

NATIONAL
GEOGRAPHIC

READING EXPEDITIONS™

国家地理
科学探索丛书

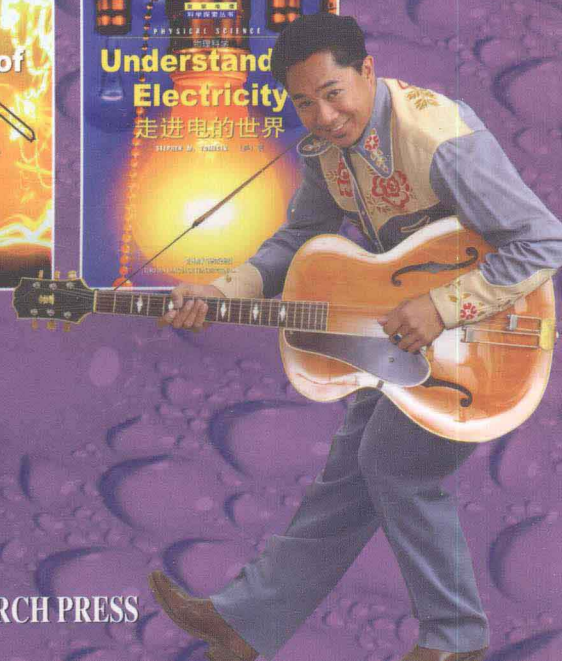
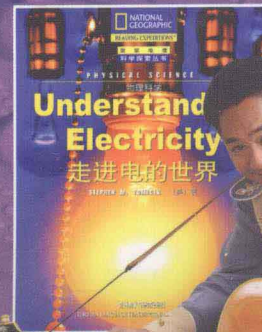
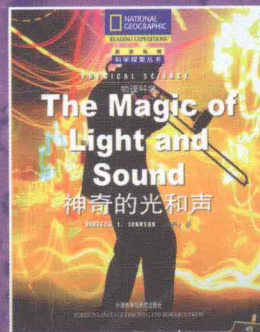
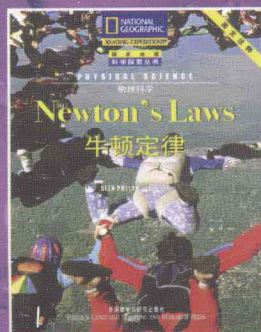
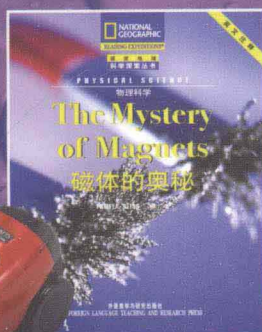
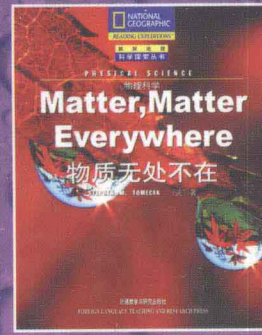
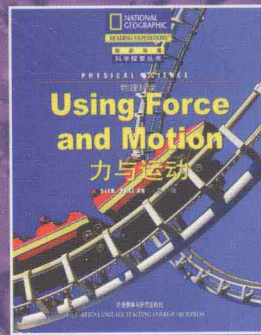
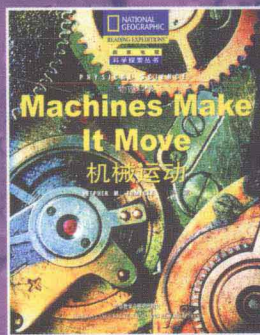
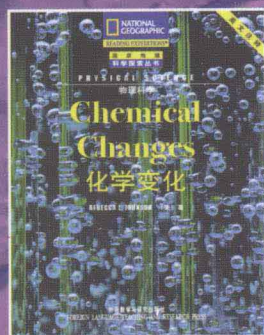
SCIENCE

自然科学

Physical Science 物理科学

TEACHER'S GUIDE & ASSESSMENTS

教师指导与评估手册



外语教学与研究出版社

FOREIGN LANGUAGE TEACHING AND RESEARCH PRESS



国家地理
科学探索丛书

SCIENCE

自然科学

Physical Science 物理科学

TEACHER'S GUIDE & ASSESSMENTS

教师指导与评估手册

美国国家地理学会 编著

Lesson Notes

课程教案

Activity Masters

课堂活动

Teacher Resources

教学资源

外语教学与研究出版社

FOREIGN LANGUAGE TEACHING AND RESEARCH PRESS

北京 BEIJING



京权图字：01 - 2005 - 2614

Copyright © (2004) National Geographic Society. All Rights Reserved.

Copyright © (2006) (English-Chinese bilingual) National Geographic Society. All Rights Reserved.

国家地理科学探索丛书(英文注释版)由美国北极星传媒有限公司策划并授权外语教学与研究出版社在中华人民共和国境内(不包括香港、澳门特别行政区及台湾省)独家出版、发行。

图书在版编目(CIP)数据

物理科学. 教师指导与评估手册 = Physical Science Teacher's Guide & Assessments / 美国国家地理学会编著. — 北京: 外语教学与研究出版社, 2004.4

(国家地理科学探索丛书)

ISBN 7 - 5600 - 3978 - 2

I. 物… II. 美… III. 英语—阅读教学—教学参考资料 IV. H319.4

中国版本图书馆 CIP 数据核字 (2004) 第 001982 号

出 版 人: 李朋义

责任编辑: 田 娜

封面设计: 孙莉明

出版发行: 外语教学与研究出版社

社 址: 北京市西三环北路 19 号 (100089)

网 址: <http://www.fltrp.com>

印 刷: 北京京科印刷有限公司

开 本: 889×1194 1/16

印 张: 7

版 次: 2004 年 6 月第 1 版 2006 年 7 月第 2 次印刷

书 号: ISBN 7 - 5600 - 3978 - 2

定 价: 13.90 元

* * *

如有印刷、装订质量问题出版社负责调换

制售盗版必究 举报查实奖励

版权保护办公室举报电话: (010)88817519

Contents

目录

Lesson Notes 课程教案

<i>Acids and Bases</i> 酸, 还是碱?	10
<i>Chemical Changes</i> 化学变化	18
<i>Machines Make It Move</i> 机械运动	26
<i>Matter, Matter Everywhere</i> 物质无处不在	34
<i>Newton's Laws</i> 牛顿定律	42
<i>The Magic of Light and Sound</i> 神奇的光和声	50
<i>The Mystery of Magnets</i> 磁体的奥秘	58
<i>Understanding Electricity</i> 走进电的世界	66
<i>Using Force and Motion</i> 力与运动	74

Teacher Resources 教学资源

Series Overview 系列概述	4
Lesson Overview 课程概述	6
Overview of Titles 教学目标	82
Literacy Internet Resources 因特网上的资源	86
Assessment Overview 测试概述	88
Using Portfolios and Retelling 阅读记录与复述评估	100
Using Graphic Organizers 运用图表	104
Index 索引	110

Series Overview

系列概述

简介 (Introduction)

“物理科学”系列包括物质、能量、机械、牛顿定律、化学变化、磁体、声和光，以及力与运动等主题。系列中的每本书以培养学生对非小说类作品的阅读技巧为目的，通过严谨的叙述介绍了一系列与主题相关的核心科学概念。

本系列运用不同的体裁、组织形式以及风格各异的行文和图表，帮助学生掌握非小说类作品的格式。同时，本系列还使用了大量激发学生兴趣的形式来表现科学内容——并辅之以问题、科学研究方法和课堂活动，作为教师课堂教学的辅助。

本系列中每一本书的结构都力图帮助学生建立一个知识框架或加深他们对某个领域的理解：

引言 (Introduction) 用实际生活中的科学现象为例，吸引学生的注意力。

第一章 (Chapter 1) 为学生提供相关的基础知识，为进一步加深对主题的理解做好准备。

第二章 (Chapter 2) 对主题进行深入分析。

第三章 (Chapter 3) 介绍科学家目前如何探索此主题涉及的领域，以及未来科学家们面临的问题和挑战。

“物理科学”系列还有一些特色项目可以激发学生的学习兴趣：

“读图地带” (Picture This) 用插图或照片帮助学生获得对问题的“感性认识”。

“像科学家一样思考” (Thinking Like a Scientist) 介绍各种科学研究方法，同时为学生提供动手实践的机会。

“亲身实践” (Hands-on Science) 为学生提供物理实验模式。

“科学备忘录” (Science Notebook) 鼓励学生在课下通过观察有趣的现象和探索更多的资源来进一步自学。

注重读写能力 (Focus on Literacy)

培养阅读理解技巧

每本书都为学生提供了培养、练习和扩展阅读技巧的机会，让他们把自己的阅读技巧应用到具有不同结构、格式和图表元素的非小说类作品中去。

本系列介绍了以下阅读技巧：

识别主题和细节 (Identify main ideas and details)

运用上下文线索 (Use context clues)

概括总结 (Summarize)

得出结论 (Draw conclusions)

比较和对比 (Compare and contrast)

运用图表 (Use graphic organizers)

运用专业词汇 (Use specialized words)

用自己的话解释 (Paraphrase)

自我提问 (Self-question)

识别因果关系 (Recognize cause-and-effect relationships)

理解非小说类作品的体裁、文本特征和图表

善于从非小说类作品中获得信息的读者对这类作品的各种体裁和格式都很熟悉。要有效地利用非小说类作品的各种特点，就要首先了解这类作品提供信息的材料。“物理科学”系列中涉及到许多非小说类作品的特征：

体裁 (Genres)

说明文 (Expository) 程序 (Procedural)

图表信息 (Graphic Information)

照片 (Photographs) 图表 (Charts)

插图 (Illustrations) 大事年表 (Timelines)

图解 (Diagrams)

书的组成部分 (Parts of a Book)

目录 (Contents) 索引 (Index)

文本特征 (Text Features)

章节标题，副标题 (Chapter titles, subheads)

插图说明 (Captions) 标签 (Labels)

边栏补充信息和特别说明 (Sidebars and features)

文章对比阅读

最近关于学生阅读行为和水平的调查结果显示,让学生有机会阅读和对比多篇文章有助于提高他们的阅读技巧。本系列围绕同一个主题——物理科学——组织了不同的文章,为学生提供对比阅读的绝好机会。学生可以就下列问题展开讨论。

对比 (Compare) ——这几本书各自的结构是怎样的? 它们之间有哪些相同点和不同点?

评价 (Evaluate) ——这些信息表述得是否清楚? 哪些辅助手段有助于对主题的理解?

总结 (Generalize) ——这个系列中每本书的主题有哪些相同点和不同点? 这些主题对理解物理科学概念有什么帮助?

注重科学知识 (Focus on Science)

培养科学研究能力

“物理科学”系列的每本书都提供给学生运用科学推理和批评性思考来发展科学观,沉浸于科学调查之中的机会。“物理科学”系列的每一本书都以一种科学研究的方法为特点,为学生提供支持,帮助他们发展与科学调查相关的思考能力。学生可以在阅读中了解这些方法,并在“像科学家一样思考”(Thinking Like a Scientist)中进行练习。下列科学

方法在“物理科学”系列中有突出的体现:

- 控制变量——《机械运动》
- 操作性定义——《神奇的光和声》
- 实验——《物质无处不在》
- 推断——《磁体的奥秘》
- 建立模型——《走进电的世界》
- 测量——《力与运动》
- 观察——《化学变化》
- 预测——《酸, 还是碱?》、《牛顿定律》

亲身实践 (Hands-on Science)

本系列的每本书都提供受控实验以引导学生进行深入学习:

加热还是冷却? (《化学变化》)

改变物质 (《物质无处不在》)

电路系统是如何工作的 (《走进电的世界》)

制作自己的磁体 (《磁体的奥秘》)

牛顿定律的作用 (《牛顿定律》)

将斜面变成螺丝钉 (《机械运动》)

大头针落地的声音 (《神奇的光和声》)

作用力和摩擦力 (《力与运动》)

你的肥皂的pH值是多少? (《酸, 还是碱?》)

Lesson Overview

课程概述

课程概述 (Overview) ——帮助教师快速选书备课

概要 (Summary)

此处简要说明书中的主要观点和重要细节。

科学背景

(Science Background)

此处就书中涉及的地点、人物和科学主题提供补充信息，为该书提供背景知识。

学习目标

(Learning Objectives)

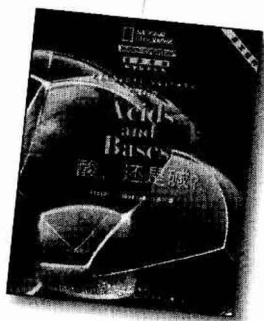
此处列出了在非小说类作品的特点、体裁，以及阅读、写作和科学研究技能等方面的学习目标，方便教师备课。

Overview

Summary

Acids and Bases

酸，还是碱？



By Rebecca L. Johnson

We come across many acids and bases each day, from the food we eat to our household cleaners. Substances are classified as acids or bases, depending on their number of hydrogen ions. Each type of substance has specific characteristics that indicate whether it is an acid or a base. In nature, acids and bases are used by plants and animals to defend themselves.

The easiest way to tell an acid from a base is by using an indicator, such as litmus paper. The pH scale classifies substances with a pH less than 7 as acids and substances greater than 7 as bases. A universal indicator is needed to tell the pH of any substance. Many of the everyday items we use today are acids and bases, including soap, fabrics, and silicon chips.

Science Background

Almost all substances can be classified as acids or bases, depending on their pH. Acids have a pH in the range of 0 to 6.99, bases have a pH in the range of 7.01 to 14, and pure water is termed “neutral” with a pH of 7. The pH scale was developed by Soren Sorensen. The scale’s name stands for “potential of hydrogen,” which refers to the amount of hydrogen ions in a liquid. The more acidic a solution is, the fewer hydrogen ions it has.

Learning Objectives

Science

- Explain how substances are placed in categories according to their characteristics
- Identify properties of acids and bases
- Describe the harmful effects of acids and bases

- Describe methods of identifying acids and bases
- Identify common acids and bases

Process Skills

- Skill Focus**
 - Predicting
- Supporting Skills**
 - Communicating
 - Inferring

Reading Skills

- Genre: Expository**
- Skill Focus**
 - Compare and contrast
 - Use context clues
- Supporting Skills**
 - Summarize
 - Draw conclusions
 - Identify cause-and-effect relationships
 - Make judgments

注重阅读 (Focus on Reading) ——关于帮助学生在阅读前后
及阅读过程中培养技巧的建议

Focus on Reading

Before Reading

Activate Prior Knowledge

Direct students' attention to the title of the book. Ask them what they know about acids and bases. Begin a K-W-L chart for the class, writing information students know about acids and bases in the K (What We Know) column. Then ask students what they want to know about acids and bases. Write their responses in the W (What We Want to Know) column.

After reading, students can add information to the L (What We Learned) column. They can also change any incorrect information in the first column of the chart.

K (What We Know)	W (What We Want To Know)	L (What We Learned)

Preview

Give students time to preview the book, paying attention to chapter titles, photos, captions, and special features. Ask:

What do the chapter titles tell you about the information presented in this book?

Looking at the photos, can you tell what this book is about?

What information do the captions provide?

Set Purpose

Ask students whether this book reminds them of other books they have read. Ask:

What do you want to find out by reading this book?

Encourage students to give reasons for their answers.

Vocabulary Strategy:
Use Context Clues

Activity Master, Page 14

Ask students how context—the words around a word—can help them figure out the meaning of an unknown word. Read these sentences from page 5 in the student book.

*Acid drips from the snottites.
It can burn skin and dissolve metal.*

Explain that the descriptions “burn skin” and “dissolve metal” help provide a meaning for the word *acid* in the first sentence. The context of the word *acid* helps you to understand its meaning. Students can use the Activity Master on page 14 to practice taking meanings of words from context, then checking meanings in the dictionary.

acid rain
fossil fuels
indicator
ions
pH
predict

Acids and Bases

知识热身

(Activate Prior Knowledge)

这些用来热身的知识常常可以用图表进行组织。

预习 (Preview)

预习非小说类作品可以帮助学生理解作品的结构，预测作品将提供哪类信息。

词汇

(Vocabulary Strategy)

学生在阅读前可以使用“课堂活动”(Activity Master)学习课文中的关键词汇。

My Notes

Writing Skills

Writing Focus

- Write steps in a process (expository)

Supporting Skills

- Prewrite
- Conduct research
- Record knowledge

Speaking/Listening

- Give an oral presentation

注重阅读 (Focus on Reading) ——关于帮助学生在阅读前后及阅读过程中培养技巧的建议

阅读技巧

(Read Strategically)

每一种重要的阅读理解技巧都配有相应的“课堂活动”(Activity Master)。“技巧点拨”(Strategy Tip)提供具体的建议,帮助学生检测自己的阅读效果。

课堂互动

(Responding)

此处的讨论问题可以帮助学生考查书中的主要观点。

写作和研究

(Writing and Research)

学生可以就书中的主题进行调查研究,然后用各种体裁和形式进行写作。

课堂交流

(Communicating)

课堂活动可以帮助学生培养听、说和观察等交流技巧。

Focus on Reading (continued)

During Reading

Read Strategically: Compare and Contrast

Activity Master, Page 15

Assign each chapter of the book as independent reading. As students read, they can compare and contrast characteristics of substances by completing the Activity Master on page 15.

Remind students that when comparing two things, they should look for what is the same. When contrasting two things, they should look for what is different.

Answers for Activity Master, page 15: Acid—tastes sour, dissolves metal, turns blue litmus paper red, pH range: 0-7, contains hydrogen. Base—contains hydroxide, turns red litmus paper blue, feels slippery, tastes bitter, pH range: 7-14. Both—has industrial uses, is a chemical, some are poisonous, contains ions.

Strategy Tip: Paraphrase

If students have trouble understanding a paragraph or section of the book, suggest they retell, or paraphrase, the part in their own words. Explain that paraphrasing helps to identify which parts they don't understand.

After Reading

Responding

Initiate a class discussion to assess reading comprehension.

Ask:

What characteristics are used to describe substances as acids or bases? (See pages 8 and 17 in the student book.) (summarize)

Describe the properties of acids. Describe the properties of bases. (See pages 9-11.) (summarize)

What are some harmful effects of acids and bases? (See pages 10 and 12-13.) (draw conclusions)

Which type of substance causes red litmus paper to turn blue? Which type of substance causes blue litmus paper to turn red? (See page 15.) (identify cause-and-effect relationships)

Which are more useful in your home—acids or bases? (Answers will vary.) (make judgments)

Writing and Research: Write Steps in a Process

Activity Master, page 16

Have students write the steps involved in testing whether a substance is an acid or a base. Students will explain how they would test five liquids to determine if they are acids or bases. They will include step-by-step instructions, an explanation for each step, and the materials used in the process. Students can use the Activity Master on page 16 to help them organize the steps they would do in their

experiments. Encourage students to use science resources, the Internet, encyclopedias, and other informational sources to research the details of this process.

Communicating: Speaking/Listening

Give an oral presentation

Students can present an oral presentation showing the steps involved in testing a substance to determine if it is an acid or a base. Suggest that students use props, including posters or pictures, to help explain the steps in their process.

Students reading aloud should

- ✓ speak clearly
- ✓ make eye contact with listeners
- ✓ adapt speech as appropriate

Listeners should

- ✓ listen politely
- ✓ listen for clues to decide if the substance is an acid or a base
- ✓ ask questions to clarify information

拓展和测试 (Extend and Assess) ——科学活动、测试和拓展活动

为教学提供了丰富的内容

Extend and Assess

Focus on Science

Thinking Like a Scientist

Process Skill: Predicting

Answer for page 19: The pH of the juice would be 7, or closer to 7. To test this prediction, test the pH of a glass of orange juice before and after placing a crushed antacid tablet in the glass.

Answers for page 27: 1. The acid reduces the pH of your mouth. 2. The toothpaste will neutralize the acid in your mouth. 3. Since toothpaste is a base, it will raise the pH of your mouth.

Check It Out: Yes, it was a good idea. Baking soda is also a base, which will neutralize the acid in your mouth.

Predicting

Activity Master, Page 17

Students list the characteristics of acids and bases on the Activity Master on page 17. Have them use the information and personal experience to predict the results for situations involving acids and bases.

Hands-on Science

Summary Students will use bar soap, water, and pH paper to check the pH of different soaps.

Tips Have students work over a desk or use a bowl to avoid messes involving the soap.

Safety Note Have students rinse their hands after handling soap. Remind them not to touch their eyes, mouth, or

nose with soapy hands.

Answers to Think Answers will vary, but the pH of the soap should be between 7 and 10; answers will vary depending on the brand of soap used; answers will vary, but no soap should have had a pH greater than 10, which would have been very basic and is rough on hands.

Assessment Options

Use the following assessment options to assess students' understanding of the book.

Questions

Use the following questions during individual conferences or ask students to write the answers in their notebooks:

- 1 What is the pH range for acids? What is the pH range for bases?
- 2 Describe two physical properties of acids and two physical properties of bases.
- 3 Identify ways acids and bases can be harmful to humans.
- 4 Name a common acidic substance and a common basic substance.
- 5 Describe two uses for acids and bases in society.

Assessment Activity

Have students create an acids and bases poster. They can cut pictures of several common acids and bases from newspapers and magazines and glue them to poster board.

Posters should include

- ✓ three pictures of common acids and three pictures of common bases
- ✓ characteristics of the item that tell whether it is an acid or a base

Multiple-choice Test

Use the multiple-choice test on page 90.

Cross-curricular Connection

Mathematics

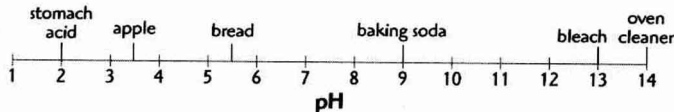
Have students create a pH scale as shown below. They can then insert each of the following on the scale where appropriate:

Stomach acid—pH 2
Apple—pH 3.5
Bread—pH 5.5
Baking soda—pH 9
Bleach—pH 13
Oven cleaner—pH 14

Ask students how the scale makes the pH data easier to compare than the list.

Home-school Connection

Together students and families can read the labels of common items in the home to determine whether each is an acid or a base. An acid often lists ingredients that include the word "acid." A base often has ingredients that include the word "hydroxide," or end in *-ide*.



注重科学知识

(Focus on Science)

通过与科学概念和研究技能相关的实践活动来帮助学生用新的方法理解书的内容。这部分也配有相关的“课堂活动”(Activity Master)。

测试 (Assessment Options)

用讨论问题、评估活动或多项选择题对学生进行评估,考查他们对书中重要概念的理解。

跨学科链接

(Cross-curricular Connection)

此处提供一些活动建议,帮助学生将科学知识 with 数学、社会研究、音乐、艺术和文学联系起来。

家庭—学校链接

(Home-school Connection)

“家庭—学校链接”给学生一些建议,让他们与家人一起讨论学到的内容。

Summary

Science Background

Acids and Bases

酸，还是碱？



By Rebecca L. Johnson

We come across many acids and bases each day, from the food we eat to our household cleaners. Substances are classified as acids or bases, depending on their number of hydrogen ions. Each type of substance has specific characteristics that indicate whether it is an acid or a base. In nature, acids and bases are used by plants and animals to defend themselves.

The easiest way to tell an acid from a base is by using an indicator, such as litmus paper. The pH scale classifies substances with a pH less than 7 as acids and substances greater than 7 as bases. A universal indicator is needed to tell the pH of any substance. Many of the everyday items we use today are acids and bases, including soap, fabrics, and silicon chips.

Almost all substances can be classified as acids or bases, depending on their pH. Acids have a pH in the range of 0 to 6.99, bases have a pH in the range of 7.01 to 14, and pure water is termed “neutral” with a pH of 7. The pH scale was developed by Soren Sorensen. The scale’s name stands for “potential of hydrogen,” which refers to the amount of hydrogen ions in a liquid. The more acidic a solution is, the fewer hydrogen ions it has.

Learning Objectives

Science

- Explain how substances are placed in categories according to their characteristics
- Identify properties of acids and bases
- Describe the harmful effects of acids and bases

- Describe methods of identifying acids and bases
- Identify common acids and bases

Process Skills

- Skill Focus**
 - Predicting
- Supporting Skills**
 - Communicating
 - Inferring

Reading Skills

- Genre: Expository**
- Skill Focus**
 - Compare and contrast
 - Use context clues
- Supporting Skills**
 - Summarize
 - Draw conclusions
 - Identify cause-and-effect relationships
 - Make judgments

Focus on Reading

Before Reading

Activate Prior Knowledge

Direct students' attention to the title of the book. Ask them what they know about acids and bases. Begin a K-W-L chart for the class, writing information students know about acids and bases in the K (What We Know) column. Then ask students what they want to know about acids and bases. Write their responses in the W (What We Want to Know) column.

After reading, students can add information to the L (What We Learned) column. They can also change any incorrect information in the first column of the chart.

K (What We Know)	W (What We Want To Know)	L (What We Learned)

Preview

Give students time to preview the book, paying attention to chapter titles, photos, captions, and special features. Ask:

What do the chapter titles tell you about the information presented in this book?

Looking at the photos, can you tell what this book is about?

What information do the captions provide?

Set Purpose

Ask students whether this book reminds them of other books they have read. Ask:

What do you want to find out by reading this book?

Encourage students to give reasons for their answers.

Vocabulary Strategy: Use Context Clues

Activity Master, Page 14

Ask students how context—the words around a word—can help them figure out the meaning of an unknown word. Read these sentences from page 5 in the student book.

*Acid drips from the snottites.
It can burn skin and dissolve metal.*

Explain that the descriptions “burn skin” and “dissolve metal” help provide a meaning for the word *acid* in the first sentence. The context of the word *acid* helps you to understand its meaning. Students can use the Activity Master on page 14 to practice taking meanings of words from context, then checking meanings in the dictionary.

acid rain
fossil fuels
indicator
ions
pH
predict

My Notes

Writing Skills

Writing Focus

- Write steps in a process (expository)

Supporting Skills

- Prewrite
- Conduct research
- Record knowledge

Speaking/Listening

- Give an oral presentation

During Reading

Read Strategically: Compare and Contrast

Activity Master, Page 15

Assign each chapter of the book as independent reading. As students read, they can compare and contrast characteristics of substances by completing the Activity Master on page 15.

Remind students that when comparing two things, they should look for what is the same. When contrasting two things, they should look for what is different.

Answers for Activity Master, page 15: Acid—tastes sour, dissolves metal, turns blue litmus paper red, pH range: 0-7, contains hydrogen. Base—contains hydroxide, turns red litmus paper blue, feels slippery, tastes bitter, pH range: 7-14. Both—has industrial uses, is a chemical, some are poisonous, contains ions.

Strategy Tip: Paraphrase

If students have trouble understanding a paragraph or section of the book, suggest they retell, or paraphrase, the part in their own words. Explain that paraphrasing helps to identify which parts they don't understand.

After Reading

Responding

Initiate a class discussion to assess reading comprehension.

Ask:

What characteristics are used to describe substances as acids or bases? (See pages 8 and 17 in the student book.) (summarize)

*Describe the properties of acids.
Describe the properties of bases.
(See pages 9-11.) (summarize)*

What are some harmful effects of acids and bases? (See pages 10 and 12-13.) (draw conclusions)

*Which type of substance causes red litmus paper to turn blue?
Which type of substance causes blue litmus paper to turn red?
(See page 15.) (identify cause-and-effect relationships)*

Which are more useful in your home—acids or bases? (Answers will vary.) (make judgments)

Writing and Research: Write Steps in a Process

Activity Master, page 16

Have students write the steps involved in testing whether a substance is an acid or a base. Students will explain how they would test five liquids to determine if they are acids or bases. They will include step-by-step instructions, an explanation for each step, and the materials used in the process. Students can use the Activity Master on page 16 to help them organize the steps they would do in their

experiments. Encourage students to use science resources, the Internet, encyclopedias, and other informational sources to research the details of this process.

Communicating: Speaking/Listening

Give an oral presentation

Students can present an oral presentation showing the steps involved in testing a substance to determine if it is an acid or a base. Suggest that students use props, including posters or pictures, to help explain the steps in their process.

Students reading aloud should

- ✓ speak clearly
- ✓ make eye contact with listeners
- ✓ adapt speech as appropriate

Listeners should

- ✓ listen politely
- ✓ listen for clues to decide if the substance is an acid or a base
- ✓ ask questions to clarify information

Focus on Science

Thinking Like a Scientist

Process Skill: Predicting

Answer for page 19: The pH of the juice would be 7, or closer to 7. To test this prediction, test the pH of a glass of orange juice before and after placing a crushed antacid tablet in the glass.

Answers for page 27: 1. The acid reduces the pH of your mouth. 2. The toothpaste will neutralize the acid in your mouth. 3. Since toothpaste is a base, it will raise the pH of your mouth.

Check It Out: Yes, it was a good idea. Baking soda is also a base, which will neutralize the acid in your mouth.

Predicting

Activity Master, Page 17

Students list the characteristics of acids and bases on the Activity Master on page 17. Have them use the information and personal experience to predict the results for situations involving acids and bases.

Hands-on Science

Summary Students will use bar soap, water, and pH paper to check the pH of different soaps.

Tips Have students work over a desk or use a bowl to avoid messes involving the soap.

Safety Note Have students rinse their hands after handling soap. Remind them not to touch their eyes, mouth, or

nose with soapy hands.

Answers to Think *Answers will vary, but the pH of the soap should be between 7 and 10; answers will vary depending on the brand of soap used; answers will vary, but no soap should have had a pH greater than 10, which would have been very basic and is rough on hands.*

Assessment Options

Use the following assessment options to assess students' understanding of the book.

Questions

Use the following questions during individual conferences or ask students to write the answers in their notebooks:

- 1 What is the pH range for acids? What is the pH range for bases?
- 2 Describe two physical properties of acids and two physical properties of bases.
- 3 Identify ways acids and bases can be harmful to humans.
- 4 Name a common acidic substance and a common basic substance.
- 5 Describe two uses for acids and bases in society.

Assessment Activity

Have students create an acids and bases poster. They can cut pictures of several common acids and bases from newspapers and magazines and glue them to poster board.

Posters should include

- ✓ three pictures of common acids and three pictures of common bases
- ✓ characteristics of the item that tell whether it is an acid or a base

Multiple-choice Test

Use the multiple-choice test on page 90.

Cross-curricular Connection

Mathematics

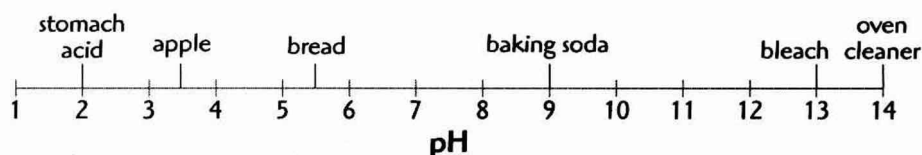
Have students create a pH scale as shown below. They can then insert each of the following on the scale where appropriate:

Stomach acid—pH 2
Apple—pH 3.5
Bread—pH 5.5
Baking soda—pH 9
Bleach—pH 13
Oven cleaner—pH 14

Ask students how the scale makes the pH data easier to compare than the list.

Home-school Connection

Together students and families can read the labels of common items in the home to determine whether each is an acid or a base. An acid often lists ingredients that include the word "acid." A base often has ingredients that include the word "hydroxide," or end in *-ide*.



Vocabulary: Use Context Clues

The words below are from *Acids and Bases*. Find each word in the student book and read the sentence that contains the word and the sentences before and after. Write the meaning of each word based on how it is used in the book. Then use the dictionary to check your answers.

Word	Meaning from Context	Definition from the dictionary
acid rain		
fossil fuels		
indicator		
ions		
pH		
predict		

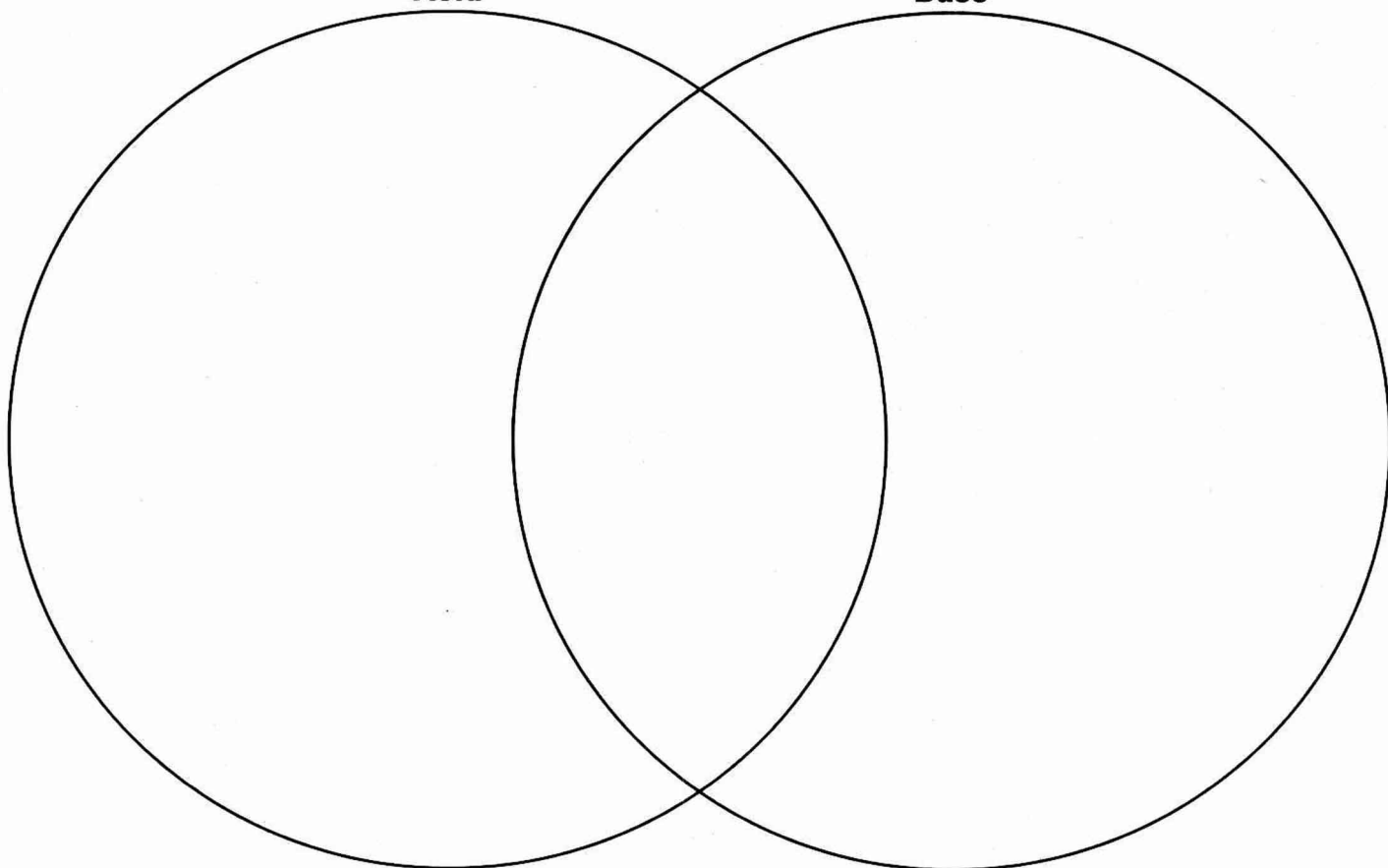
Reading: Compare and Contrast

Acids and bases each have special characteristics that make them different. But they also have some characteristics in common. When you contrast two things, you tell how they are different. When you compare two things, you tell how they are the same.

As you read *Acids and Bases*, think about the characteristics of acids and bases. Each characteristic listed below describes acids, bases, or both. Write characteristics that apply only to acids in the left circle, only to bases in the right circle, and to both acids and bases in the overlapping portion of the circles.

Characteristics

- | | | | |
|-----------------------|-------------------------------|---------------------|----------------------|
| • tastes sour | • turns red litmus paper blue | • is a chemical | • some are poisonous |
| • has industrial uses | • turns blue litmus paper red | • pH range: 0-7 | • contains ions |
| • dissolves metal | • feels slippery | • tastes bitter | • pH range: 7-14 |
| • contains hydroxide | | • contains hydrogen | |

Acid**Base**

Writing: Prewrite**Write Steps in a Process**

When scientists do experiments, they write a list of materials they will need and the steps that they will do. Use the questions below to help you plan an experiment that will determine if five common liquids are acids or bases.

1. What liquids will you test in the experiment?

2. Would you use litmus paper or a universal indicator to tell if the liquids were acids or bases?

3. Using the testing method that you have chosen, how would you know if a liquid were an acid or a base?

4. What materials would you need to do your experiment?

5. List the steps that you would do to test each liquid to determine if it was an acid or a base.

6. Create a data table that you would use to show the results of your experiment.