information that may be unclear or concepts that are difficult to understand, as these will be addressed later.

7 Ask students to look for the description of the study of alchemy. Take time to review the work of scientists in this area. Then ask students to read on about the work of John Dalton and his study of atoms.

8 As students read, encourage them to take special note of any information in the text that was difficult to understand. Instruct students to locate the pages on which this information is found and mark these pages with adhesive notes.

9 Explain that often readers encounter information that is unfamiliar to them. Good readers employ strategies that help them to make sense of print. Ask the students what they typically do when they come to a word or to information that is unclear to them. Discuss these strategies. Then mention the following strategies for clearing up confusion:

Read the text again.

Try to form mental images.

Think about what you already know about the topic.

Consult another source (reference book, knowledgeable person).

Instruct the students or pairs of students to select a strategy to use in order to make sense of the confusing information they identified.

10 Have students return to the information that was confusing for them and instruct them to try some of these strategies. Then invite students to share whether or not any of the strategies were helpful to them.

11 Are all atoms the same? Do they all look the same? Reread pages 6 and 7 with students. If the students were to draw a picture of what an atom looked like, would it be similar to the one on page 7? Explain that the visual model for an atom has changed over time. Display the transparency. Discuss with students the similarities and differences they notice among the atom models. How do the students justify the changes they observe? Distribute *Inside an Atom* on page 54 to students. Have students complete this worksheet independently. Following, have three students share their atom models at the bottom of the worksheet. Are they all the same?

After Reading

12 Ask the students what they noticed about the organization of the text. How did the author grab the reader's attention with the introduction? How was the information sequenced in a logical manner? How did the author conclude the text? Divide students into pairs and ask each pair to briefly outline the text in the following manner:

Introduction:

First big idea:

Second big idea:

Third big idea:

Other important ideas:

Conclusion:

Ask students to share how this organization helped to make a difficult concept easier to understand. Then instruct each student to write a summary of the text, highlighting the major points.

13 Point out that many scientists were featured throughout the reader. Divide students into pairs and have each pair select a scientist to research further. Encourage students to locate resources through the library or on the Internet. Then have the students share the information they found with the group.

14 Introduce students to the Periodic Table, if available. Use *What's My Number* on page 55 to explain the numbers on the chart. Work through the examples together. Then have students complete the bottom half of the worksheet independently.

15 Encourage students to reflect on their comprehension by creating their own questions about the text. Have students work in pairs for this activity. Then have each pair of students read through the reader page by page, creating a comprehension question for each section. In addition to the comprehension questions, have each pair create a higher-level thinking question that requires making inferences or speculations. Allow students to quiz their classmates.

16 What do the students know about radiation? Is ALL radiation dangerous? Have students reread pages 16 through 18. Explain that contrary to popular belief, not all radiation is dangerous. People are exposed to it every day in small doses. The Curies were exposed to so much, though, they got radiation poisoning and grew sick. Distribute the *Radioactive Day* worksheet on page 56 to students. Read the introductory paragraph. Discuss what "Natural Annual Sources" are. They include exposure from the sun; what occurs naturally in soil, water, and vegetation; and what is part of our bodies naturally. Discuss the information in the chart, then have students complete the questions independently.

17 A short quiz on page 57 is provided for your use to assess student understanding of the reader.

18 Finally, gather the students back together in a whole group to have them complete the Concluding Activities on page 47.

Inside an Atom

Directions: Look at the overhead showing different atom models. Use these models and the information you learned in *Investigating the Chemistry of Atoms* to answer these questions.

1. Describe how the model of an atom has changed over time. Why did scientists change it?
2. What is true of all atoms?
   a. The nucleus has protons, neutrons, and electrons.
   b. There are always as many neutrons as electrons.
   c. Electrons orbit the nucleus.
   d. Atoms are the ultimate smallest particle.

Hint: An atom's atomic mass can be found by adding the atom's protons and neutrons.

3. A lithium atom with 3 protons and 4 neutrons has an atomic mass of _____.
4. A hydrogen atom with 1 proton and 1 neutron has an atomic mass of _____.
5. A helium atom with 2 protons and 2 neutrons has an atomic mass of _____.
6. Only two electrons can stay in an atom's first orbit. What do you think happens to the third electron in the lithium atom?
   a. It explodes.
   b. It collides with the two other electrons.
   c. It collides with the nucleus.
   d. It has an orbit above the other two electrons.
7. Which of these atom parts is the largest?
   a. nucleus b. proton c. neutron d. electron
8. The atomic particle with a negative charge is the:
   a. nucleus b. electron c. neutron d. proton
9. Draw your own model of an atom. Be sure to label the nucleus with similar numbers of protons and neutrons, and electrons orbiting the nucleus. Give your model a name, and be sure to write the year it was created.

Reader Quiz

Directions: Use what you learned from reading *Investigating the Chemistry of Atoms* to choose the best answer for each question.

1. What is true of all matter?
   a. It is large.
   b. It is the building block of all things.
   c. It is made of tiny particles called atoms.
   d. It is all common.

2. Read these sentences from the book.

   In protons, the charge is positive. In electrons the charge is negative. Together, they BALANCE the atom's charge.

   What does the word BALANCE mean in this sentence?
   a. heavy
   b. equal
   c. weight
   d. measure

3. Which of these atomic particles is the smallest?
   a. nucleus
   b. proton
   c. neutron
   d. quark

4. The mass of an atom is also called its
   a. atomic capacity
   b. atomic weight
   c. matter
   d. energy

5. How did people discover radium was dangerous?
   a. People used radium to make x-rays.
   b. Many elements made radium energy.
   c. Many people who used radium got sick and died.
   d. Radium was used to make paint.

6. How has the study of atomic energy benefited the world? Use details and information from the reader to support your answer.

Inside an Atom Transparency