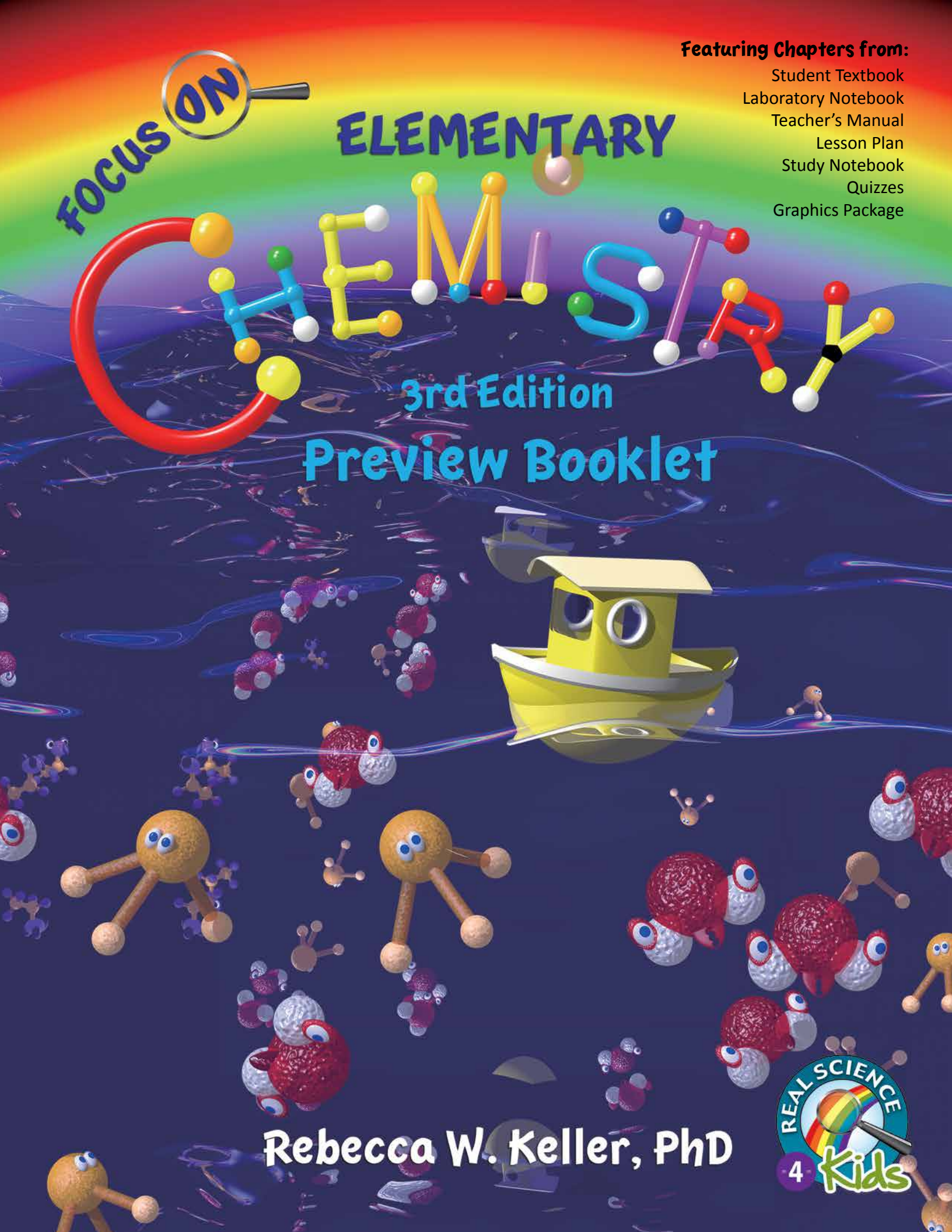
Featuring Chapters from:
Student Textbook
Laboratory Notebook
Teacher's Manual
Lesson Plan
Study Notebook
Quizzes
Graphics Package

Focus On Elementary Chemistry

3rd Edition

Preview Booklet



Rebecca W. Keller, PhD

Real Science 4 Kids

Introduction

Welcome to the ***Focus On Elementary Chemsitry 3rd Edition Preview Booklet*** where you can take our one semester unit study program for a test run!

The materials sampled in this booklet are taken from a full semester course, with two chapters from each part of the curriculum:

- The ***Focus On Elementary Chemistry Student Textbook–3rd Edition*** provides foundational science concepts presented in a way that makes it easy for students to read and understand. The many colorful illustrations make each chapter fun to look at and reinforce concepts presented.

- With two science experiments for each chapter, the ***Laboratory Notebook*** helps young students learn how to make good observations, an important part of doing science. Open-ended questions help students think about what they are learning, and information is provided to assist students with understanding what they observed while performing their experiments.

- The ***Teacher's Manual*** includes instructions for helping students conduct the experiments, as well as questions for guiding open inquiry. The commonly available, inexpensive materials used for all the experiments can be seen in the complete materials lists included in this booklet.

- Using the ***Lesson Plan*** makes it easy to keep track of daily teaching tasks. A page for each chapter in the ***Student Textbook*** has the objectives of the lesson and questions for further study that connect science with other areas of knowledge, such as history; philosophy; art, music, and math; technology; and language. Forms are included for students to use to do a review of material they've learned and to make up their own test for the chapter. Also included are icons that can be copied onto sticker sheets and used to help plan each day of the week.

- Different types of fun activities are presented in the ***Study Notebook***. These help reinforce the concepts students are learning and include making observations, some simple experiments, matching, fill in the blank, cut and paste, writing, following directions, and more.

- The one final and two midterm ***Quizzes*** are self-explanatory. For those who are not fans of quizzes, students can use the self-test at the end of the ***Lesson Plan*** instead.

- Another type of teaching aid is provided in the ***Graphics Package,*** which has two full-color images from each chapter of the ***Student Textbook.*** These graphics can be used to create additional teaching aids such as flash cards, wall posters, PowerPoint lectures, or overhead projections.

FOCUS ON

Grades K-4

ELEMENTARY CHEMISTRY

3rd Edition

Rebecca W. Keller, PhD

REAL SCIENCE 4 Kids

Real Science-4-Kids

Illustrations: Janet Moneymaker

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Chapter 1 What Is Chemistry?

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1.1 Introduction

Science is a way to study how things work. Science is made up of five different scientific subjects: chemistry, biology, physics, astronomy, and geology. These five subjects are the building blocks for all science.

In this chapter we will explore the building block called chemistry. Chemistry investigates what physical things are made of and the ways in which they change. Everything you can see, smell, or touch is made of "something." Scientists call this "something" matter. Chemistry is the study of matter.

1.2 History of Chemistry

A long time ago, students didn't study chemistry in school. Today, chemistry is an important part of all science, and students all over the globe study chemistry.

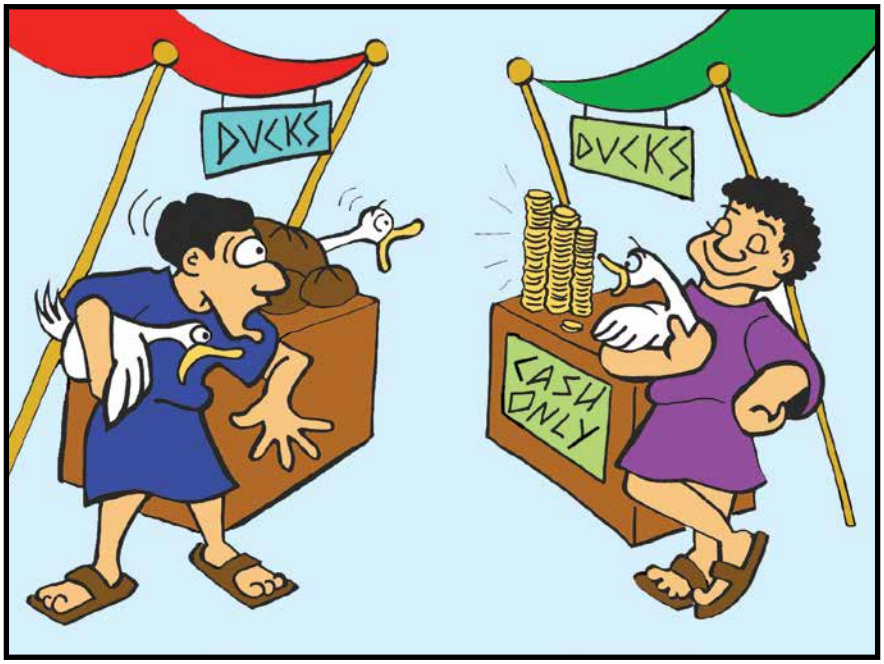
But where did we get chemistry?

Without knowing about chemistry, ancient people still did lots of chemistry. Ancient people used chemical processes every day.

A chemical process is any activity that involves some kind of chemistry.

For example, when ancient people treated animal furs so that they could be used as clothing, they were doing chemistry.

When ancient people created paints to draw pictures on walls, they were doing chemistry. And when ancient people made bowls or coins from metal, they were doing chemistry.



Ancient people did a lot of experimenting to learn about the world around them. Experimenting just means testing ideas and observing what happens.

For example, by experimenting, ancient people learned whether or not something would burn or melt. They learned if something tasted sweet or bitter. They learned that some things change color when added to other things. They even learned that some plants could be used as medicine. All of this is chemistry.

However, people didn't start thinking about chemistry as a science until the late 16th century. Around this same time,

other scientific subjects, such as physics and astronomy, were also being developed. Also at this time, there were lots of people who did not do any experimenting at all, but just thought about things.

Thinking about how things work and doing experiments are two different ways to learn about the world.

In the late 16th century, thinkers began thinking about experimenting. Eventually thinking and doing were blended together, and these two ways of studying the world turned into what we call chemistry.

1.3 Modern Chemistry

Thinking about how the world works and doing experiments to observe how the world works are both important to modern chemistry.

We will see in Chapter 3 that matter is made of atoms. But atoms are so small that they can't be seen with our eyes. So if we can't see them with our eyes, how do we know they really exist?

Modern chemists do experiments to show that atoms exist. From these experiments they can learn a great deal about atoms. For example, by doing an experiment a chemist might find out how large an atom is, how fast it can move, or how heavy it is.

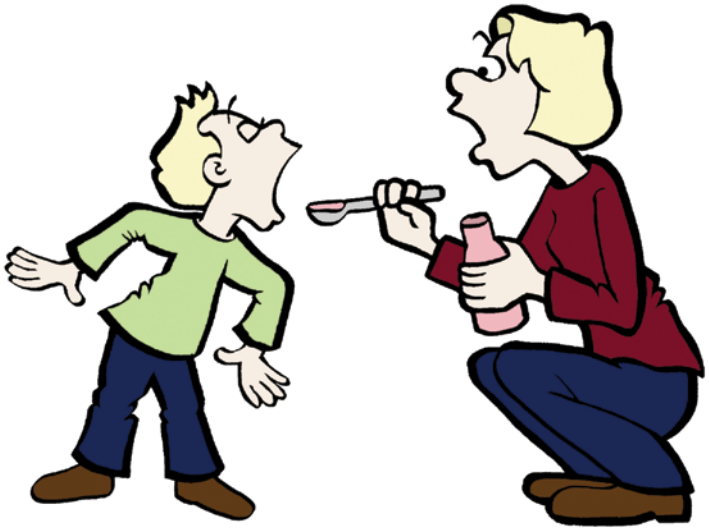
Modern chemists also think about atoms and make models to explain how atoms behave. A model is a good guess about how something works. Models can be created as writing, drawings, or computer programs, or they can be built from different materials. A model may not be completely true, but good models help chemists understand how things might work.

In Chapter 3 you will see a model for atoms. Each atom is drawn with a face and arms. Real atoms don't have arms, but that's OK. The models of atoms used in Chapter 3 will help you understand how atoms work.

1.4 Everyday Chemistry

You use chemistry every day, but you probably don't know it.

When you brush your teeth in the morning, chemicals in the toothpaste help clean your mouth. This is chemistry.



If you have a tummy ache, your mom might give you some medicine to make you feel better. This is chemistry.

If you want ice cream, your big sister might put gas in the car to drive you to the ice cream store. This is chemistry.

Even when you use watercolors to paint a picture, you are using chemistry.

Chemistry is everywhere! In this book you will learn more about chemistry and how we use chemistry every day.

1.5 Summary

- Chemistry is the study of matter.
- Chemistry is both thinking about how things work (making models) and doing experiments.
- Chemistry happens every day, and we use chemistry in many different ways.

1.6 Some Things to Think About

- When you are studying chemistry, what do you think you will be learning about?

- Why do you think doing chemistry experiments is important?

- What is your favorite type of model?

  Models of cars and toy cars

  Models of airplanes and toy airplanes

  Models of people and dolls

  Models of buildings and toy houses

  Models of the solar system and toy planets

  Other models and toys (What are they?)

- How would you describe three activities you do every day that use chemistry?

Chapter 7 Acids and Bases React

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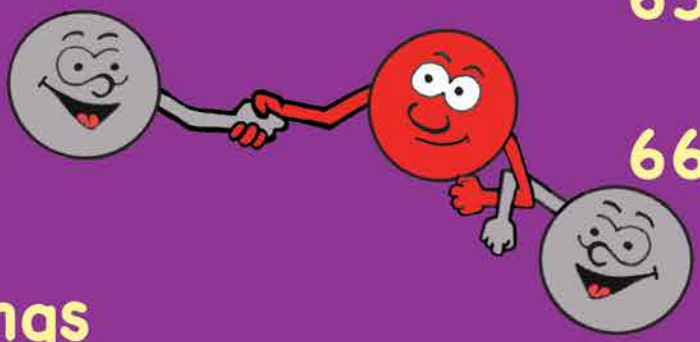
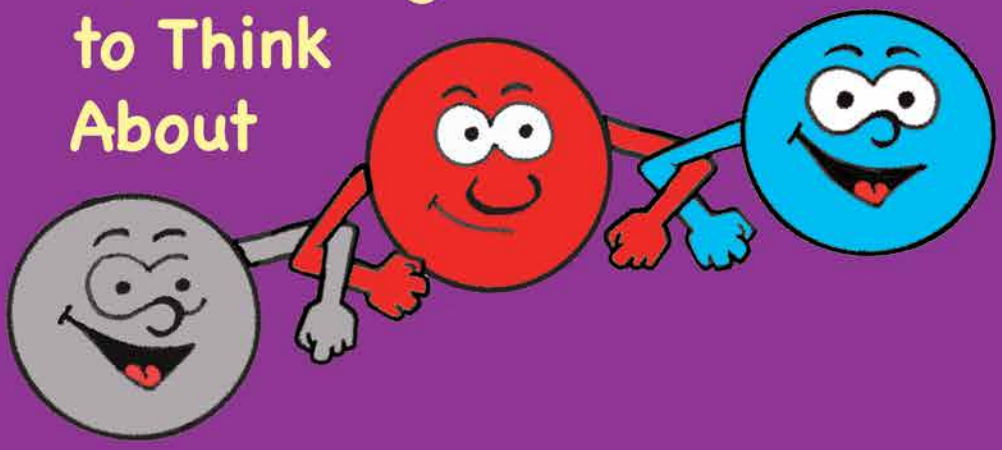


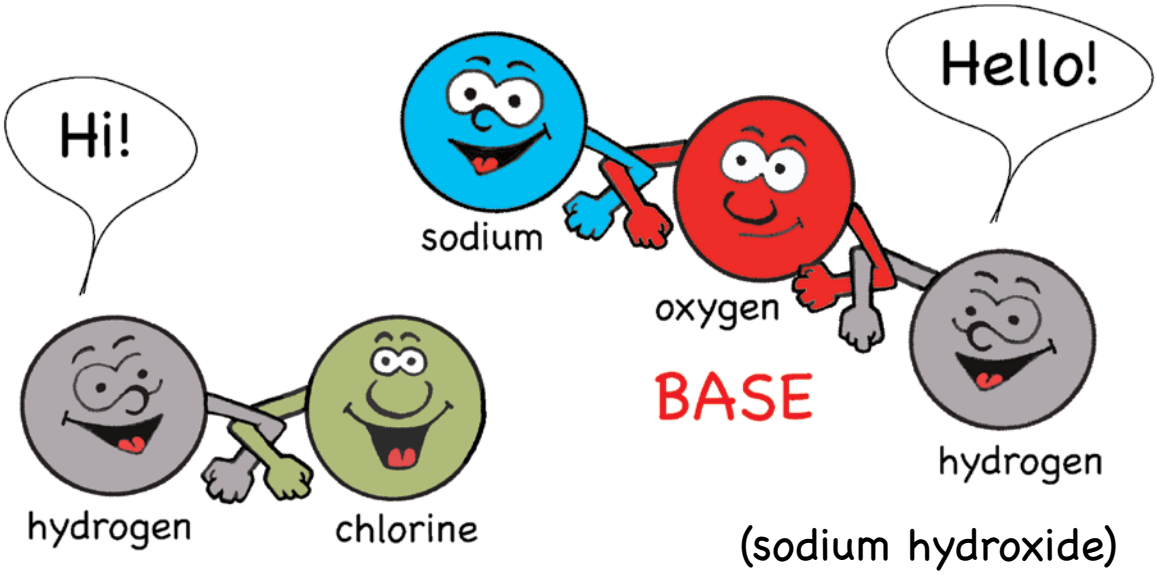


7.1 When Acids and Bases Meet

In the last chapter we learned about two different kinds of molecules—acids and bases. We saw that acids and bases are found in lots of different things. Acids are in batteries, lemons, and even soda pop. Bases are in soap, window cleaner, and bananas too.

What happens when acids and bases meet? When molecules meet, sometimes they react. Do acids and bases react when they meet?

1. An acid and a base meet.



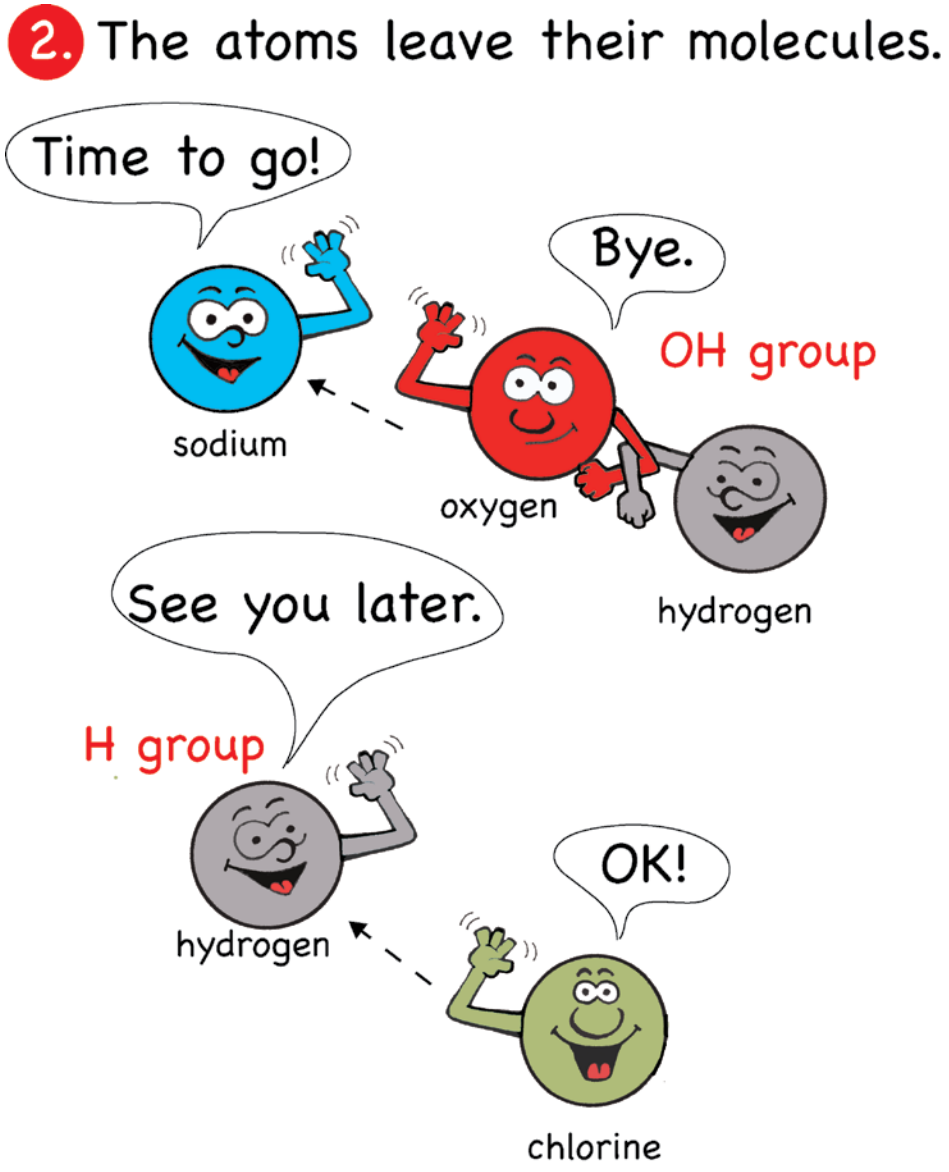
(sodium hydroxide)

(hydrogen chloride)

7.2 Acid-Base Reactions

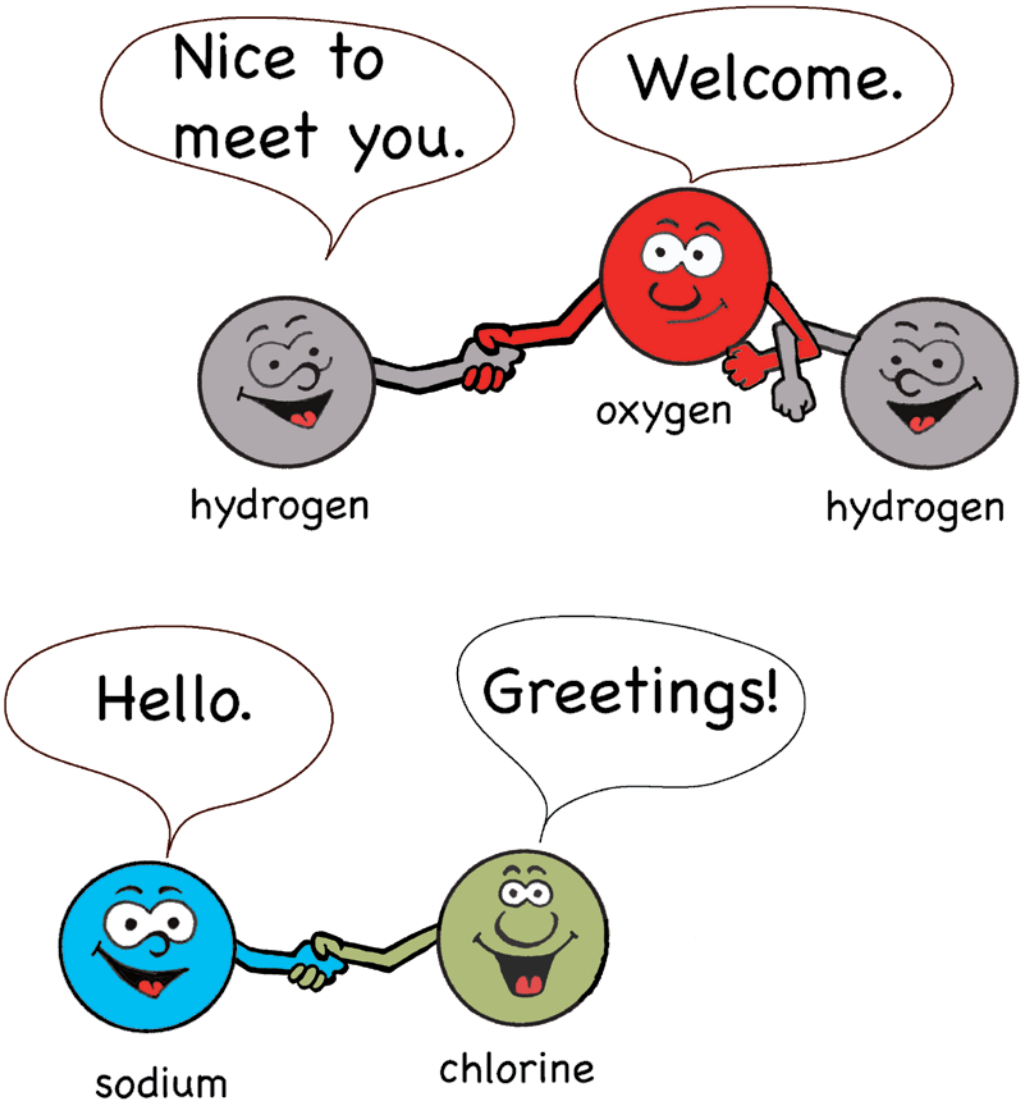
In fact, they do! Acids and bases make a special kind of reaction called an acid-base reaction. When an acid and a base meet, the atoms in the acid exchange with the atoms in the base.

After they meet, some atoms leave their molecules.



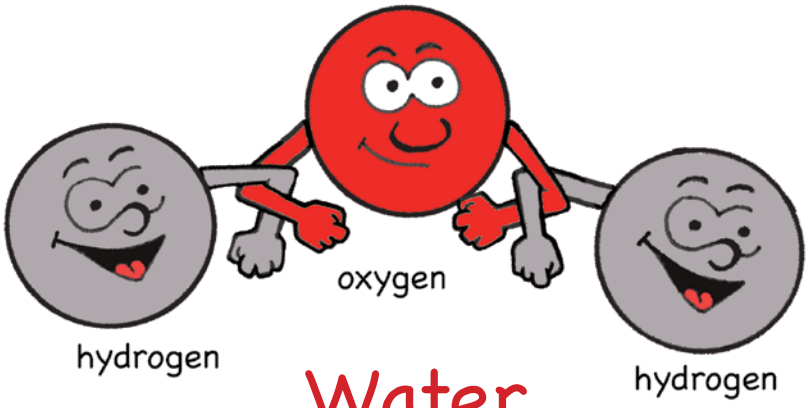
Next, the atoms that left their molecules go to the other molecules and "make new friends."

3. The atoms make new friends.



Now two new molecules have been made. The new molecules for this reaction are water and table salt (sodium chloride).

4. Two new molecules are made.



Water

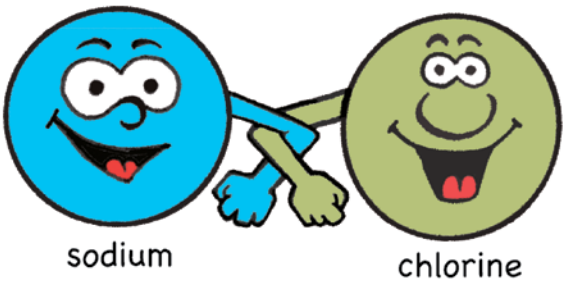


Table Salt
(sodium chloride)

The acids and bases are no longer acids and bases. When they react, they become other kinds of molecules, such as salt and water.

7.3 Important Acid-Base Reactions

Acid-base reactions are very important. For example, your stomach has acid in it. This acid is necessary for digesting your food. Sometimes there is too much acid. When this happens, your stomach hurts. The medicine your mom or

dad may give you is a base. It reacts with the acid in your stomach, turning it into a salt and water. That makes your stomach stop hurting.

7.4 Summary

- Acids and bases react with each other in acid-base reactions.
- When an acid and a base meet in an acid-base reaction, atoms in the acid exchange with atoms in the base.
- Many acid-base reactions make salts and water.
- Acid-base reactions are very important.

7.5 Some Things to Think About

- Have you ever added vinegar to baking soda? If so, can you describe what happened?
- How would you describe an acid-base reaction to your friend?
- What is your favorite remedy to take when your tummy hurts?

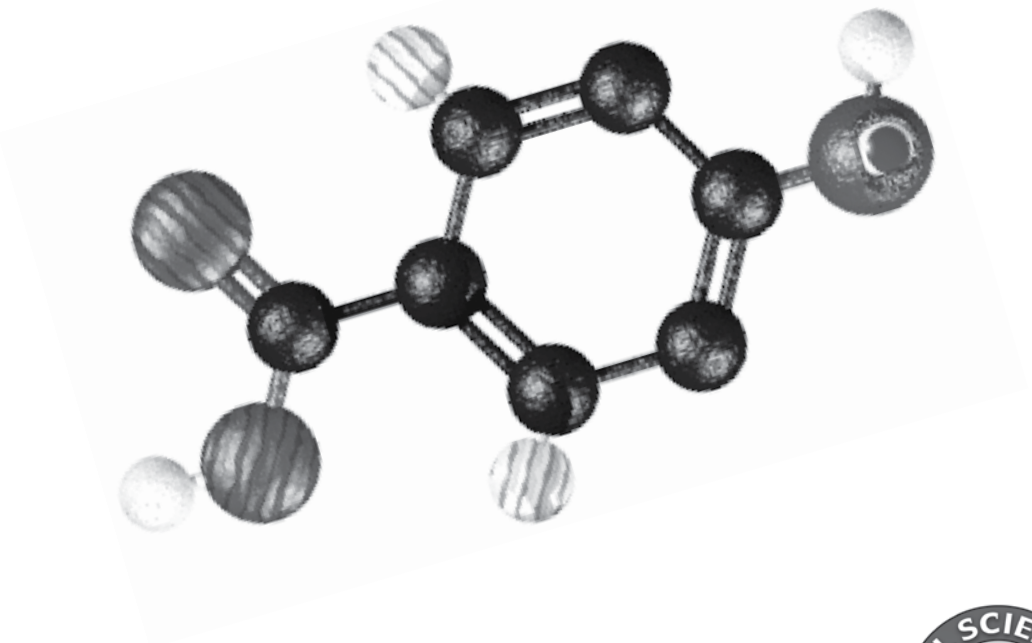
  pink antacid
  baking soda and water
  vinegar and water
  clear soda
  pickle juice

Grades K-4

FOCUS ON ELEMENTARY CHEMISTRY

Laboratory Notebook

3rd Edition



Rebecca W. Keller, PhD

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A Note From the Author

Hi!

In this curriculum you are going to learn the first step of the scientific method:

Making good observations!

In the science of chemistry, making good observations is very important.

Each experiment in this notebook has several different sections. In the section called *Observe It*, you will be asked to make observations. In the *Think About It* section you will answer questions. There is a section called *What Did You Discover?* where you will write down or draw what you observed from the experiment. And finally, in the section *Why?* you will learn about the reasons why you may have observed certain things during your experiment.

These experiments will help you learn the first step of the scientific method and.....they're lots of fun!

Enjoy!

Rebecca W. Keller, PhD

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Experiment 1

Chemistry Every Day

People have always used chemistry in their lives, but before it became a science, people did not know how chemistry made things work. In this experiment you will explore how you use chemistry every day.

I. Think About It

❶ Think about whether or not the things you do in a day involve any chemistry. Think about what you do, where you go, and what you eat.

❷ Make a list of some of the things you do in a day.

❸ Do any of these activities involve chemistry? Why or why not?

II. Observe It

Make a list of everything you do in one day. Start with the first thing you do in the morning and observe yourself throughout the day. Write down what you do, what you eat, how your food is prepared, where you go, and how you get there.

III. What Did You Discover?

❶ Do you use chemistry when you brush your teeth with toothpaste? Why or why not?

❷ Do you use chemistry when cooking food? Why or why not?

❸ Do you use chemistry when you eat food? Why or why not?

❹ Do you use chemistry when you ride in a car? Why or why not?

IV. Why?

Chemistry is the study of physical things and the matter things are made of. Chemists are scientists who do experiments to find out what physical things are like and how they change. Sometimes when matter is heated or when different kinds of matter are mixed together, a chemical process will make a change take place. By doing experiments, chemists can discover useful changes that happen to physical things. For example, chemists discovered which things when mixed together will make a soap that will take stains out of clothes.

Many daily activities use chemistry. Toothpaste is made of chemicals that help keep your teeth clean and your gums healthy. Cooking changes the chemistry of food. Eggs solidify with heat because of chemistry. Your body uses chemistry to digest the food you eat. A car is powered by the chemistry of gasoline. Painting a picture involves making mixtures and using chemicals that give off particular colors. All of these activities use chemistry.

V. Just For Fun

Use watercolor paints for this part of the experiment.

❶ Mix blue and red together. What color do you get?

_____

❷ Mix blue and yellow together. What color do you get?

_____

❸ Mix yellow and red together. What color do you get?

_____

❹ How many colors do you need to mix together to make black?

_____

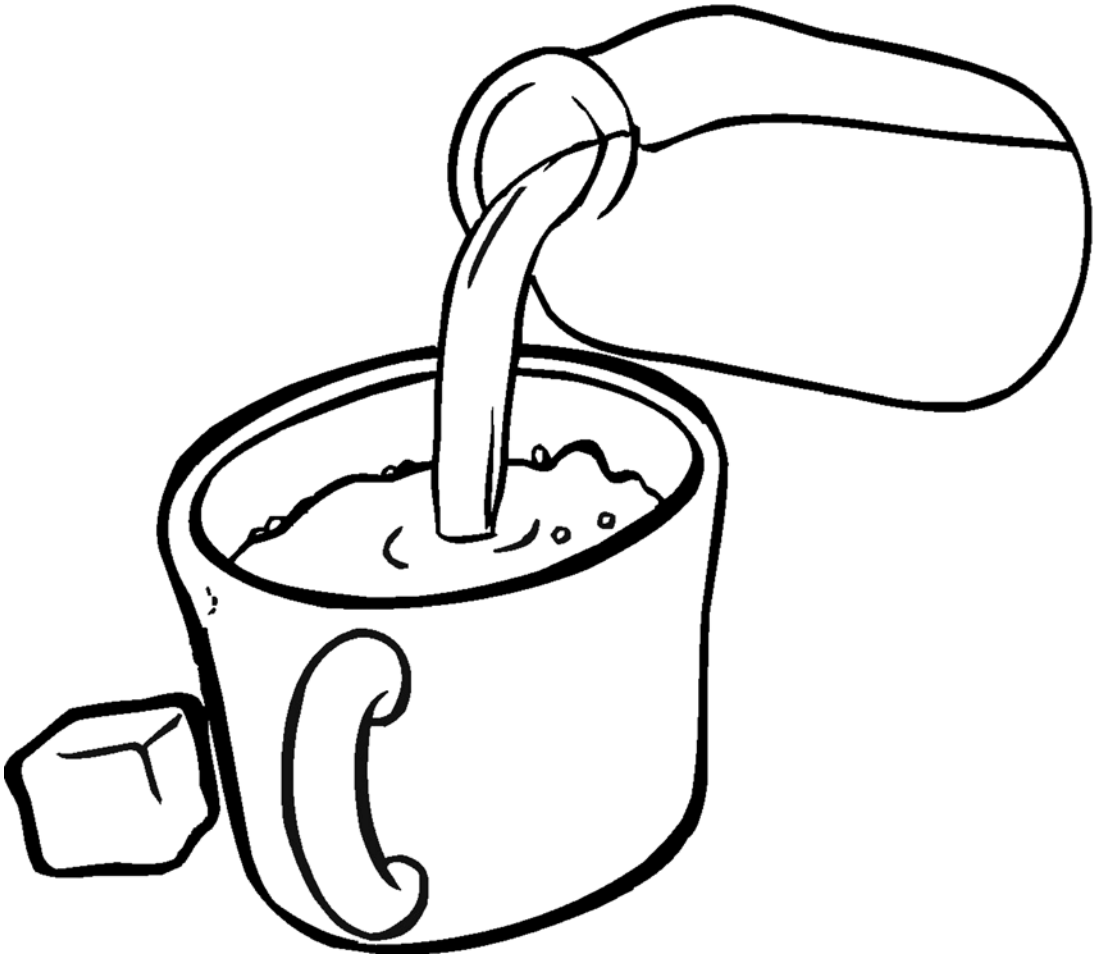
❺ Experiment with mixing the paint in different color combinations and see how many colors you can make.

❻ When the paint is dry, cut out some examples of your mixtures and tape them on the next page.

Paint Mixtures

Experiment 7

Pink and Green Together



Introduction

In the last experiment we added red cabbage juice indicator to different liquids and they changed color. Some turned pink, some turned green, and some turned purple. We found that the pink liquids were acids, the green liquids were bases, and the purple liquids were neither acids nor bases but were neutral.

I. Think About It

❶ What do you think will happen if you add a pink liquid to a green liquid?

❷ Do you think the color will change or stay the same? Why?

❸ Do you think a pink liquid will turn green if a green liquid is added? Why?

❹ Do you think a green liquid will turn pink if a pink liquid is added? Why?

❺ Do you think they will turn orange, blue, or even black? Why?

II. Observe It

❶ Take the red cabbage juice, add it to the following liquids, and then record the color.

Liquid	Pink	Green	Purple
distilled water			
mineral water			
lemon juice			
vinegar			
baking soda water			
antacid water			

❷ Mix the pink liquids and the green liquids together and observe whether or not they change color. Record your observations.

	antacid water	lemon juice	vinegar	mineral water	distilled water	baking soda water
antacid water						
lemon juice						
vinegar						
mineral water						
distilled water						
baking soda water						

❸ Complete the above chart by mixing the rest of the liquids together and recording the results.

III. What Did You Discover?

❶ What happened when you added a pink liquid to a green liquid?

❷ What happened when you added a green liquid to a pink liquid?

❸ Did you get different colors when you added different liquids together?

❹ Did any of the colors stay pink, green, or purple?

IV. Why?

You may have seen that when you added the pink liquids to the green liquids, the pink liquids turned green. You may also have noticed that when you added the pink liquids to the green liquids, the green liquids turned pink. You may have observed that when you kept adding the liquids together, all of the liquids turned purple (the same color that water turns with the cabbage juice indicator). Why? Why do the pink or green liquids change color, and why do all of the liquids turn purple at the end?

Remember that the pink liquids are acids, and the green liquids are bases. When acids and bases are added together, they react. That is, they change—the acids lose what makes them acids, and the bases lose what makes them bases.

This is why all of the liquids turn purple when you continue to mix them. They turn into a liquid that is neither an acid nor a base—it is neutral, like water!

V. Just For Fun

Find different liquids to mix together and test with the red cabbage juice indicator. You might try mixing soda pop with baking soda water and white grape juice with baking soda water. What happens if you mix the mixtures together? What other mixtures can you make and then mix together? Record your observations.

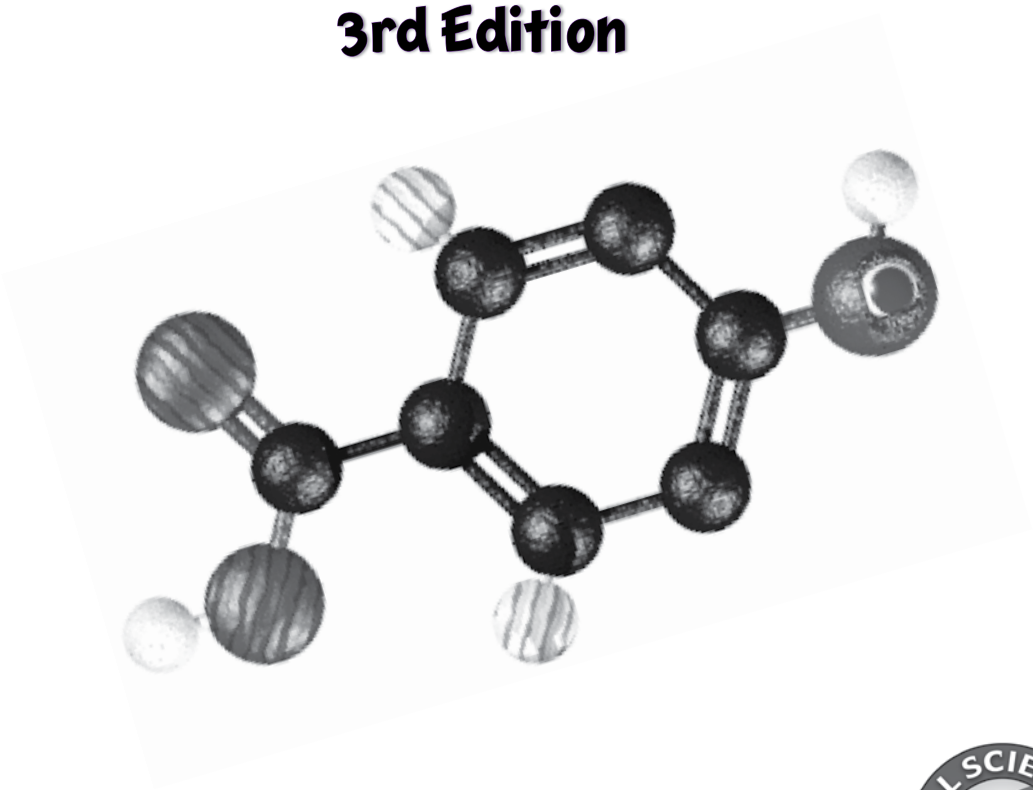
Mixture Observations

Grades K-4

FOCUS ON ELEMENTARY CHEMISTRY

Teacher's Manual

3rd Edition



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A Note From the Author

This curriculum is designed to provide an introduction to chemistry for students in the elementary level grades. *Focus On Elementary Chemistry—3rd Edition* is intended to be used as the first step in developing a framework for the study of real scientific concepts and terminology in chemistry. This *Teacher's Manual* will help you guide students through the series of experiments in the *Laboratory Notebook*. These experiments will help the students develop the skills needed for the first step in the scientific method — making good observations.

There are several sections in each chapter. The section called *Observe It* helps the students explore how to make good observations. The *Think About It* section provides questions for the students to think about and use to make further observations. In every chapter there is a *What Did You Discover?* section that gives the students an opportunity to summarize the observations they have made. A section called *Why?* provides a short explanation of what students may or may not have observed. And finally, in each chapter there is a section called *Just For Fun* that contains an additional activity.

The experiments take up to 1 hour. The materials needed for each experiment are listed on the next page and also at the beginning of each experiment.

Enjoy!

Rebecca W. Keller, PhD

Materials at a Glance

Experiment 1

watercolor paints
water in a container
paintbrush
several pieces of paper to paint on
scissors
tape

Experiment 2

salt, 15 ml
water, 237 ml
brick of modeling clay (1 or 2)
sugar

Experiment 3

magnifying glass
household items such as:
- cotton balls
- rubber bands
- pencil

several food items such as:
- crackers
- cheese
- marshmallow
- beans
- color-coated candy

Experiment 4

Legos
small marshmallows, 1 pkg
large marshmallows, 1 pkg
toothpicks

Experiment 5

4 or more clear plastic cups or glasses
marking pen
measuring cup
measuring spoons
the following food items:
- lemon juice - 180 ml
- vinegar - 180 ml
- milk - 180 m
- baking soda - 90 ml
- water - 180 ml

Just For Fun section:
baking soda
vinegar
sugar
Or
2 or more food items chosen by student

Experiment 6

clear plastic cups, 12+
measuring cup
measuring spoons
marking pen
1 head of red cabbage
knife
cooking pot, large
distilled water, 1.25-1.75 liters
white grape juice, 60 ml
milk, 60 ml
lemon juice, 60 ml
grapefruit juice, 60 ml
mineral water, 60 ml
antacid tablets—3 extra-strength unflavored white Tums
baking soda, 5 ml
other substances to test

Optional
small plastic bag
wooden mallet or other hard object

Experiment 7

18 or more clear plastic cups
measuring cup
measuring spoons
marking pen
leftover red cabbage juice from Experiment 6 or one head of red cabbage
food items, approx. 300 ml each:
- vinegar, lemon juice, mineral water, distilled water

baking soda (25 ml or more)
antacid tablets, 5 or more (try Tums plain, white, extra strength)
substances of students' choice

Experiment 8

15 or more clear plastic cups
measuring cup
measuring spoons
spoon for mixing
liquid soap
marking pen
the following food items (approx. 60 ml each):
- water
- milk
- juice
- vegetable oil
- melted butter

Experiment 9

several glasses or plastic cups
measuring cup
3 bags (small paper or plastic)
several small rocks (5-10)
Legos (handful)
sand (2 handfuls)
sugar (handful)
salt (2 handfuls)
water
food coloring, several colors
1-2 white coffee filters
white paper, several sheets
scissors
several pencils
tape

Experiment 10

Elmer's white glue, approx. 30-60 ml
liquid laundry starch, approx. 30-60 ml (or cornstarch, borax, and water mixture)
measuring cup
2 plastic cups
30 metal paper clips
Elmer's white glue, approx. 30-60 ml
Just For Fun section:
non-toxic glue such as blue glue, clear glue, wood glue, glitter glue, or paste glue, approx. 30-60 ml

Optional
food coloring

Experiment 11

the following foods:
- marshmallows (2-3)
- ripe banana
- green banana
- several pretzels or salty crackers
- raw potato
- cooked potato
- other food items

blindfold

Experiment 12

flour, 2 liters
1 pkg. active dry yeast
sugar, 30 ml
vegetable oil
salt, 5 ml
soft butter, 120 ml
double-acting baking powder, 15 ml
milk, 360 ml
measuring cups
measuring spoons
4 mixing bowls
mixing spoon
floured bread board
2 cookie sheets
marking pen
refrigerator
oven
timer

Optional
rolling pin
biscuit cutter
2 bread pans

Materials: Quantities Needed for All Experiments

Equipment	Materials	Foods
blindfold bowls, mixing, 4 bread board, floured cookie sheets, 2 cup, measuring cups or glasses, 12-50 clear plastic knife Legos magnifying glass oven pot, large, cooking refrigerator scissors spoon for mixing spoons, measuring timer **Optional** biscuit cutter bread pans, 2 mallet, wooden, or other hard object rolling pin	bags (small paper or plastic), 3 clay, modeling, 1 or 2 bricks coffee filters, 1-2 white food coloring, several colors glue, Elmer's white, approx. 30-60 ml glue, non-toxic, such as blue glue, clear glue, wood glue, glitter glue, or paste glue, approx. 30-60 ml household items such as: cotton balls rubber bands pencil paintbrush paints, watercolor paper, several pieces to paint on paper, white, several sheets paperclips, 30 metal pen, marking pencils, several rocks, small (5-10) sand (2 handfuls) soap, liquid starch, liquid laundry, approx. 30-60 ml (or cornstarch, borax, and water mixture) tape toothpicks water water, distilled **Optional** bag, 1 plastic, small	antacid tablets—8 or more extra-strength unflavored white Tums baking powder, double-acting baking soda bananas, 1 ripe, 1 green butter cabbage, red, 1-2 heads flour, 2 liters food items such as: beans candy, color-coated (e.g., M&Ms) cheese crackers marshmallow juice, grapefruit juice, lemon juice, white grape marshmallows, large, 1 pkg marshmallows, small, 1 pkg milk potato, 1 raw, 1 cooked pretzels or salty crackers, several salt sugar vegetable oil vinegar water, mineral yeast, 1 pkg. active dry **Optional** food items chosen by student

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Experiment 1

Chemistry Every Day

Materials Needed

- watercolor paints
- water in a container
- paintbrush
- several pieces of paper to paint on
- scissors
- tape

Objectives

In this experiment students explore how chemistry is involved in activities they perform daily.

The objectives of this lesson are for the students to:

- Observe their activities.
- Make the connection that the activities they perform involve some aspect of chemistry.

Experiment

I. Think About It

Read this section of the *Laboratory Notebook* with your students.

❶-❷ Have the students think about and make a list of the activities they perform in a day. Some suggestions are:

- *Brushing their teeth.*
- *Shampooing their hair.*
- *Eating a cooked egg.*
- *Washing something with soap.*
- *Using a car or other motorized vehicle for transportation.*

❸ Guide the students in their exploration of whether or not these activities involve chemistry.

There are no right answers for these questions. Just allow the students to explore their own ideas.

II. Observe It

Read this section of the *Laboratory Notebook* with your students.

Have your students observe and make a list of everything they do during the course of one day. Have them be as specific as possible.

Have them observe when they are using products such as toothpaste, shampoo, soap, other cleaning products, or medications.

Have them observe the use of any tools or machines. Are they riding a bike, riding in a car, or using an electric powered tool?

III. What Did You Discover?

Read the questions with your students.

❶-❹ Have the students answer the questions. These can be answered orally or in writing. Again, there are no right answers, and their answers will depend on what they actually observed.

IV. Why?

Read this section of the *Laboratory Notebook* with your students.

Discuss any questions that might come up.

V. Just For Fun

Read this section of the *Laboratory Notebook* with your students.

❶-❹ Help your students use watercolors to observe how colors mix. Have them notice how colors change and which colors mixed together will make black.

❺ If the students are interested, they may enjoy experimenting with mixing different colors of their own choice to see what happens.

❻ Have the students cut out some examples of their paint mixtures and tape them in their *Laboratory Notebook* in the space provided. A hair dryer can be used to speed drying time.

Experiment 7

Pink and Green Together

Materials Needed

- 18 or more clear plastic cups
- measuring cup
- measuring spoons
- marking pen
- leftover red cabbage juice from Experiment 6 or one head of red cabbage
- the following food items, approx. 300 ml (1 1/4 cups) each:
  vinegar
  lemon juice
  mineral water
  distilled water (if you need to make red cabbage juice, you will need 1.5 liters more)
- baking soda, 25 ml (5 tsp.) or more
- antacid tablets, 5 or more (try Tums plain, white, extra strength)
- substances of students' choice to mix together

Objectives

In the last experiment students added red cabbage juice to several liquids to determine which were acids and which were bases. In this experiment students will continue their exploration of acids and bases.

The objectives of this lesson are for students to:

- Explore what happens when an acid and a base are mixed together.
- See that mixing an acid and a base can result in a neutral mixture, one that is neither an acid nor a base.

Experiment

If you have refrigerated red cabbage juice left from Experiment 3, use that. Otherwise follow the directions below.

If you do not have red cabbage juice from Experiment 6, do the following 1 hour before:

Chop or shred one head of red cabbage and boil it in approximately 1.5 liters (6 cups) of distilled water for 15 minutes. Remove the cabbage and allow the liquid to cool to room temperature.

NOTE: Do not use tap water. Use only distilled water or you will not get the correct results.

Setup

Put 60 ml (1/4 cup) of each of the following liquids into separate plastic cups and label the cups with a marking pen:

- vinegar
- lemon juice
- mineral water
- distilled water

Take two more plastic cups and put 60 ml (1/4 cup) of distilled water in each. Add 5 ml (1 tsp.) of baking soda to one cup and an antacid tablet to the other. (You may want to break or crush the tablet to help it dissolve faster.)

Alternatively, you can mix enough baking soda water and antacid water for the entire experiment. Use 300 ml (1 1/4 cups) distilled water to 25 ml (5 tsp.) baking soda and the same amount of distilled water with 5 or more antacid tablets. Then put 60 ml (1/4 cup) of each solution in a cup.

Label the cups.

I. Think About It

Read this section of the *Laboratory Notebook* with your students.

❶-❺ Have the students think about and answer the questions in this section of the *Laboratory Notebook*. Their answers will vary.

II. Observe It

Read this section of the *Laboratory Notebook* with your students.

❶ Place all of the cups on the table and have the students add 60 ml (1/4 cup) of cabbage juice to each cup. Have them observe the color of the liquid in each cup, and then have them record their results in the chart.

They should get the following:

Liquid	Pink	Green	Purple
distilled water			*X*
mineral water			*X*
lemon juice	*X*		
vinegar	*X*		
baking soda water		*X*	
antacid water		*X*	

❷ Have the students pour a green liquid into a cup containing a pink liquid and then a pink liquid into a cup containing a green liquid. This way they can observe that the result will be the same if an acid is added to a base or a base is added to an acid. Have them try all the combinations of pink and green liquids. Help the students fill more cups as needed.

Have them record their observations. Not all the empty squares will be filled in during this part of the experiment.

	antacid water	lemon juice	vinegar	mineral water	distilled water	baking soda water
antacid water						
lemon juice						
vinegar						
mineral water						
distilled water						
baking soda water						

❸ Next, have the students mix together the remaining liquids listed on the chart. Help them record any color changes that occur. For example, when lemon juice (pink) is added to mineral water (purple), the mineral water will turn pink. When mineral water (purple) is added to baking soda water (green), the color may change only slightly.

Encourage them to keep pouring the liquids back and forth to see what happens when mixtures are added to other mixtures. In the end, all of the liquids should turn purple. If some liquids are still green or pink, have the students pour them back and forth until every cup contains purple liquid.

Have them record anything they observe that they find interesting.

III. What Did You Discover?

Read this section of the *Laboratory Notebook* with your students.

❶-❹ Help the students answer the questions in this section. They should have seen some of the pink liquids turn green when green liquid was added and some of the green liquids turn pink when pink liquid was added.

IV. Why?

Read this section of the *Laboratory Notebook* with your students.

Have the students look at the chart they made and discuss the results with them. Explain that when they poured the liquids back and forth, the colors changed because the acids and bases were *reacting* with each other. Remind the students that in Chapter 6 they learned that a chemical reaction can be *indicated* by a color change. In this experiment the red cabbage juice indicator changed color as the acids and bases reacted with each other.

At the end of the experiment all of the liquids turn purple. Explain to the students that the acids and bases react with each other and cancel each other out, or *neutralize* each other. In the end there are no acids or bases left, only neutral liquids.

V. Just For Fun

Have the students look for some different liquids they can mix together and test with red cabbage juice indicator. Have them save these mixtures and then mix the mixtures together and see what happens. Do they change color? Have them observe whether they have an acid, a base, or a neutral mixture. They are not to taste these mixtures.

Grades K-4

FOCUS ON

ELEMENTARY CHEMISTRY

LESSON PLAN

3rd Edition

Rebecca W. Keller, PhD

REAL SCIENCE 4 Kids

Real Science-4-Kids

Focus On Elementary Chemistry Lesson Plan—3rd Edition

Published by Gravitas Publications Inc.
www.gravitaspublications.com
www.realscience4kids.com

LESSON PLAN INSTRUCTIONS

This *Lesson Plan* accompanies *Focus On Elementary Chemistry Student Textbook, Laboratory Notebook,* and *Teacher's Manual—3rd Edition*. It is designed to be flexible to accommodate a varying schedule as you go through the year's study. And it makes it easy to chart weekly study sessions and create a portfolio of your student's yearlong performance. The PDF format allows you to print pages as you need them.

This Lesson Plan file includes:

- Weekly Sheets
- Sticker Templates
- Self-Review Sheet
- Self-Test Sheet

Materials recommended but not included:

- 3-ring binder
- Indexing dividers (3)
- Labels—24 per sheet,1.5" x 1.5" (Avery 22805)

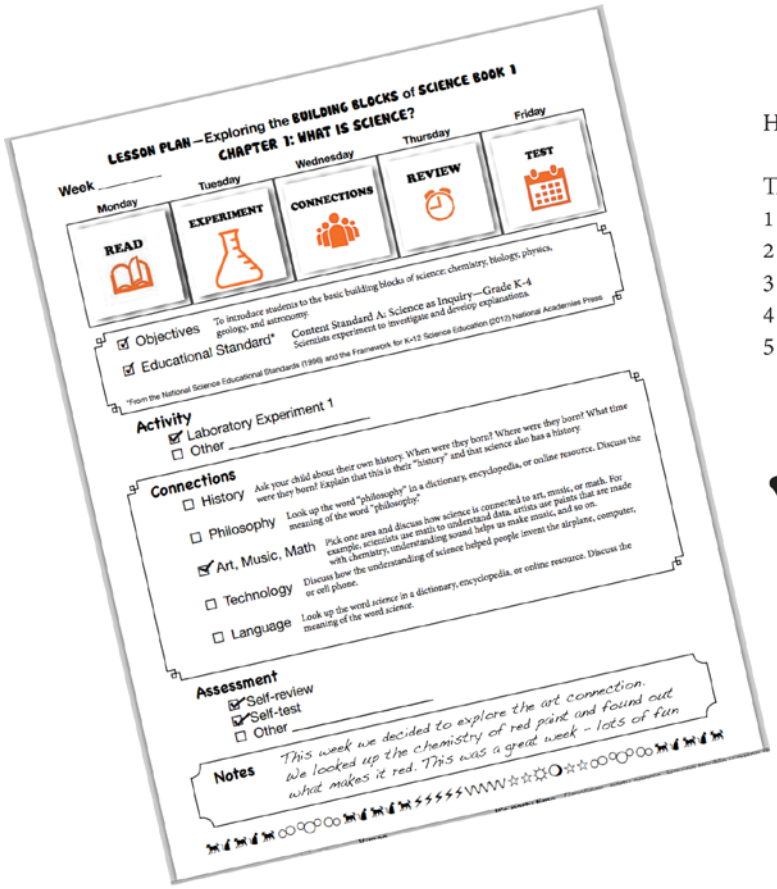
Use the Weekly Sheets to map out daily activities and keep track of student progress. For each week you decide when to read the text, do the experiment, explore the optional connections, review the text, and administer tests. For those families and schools needing to provide records of student performance and show compliance to standards, there is a section on the Weekly Sheets that shows how the content aligns to the National Science Standards.

To use this Lesson Plan:

- Print the Weekly Sheets
- Print Self-Review Sheets
- Print Self-Test Sheets
- Print the stickers on 1.5" x 1.5" labels
- Place all the printed sheets in a three-ring binder separated by index dividers

At the beginning of each week, use the squares under each weekday to plan your daily activities. You can attach printed stickers to the appropriate boxes or write in the daily activities. At the end of the week, use the Notes section to record student progress and performance for that week.

WEEKLY LESSON PLAN SAMPLES


LESSON PLAN—Exploring the BUILDING BLOCKS of SCIENCE BOOK 1
CHAPTER 1: WHAT IS SCIENCE?

Week _____

Monday	Tuesday	Wednesday	Thursday	Friday
READ	EXPERIMENT	CONNECTIONS	REVIEW	TEST

☑ Objectives — To introduce students to the basic building blocks of science: chemistry, biology, physics, geology, and astronomy.
☑ Educational Standard* — Content Standard A: Science as Inquiry—Grade K-4 Scientists experiment to investigate and develop explanations.
*From the National Science Educational Standards (1996) and the Framework for K-12 Science Education (2012) National Academies Press

Activity
☑ Laboratory Experiment 1
☐ Other _____

Connections
☐ History — Ask your child about their own history. When were they born? Where were they born? What time were they born? Explain that this is their "history" and that science also has a history.
☐ Philosophy — Look up the word "philosophy" in a dictionary, encyclopedia, or online resource. Discuss the meaning of the word "philosophy."
☑ Art, Music, Math — Pick one area and discuss how science is connected to art, music, or math. For example, scientists use math to understand data, artists use paints that are made with chemistry, understanding sound helps us make music, and so on.
☐ Technology — Discuss how the understanding of science helped people invent the airplane, computer, or cell phone.
☐ Language — Look up the word science in a dictionary, encyclopedia, or online resource. Discuss the meaning of the word science.

Assessment
☑ Self-review
☑ Self-test
☐ Other _____

Notes This week we decided to explore the art connection. We looked up the chemistry of red paint and found out what makes it red. This was a great week - lots of fun

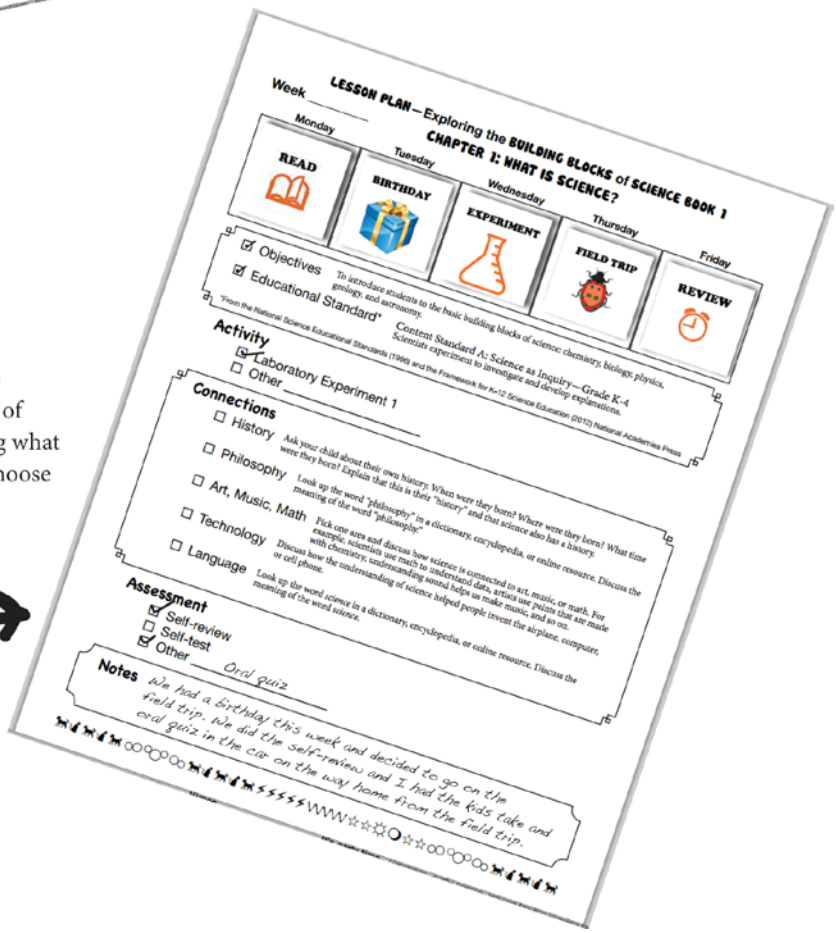
Here is a sample of a normal week.

The recommended sequence is
1 - Read the student textbook on the first day.
2 - Do the laboratory experiment on the second day.
3 - Pick one or more connections to explore on the third day.
4 - Do the self-review sheet on the fourth day.
5 - Administer the self-test or another exam on the fifth day.

Here is a sample of a week with other activities

1- Find at least one day to READ the text.
2 - Find a day to perform the EXPERIMENT.
3 - Find a day to do the REVIEW or TEST.

Any activity that is missed can be rescheduled for the following week. However, keep to the main sequence of reading the text, doing the experiment, and reviewing what has been covered. If an activity needs to be missed, choose the CONNECTIONS or SELF-TEST.


LESSON PLAN—Exploring the BUILDING BLOCKS of SCIENCE BOOK 1
CHAPTER 1: WHAT IS SCIENCE?

Week _____

Monday	Tuesday	Wednesday	Thursday	Friday
READ	BIRTHDAY	EXPERIMENT	FIELD TRIP	REVIEW

☑ Objectives — To introduce students to the basic building blocks of science: chemistry, biology, physics, geology, and astronomy.
☑ Educational Standard* — Content Standard A: Science as Inquiry—Grade K-4 Scientists experiment to investigate and develop explanations.
*From the National Science Educational Standards (1996) and the Framework for K-12 Science Education (2012) National Academies Press

Activity
☑ Laboratory Experiment 1
☐ Other _____

Connections
☐ History — Ask your child about their own history. When were they born? Where were they born? What time were they born? Explain that this is their "history" and that science also has a history.
☐ Philosophy — Look up the word "philosophy" in a dictionary, encyclopedia, or online resource. Discuss the meaning of the word "philosophy."
☐ Art, Music, Math — Pick one area and discuss how science is connected to art, music, or math. For example, scientists use math to understand data, artists use paints that are made with chemistry, understanding sound helps us make music, and so on.
☐ Technology — Discuss how the understanding of science helped people invent the airplane, computer, or cell phone.
☐ Language — Look up the word science in a dictionary, encyclopedia, or online resource. Discuss the meaning of the word science.

Assessment
☑ Self-review
☐ Self-test
☑ Other Oral quiz

Notes We had a birthday this week and decided to go on the field trip. We did the self-review and I had the kids take and oral quiz in the car on the way home from the field trip.

Week _____ **CHAPTER 1: WHAT IS CHEMISTRY?**

Monday	Tuesday	Wednesday	Thursday	Friday

☑ Objectives To introduce students to the scientific discipline called chemistry.

☑ Educational Standard* **Content Standard 2-PS1.B: Chemical Reactions**
Heating or cooling a substance may cause changes that can be observed.

*From the Next Generation Science Standards (NGSS)

Activity

- ☐ Laboratory Experiment 1
- ☐ Other _____

Connections

- ☐ History — Look up the history of chemistry on the internet or in the library. Discuss how ancient people used chemistry in their everyday lives; for example, processes for treating furs, making paints, and molding metals.
- ☐ Philosophy — Look up the philosophy of chemistry on the internet or in the library. Explain how philosophers and scientists both ask questions about how to describe the physical world.
- ☐ Art, Music, Math — Discuss how chemistry has played a role in the history of art. For example, modern paints are very different from paint used several hundred years ago.
- ☐ Technology — Discuss how chemistry has changed many of the ways we live. For example, pesticides have changed the way we farm, polyesters have changed our clothing, and rocket fuel has allowed us to fly to the moon.
- ☐ Language — Look up the word *chemistry* in a dictionary, encyclopedia, or online resource. Discuss the meaning of the word *chemistry*.

Assessment

- ☐ Self-review
- ☐ Self-test
- ☐ Other _____

Notes

Week _____ **CHAPTER 7: ACIDS AND BASES REACT**

Monday	Tuesday	Wednesday	Thursday	Friday

☑ Objectives To have students explore the nature of acid/base chemistry.

☑ Educational Standard* **Content Standard 2-PS1.B**
Chemical reactions can be observed.

*From the Next Generation Science Standards (NGSS)

Activity

- ☐ Laboratory Experiment 7
- ☐ Other _____

Connections

- ☐ History Look up the history of antacids and explore how people discovered that antacids could relieve stomach pain.
- ☐ Philosophy In chemistry, acids and bases are "opposites" that can violently react when combined. Explore with your students the nature of other types of "opposites" that can "react" when combined.
- ☐ Art, Music, Math Continue to explore how the combination of "opposites" creates dramatic effect in the arts. Look for examples in music and writing.
- ☐ Technology Explore how medicine, science, and technology helped create medicines to relieve stomach pain.
- ☐ Language Look up the word *reaction* in a dictionary or encyclopedia. Discuss the meaning of the word *reaction*.

Assessment

- ☐ Self-review
- ☐ Self-test
- ☐ Other _____

Notes

SELF-REVIEW

Think about all of the ideas, concepts, and facts you read about in this chapter. In the space below, write down everything you've learned.

Date _____ **Chapter** _____

SELF-TEST

Imagine you are the teacher and you are giving your students an exam. In the space below, write 5 questions you would ask a student based on the information you learned in this chapter.

Date _____ **Chapter** _____

READ

READ

READ

READ

REVIEW

REVIEW

REVIEW

REVIEW

EXPERIMENT

EXPERIMENT

EXPERIMENT

EXPERIMENT

CONNECTIONS

CONNECTIONS

CONNECTIONS

CONNECTIONS

TEST

TEST

TEST

TEST

READ

READ

READ

READ

HOLIDAY

HOLIDAY

HOLIDAY

HOLIDAY

FIELD TRIP

FIELD TRIP

FIELD TRIP

FIELD TRIP

BIRTHDAY

BIRTHDAY

BIRTHDAY

BIRTHDAY

REST DAY

REST DAY

REST DAY

REST DAY

REST DAY

REST DAY

REST DAY

REST DAY

SICK DAY

SICK DAY

SICK DAY

SICK DAY

FOCUS ON

Grades K-4

ELEMENTARY CHEMISTRY

STUDY NOTEBOOOK

3rd Edition

REAL SCIENCE 4 Kids

(Print this page and glue to the front of your Study Notebook.)

Real Science-4-Kids

Illustrations: Janet Moneymaker

Focus On Elementary Chemistry Study Notebook—3rd Edition

Published by Gravitas Publications Inc.
Real Science-4-Kids®
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www.gravitaspublications.com

FOCUS ON ELEMENTARY CHEMISTRY STUDY NOTEBOOK

This Study Notebook has activities for you to do that will help you learn the ideas presented in each chapter of the Student Textbook.

Materials you will need

- 8.5 x 11 white paper
- color printer
- scissors
- glue or clear tape
- colored pencils
- 1 manila file folder
- 3 brad paper fasteners or 3-ring binder
- 3-hole punch

STEP 1 Printing

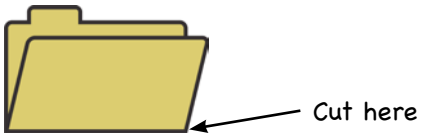
- Download the Study Notebook file for the chapter you are reading.
- Use the printer settings: portrait, letter, 8.5 x 11.
- Print the pages single sided.

STEP 2 Activities

- The little blue boxes on the left-hand side of the main pages show you which section of the Student Textbook has the information for that activity.
- For the chapter you are studying, do the activities on the two main pages (those that have page numbers at the bottom): fill in the blanks, answer questions, and follow the directions for other types of activities.
- On the **Stuff to Cut Out** pages, follow the directions for cutting out the pieces and gluing or taping them to the main pages.

STEP 3 Make the Study Notebook pages into a Book

- Cut the file folder in half along the fold.
- Use a 3-hole punch to make holes along the cut edge of the file folder pieces.



- Use the two pieces for the front and back covers.
- As you complete each chapter, punch holes in the pages and insert them between the front and back covers of your Study Notebook.

This is YOUR book! Add color to the pages along with doodles, squiggles, and notes in the margins. The backs of the pages are great for writing observations and ideas. Add your own pages with more ideas, observations, questions, science news you have heard about, and anything else you want to remember.

1. What Is Chemistry?

Punch holes on this edge.

Chemistry

1.1 is the s t _ d _
of m _ tt _ r.

1.1 What is **everything** you can see, smell, or touch made of?

M _ _ _ _ _!

Draw some objects that are made of **MATTER**.

1.2 **What** are **2** ways **you** can learn about the world?

By th _ n _ _ ng

By doing e _ per _ m _ nts

Do you **think** you are using **chemistry** when you use **soap**? YES! NO!

1.3 What is **ALL matter** made of?

A _ _ _ _!

1.3 **Is this an ATOM fact?**

Atoms are too small to be seen with just our eyes.

YES! **NO!**

To show that **atoms exist**, scientists:
(✓ check one)

- **Cook dinner**
- **Argue**
- **Give lectures**
- **Do experiments**

Punch holes on this edge.

1.3

Question:

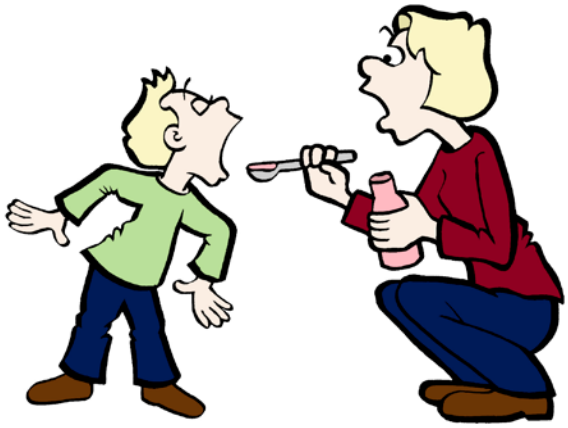
An **atom** is too tiny to be seen with just our eyes. Do you think this means an **atom** is too tiny to have weight?

Why or why not?

Answer:

1.4

Glue **TAB 1.4A** Here



Do you use chemistry when you take some medicine?

YES **NO**

Glue **TAB 1.4C** Here

Be a CHEMIST!

Do this little experiment.

1. Think about what might happen if you add vinegar to baking soda.
2. Put a teaspoonful of baking soda in a clear glass or cup.
3. Add about a teaspoonful of vinegar to the cup or pour in a little vinegar.
4. What do you observe?
5. Why do you think this happened? Was it what you expected?

1.4

Chemistry is everywhere! YES!

We hardly ever use Chemistry. NO!

TRUE!

FALSE!

Stuff to Cut Out for Chapter 1

Cut out each of these pieces on their solid outline. Put glue on the back of the bar that has the **TAB** number. Glue to the Study Notebook page, matching the **TAB** numbers.

Take the piece below and match **yellow TAB 1.4A** to the **green GLUE TAB 1.4A HERE** in Section 1.4 on page 2.

TAB 1.4A | Glue **TAB 1.4B** Here

Do you use chemistry when you brush your teeth?

YES **NO**

Take the piece below and match **yellow TAB 1.4B** to the **green GLUE TAB 1.4B HERE** on the piece you just glued in Section 1.4 on page 2.

TAB 1.4B

Do you use chemistry when you paint with watercolors?

YES **NO**

More Stuff to Cut Out for Chapter 1

Cut out each of these pieces on their solid outline. Put glue on the back of the bar that has the **TAB** number. Glue to the Study Notebook page, matching the **TAB** numbers.

Take the piece below and match **pink TAB 1.4C** to **blue GLUE TAB 1.4C HERE** in Section 1.4 on page 2.

TAB 1.4C | Glue **TAB 1.4D** Here

Be a CHEMIST!

Do this little experiment.

1. Think about what might happen if you add a teaspoonful of sugar to a glass of warm water.
2. Put warm water in a clear cup or glass. Taste the water.
3. Add a flat teaspoonful of sugar and stir. Taste.
4. What do you observe?
5. Why do you think this happened? Was it what you expected?

Take the piece below and match **pink TAB 1.4D** to **blue GLUE TAB 1.4D HERE** on the piece you just glued in Section 1.4 on page 2.

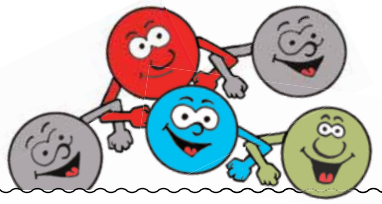
TAB 1.4D

Be a CHEMIST!

Do this little experiment.

1. Think about what might happen if you rub a little butter on a plate and rinse it with water.
2. Rub a little butter on a plate.
3. Rinse with water.
4. Now rub some dish soap on the butter and rinse with water.
5. What do you observe?
6. Why do you think this happened? Was it what you expected?

7. Acids and Bases React!



7.1

Explore
what happens when
ACIDS and **BASES**
meet.

When **A _ _ DS** and **BA _ _ S** **meet,** they make a special kind of **r _ _ ct _ _ n** called an **A _ _ _ - B_ _ _ r _ _ ct _ _ n.**

(See directions on **Stuff to Cut Out** pages.)

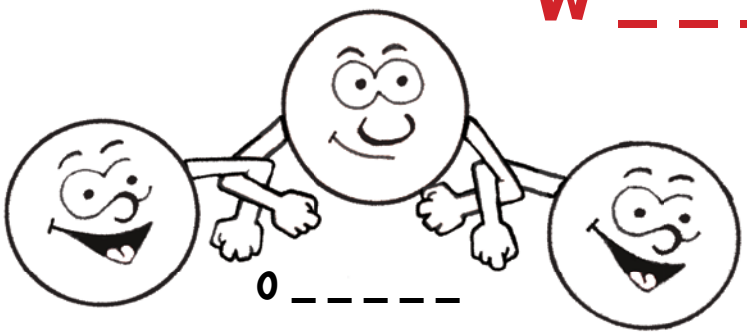
Punch holes on this edge.

Glue **TAB 7.2** Here

7.1
7.2

4 Two new **M _ _ _ _ _ _ _ S** are made.

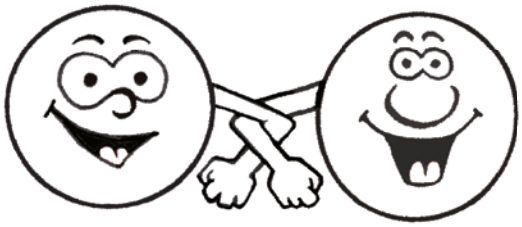
W _ _ _ _



O _ _ _ _ _

H _ _ _ _ _ _ _

H _ _ _ _ _ _ _



S _ _ _ _ _

C _ _ _ _ _ _ _

T _ _ _ _ S _ _ _

(s _ _ ium chlo _ _ de)

7.1
7.2

YOU be the teacher!

1. Print the **Quiz to Cut Out** page. Write 3 quiz questions about the information in Sections 7.1 and 7.2 of your Student Textbook.
2. Find a friend, sibling, or your teacher and explain to them what happens when acids and bases meet.
3. Have them take your quiz!

Glue **QUIZ TAB** Here

Punch holes on this edge.

7.3

Stomach Surprise!

Recall from *Study Notebook Chapter 6* that if your friend got a **stomachache** from having **too much ACID** in their **stomach**, you would tell them to take a **BASE**. Now your friend asks you why you think this will work. What is your answer?

Stuff to Cut Out for Chapter 7

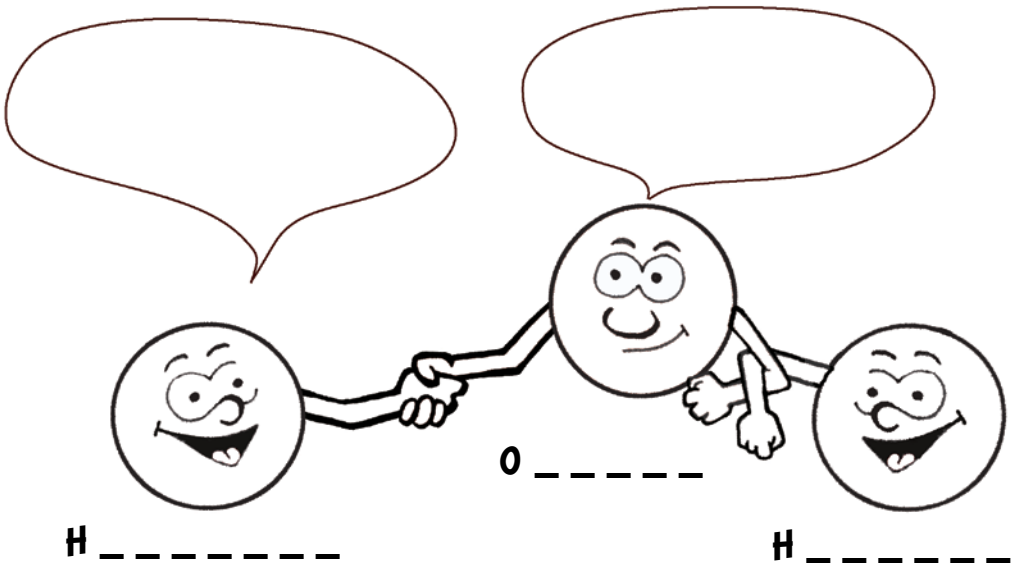
Cut out this piece and those on the following pages on their solid outline. Put glue on the back of the bar that has the **TAB** number. Glue to Study Notebook page 13, matching the **TAB** numbers. Use your Student Textbook to find the information to fill in the blanks and color the atoms.

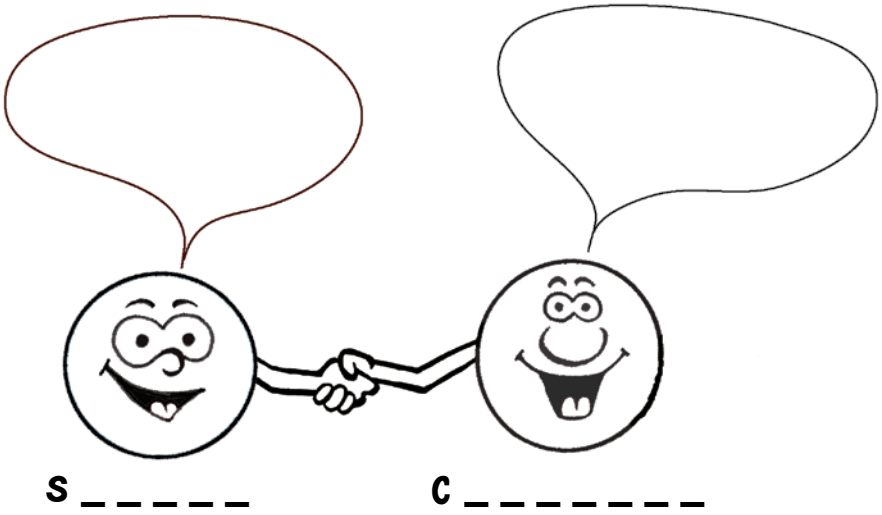
Fill in what the atoms are saying. Use the words in the textbook or make up your own words. Then cut out the piece below on its solid outline and match **yellow TAB 7.2** to the **green Glue TAB 7.2 Here** on page 13.

Glue **TAB 7.2A** Here

TAB 7.2

3 The **AT _ _ S** make new **F _ _ _ _ _ S**.





More Stuff to Cut Out for Chapter 7

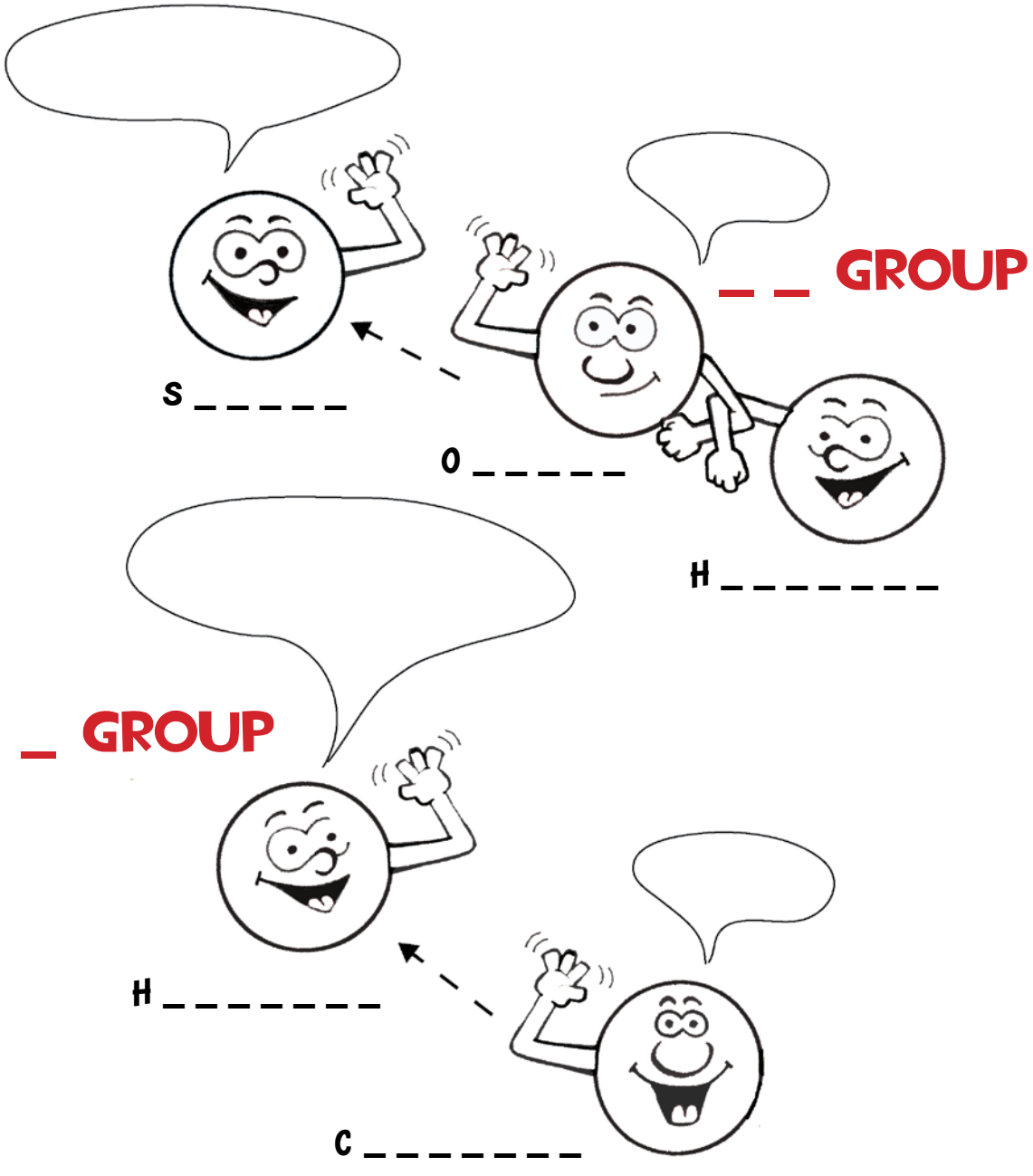
Cut out this piece and the one on the following page on their solid outline. Put glue on the back of the bar that has the **TAB** number. Glue to Study Notebook page 13, matching the **TAB** numbers. Use your Student Textbook to find the information to fill in the blanks and color the atoms.

Fill in what the atoms are saying. Use the words in the textbook or make up your own words. Then cut out the piece below on its solid outline and match **yellow TAB 7.2A** to the **green Glue TAB 7.2A Here** on page 13.

Glue **TAB 7.2B** Here

TAB 7.2A

2 The **AT _ _ S** leave their **M _ _ _ _ _ _ _ _ S**.



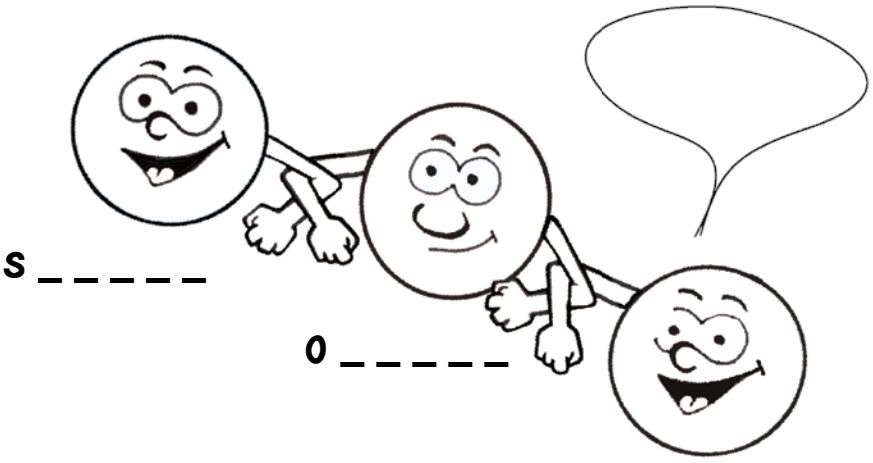
Even More Stuff to Cut Out for Chapter 7!

Cut out this piece on its solid outline. Put glue on the back of the bar that has the **TAB** number. Glue to Study Notebook page 13, matching the **TAB** numbers. Use your Student Textbook to find the information to fill in the blanks and color the atoms.

Fill in what the atoms are saying. Use the words in the textbook or make up your own words. Then cut out the piece below on its solid outline and match **yellow TAB 7.2B** to the **green Glue TAB 7.2B Here** on page 13.

TAB 7.2B

1 An **A** _ _ **D** and a **BA** _ _ **m** _ _ **t**.



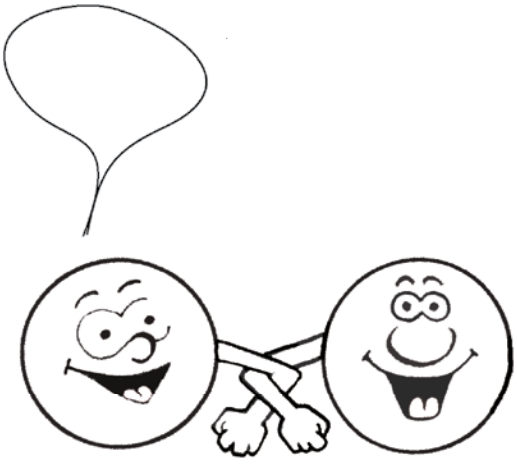
S _ _ _ _ _

O _ _ _ _ _

H _ _ _ _ _ _ _

B _ _ _

(sodium hydroxide)



H _ _ _ _ _ _ _

C _ _ _ _ _ _ _

A _ _ _

(hydrogen chloride)

Quiz to Cut Out for Chapter 7

Cut out this piece on its solid outline. Follow the directions in the **You be the teacher!** section on page 14. After the quiz has been completed, put glue on the back of the bar at the top that says **QUIZ TAB**. Glue to Study Notebook page 14, matching the **QUIZ TAB**s. Print this page and give the quiz as many times as you like. Glue all the quizzes in your Study Notebook.

QUIZ TAB

QUIZ! WHAT HAPPENS WHEN AN ACID AND A BASE MEET?

1. **Question** _____

_____

Answer _____

_____

_____

_____

2. **Question** _____

_____

Answer _____

_____

_____

_____

3. **Question** _____

_____

Answer _____

_____

_____

_____

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Focus On Elementary Chemistry 3rd Edition, Midterm 1
Chapters 1-6, 18 questions, 10 points each

1. In science, matter is... (10 points)
   - ○ A problem.
   - ○ Everything you can see, smell, or touch.
   - ○ An experiment.
   - ○ Chemistry.

2. In science, a model is a good guess about how something works. (10 points)
   - ○ True
   - ○ False

3. Chemistry... (Check all that apply.) (10 points)
   - ☐ Is the study of matter.
   - ☐ Is something we use only when doing experiments.
   - ☐ Is both thinking about how things work and doing experiments.
   - ☐ Happens every day.
   - ☐ Is a very new discovery.

Focus On Elementary Chemistry 3rd Edition, Midterm 2
Chapters 7-12, 18 questions, 10 point each

1. What happens during an acid-base reaction? Put the steps in order using numbers 1-4. (10 points)

   _____ The atoms go to other molecules and make new friends.

   _____ Two new molecules are made.

   _____ An acid and a base meet.

   _____ The atoms leave their molecules.

2. Many acid-base reactions make... (10 points)
   - ○ Salts and water.
   - ○ Oxygen and hydrogen atoms.
   - ○ A new acid or base.
   - ○ Red cabbage juice indicator.

3. When an acid-base reaction is complete, the acids and bases remain unchanged. (10 points)
   - ○ True
   - ○ False

Focus On Elementary Chemistry 3rd Edition, Final Quiz
Chapters 1-12, 24 questions, 10 points each

1. "Experimenting" means testing ideas and observing what happens. (10 points)
   - ○ True
   - ○ False

2. Chemistry... (Check all that apply.) (10 points)
   - ☐ Is the study of matter.
   - ☐ Happens every day.
   - ☐ Is not commonly used.
   - ☐ Is both thinking about how things work and doing experiments.
   - ☐ Is not used in cars.

13. An acid-base reaction happens when an acid and a base meet and form new molecules. (10 points)
   - ○ True
   - ○ False

14. When an acid and a base meet in an acid-base reaction... (10 points)
   - ○ New atoms are formed.
   - ○ The base is changed but the acid is not.
   - ○ Not much happens.
   - ○ Atoms in the acid exchange with atoms in the base.
   - ○ Water becomes table salt.

Focus On Elementary Chemistry 3rd Edition, Midterm 1
Chapters 1-6, 18 questions, 10 points each

1. Everything you can see, smell, or touch.
2. True
3. Is the study of matter., Is both thinking about how things work and doing experiments., Happens every day.

Focus On Elementary Chemistry 3rd Edition, Midterm 2
Chapters 7-12, 18 questions, 10 point each

1. 3, 4, 1, 2
2. Salts and water.
3. False

Focus On Elementary Chemistry 3rd Edition, Final Quiz
Chapters 1-12, 24 questions, 10 points each

1. True
2. Is the study of matter., Happens every day., Is both thinking about how things work and doing experiments.

13. True
14. Atoms in the acid exchange with atoms in the base.

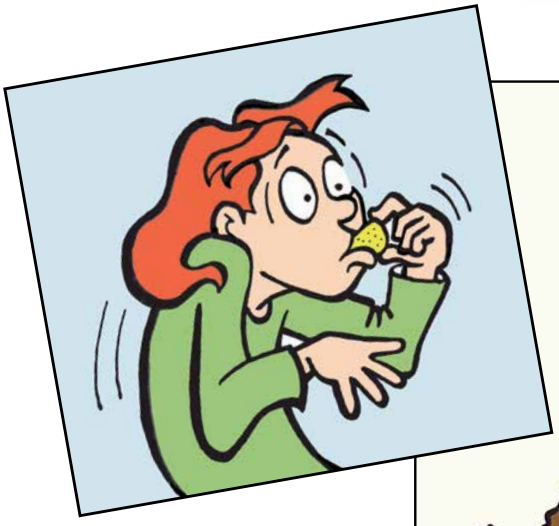
FOCUS ON

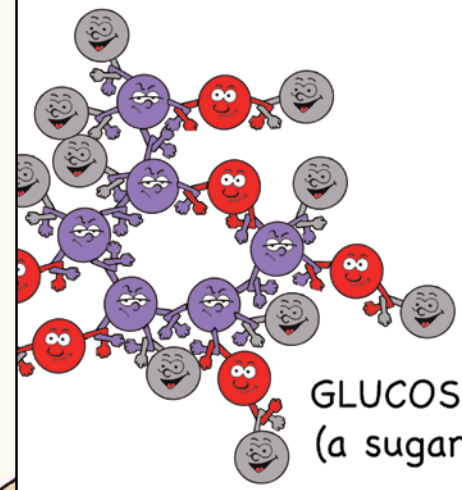
Grades K-4

ELEMENTARY CHEMISTRY

GRAPHICS

3rd Edition





GLUCOSE
(a sugar)

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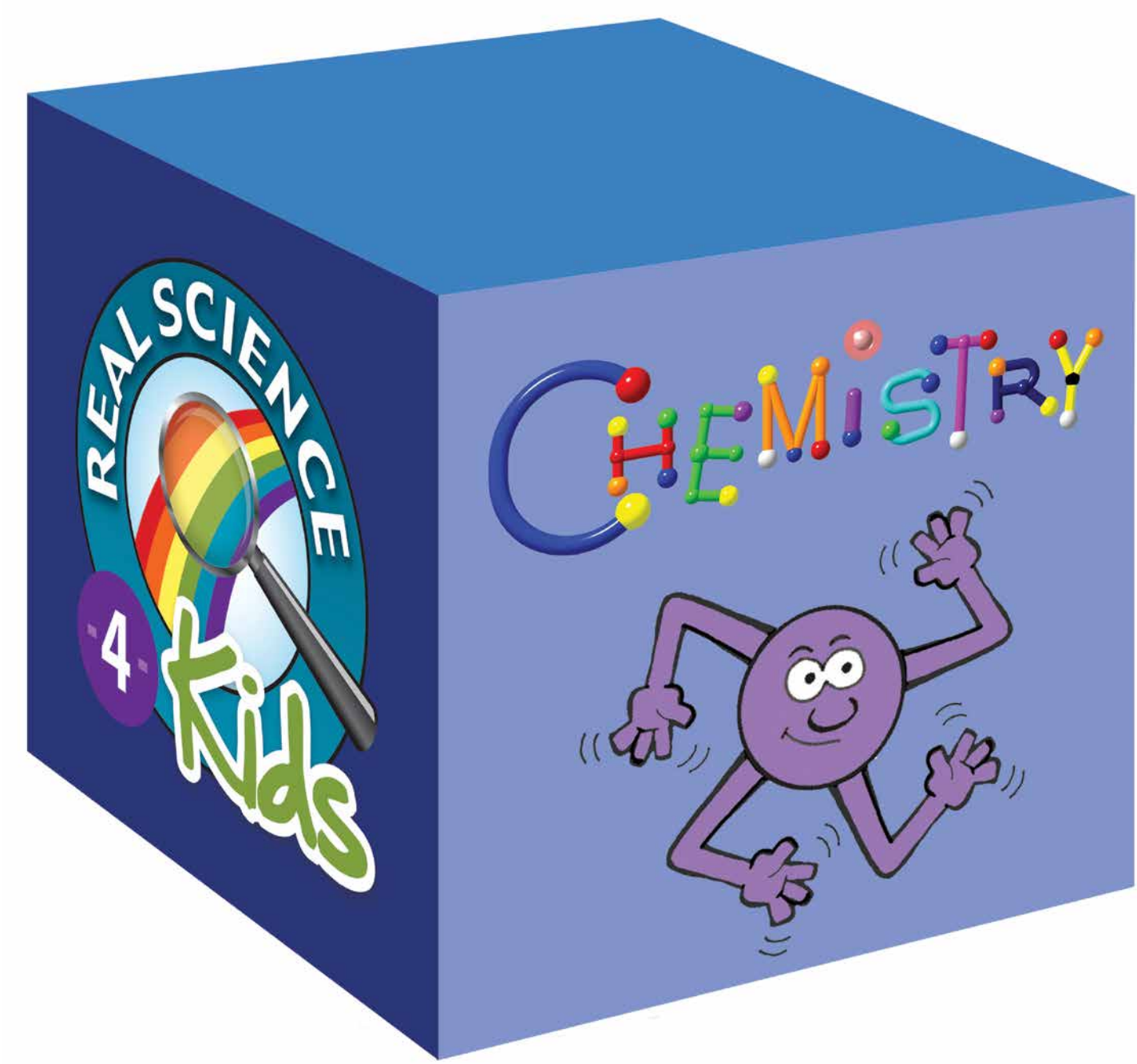

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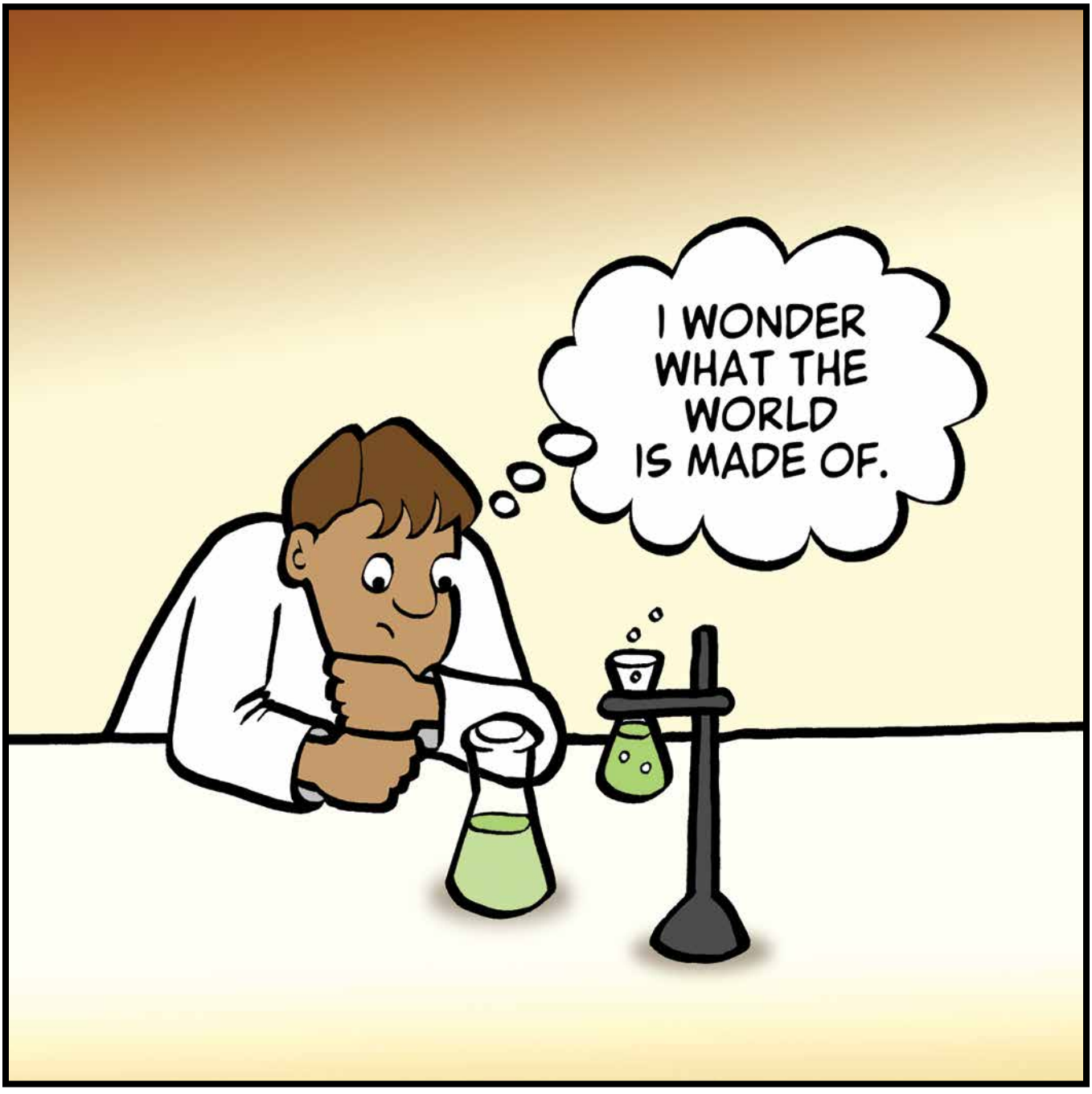
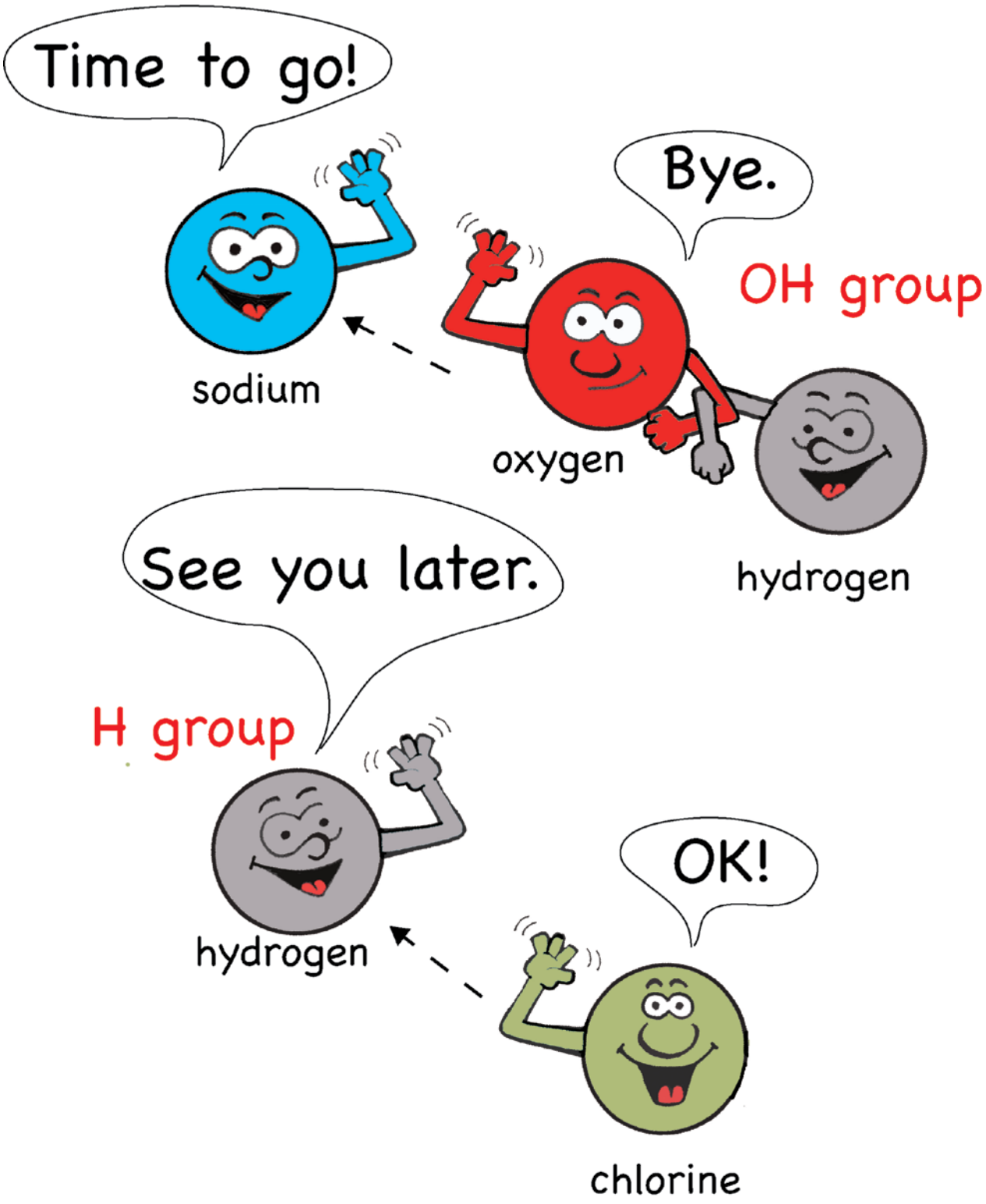
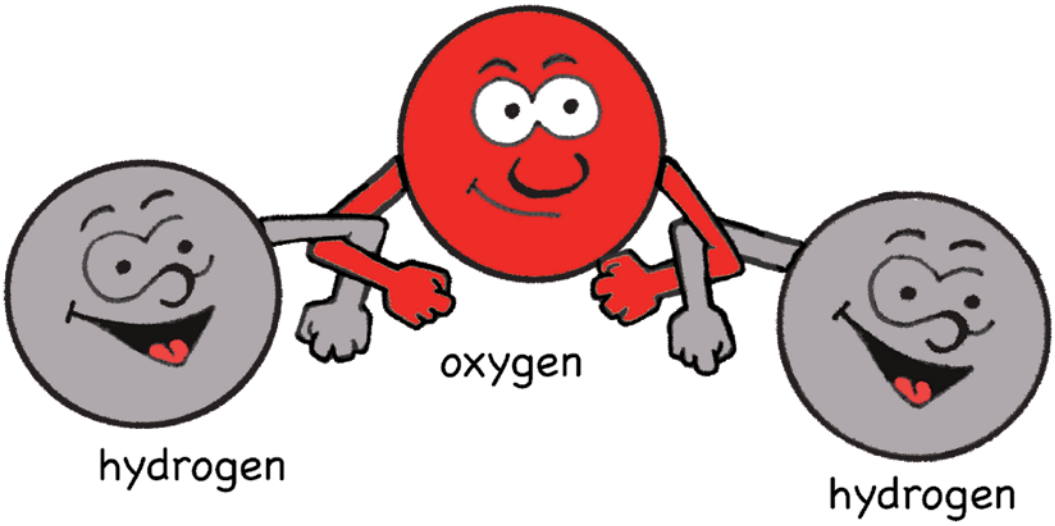
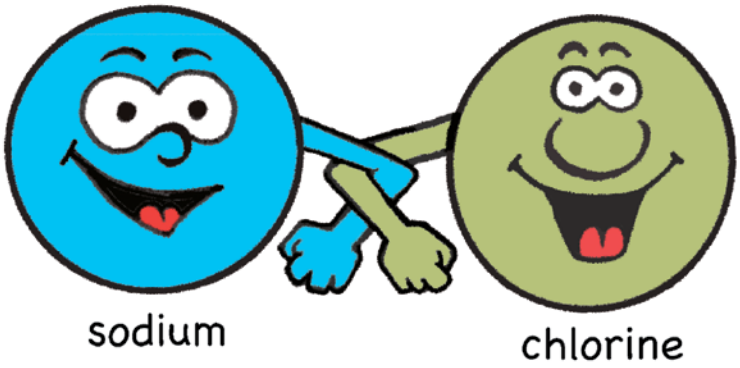

I WONDER WHAT THE WORLD IS MADE OF.

2. The atoms leave their molecules.



4. Two new molecules are made.





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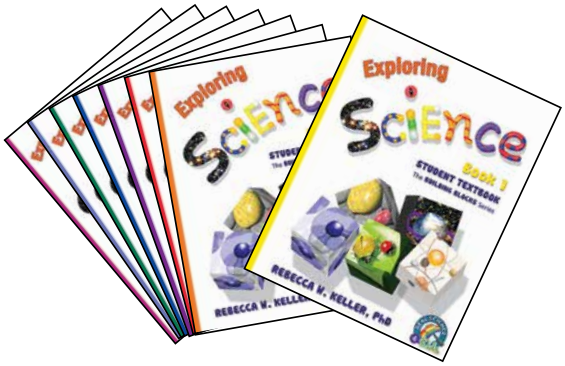

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