

# **Teacher's Guide**



# Chemistry

#### Dear Educator,

our students will discover chemistry is cool as they read through this issue of KIDS DISCOVER. Your young scientists will explore the topics at the right in Chemistry.

This Teacher's Guide is filled with activity ideas and blackline masters that can help your students understand more about chemistry and its role in their everyday lives. Select or adapt the activities that suit your students' needs and interests best.

Thank you for making KIDS DISCOVER a part of your classroom agenda.

Sincerely,

#### KIDS DISCOVER

P.S. We would enjoy hearing from you. E-mail your comments and ideas to teachers@kidsdiscover.com

#### WHAT'S IN CHEMISTRY

- 2-3 Why Matter Matters Matter defined
- 4-5 CHON Carbon, Hydrogen, Oxygen, and Nitrogen
- 6-7 Nature's Changes Chemistry in sparkling waters and curls
- 8–9 Chemistry Superstars A gallery of chemists
- 10-11 The Color of Fireworks Colored sky lights
- 12-13 Behind the Scenes Chemistry in everyday things
- 14-15 Nature's Pharmacy Chemicals providing protection
- 16–17 At the Cutting Edge Chemical innovations
- 18-19 Game Pages
  - A puzzle, chemical creations, and reading recommendations for extending content and activities

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### **Meeting the Standards**

**Physical Science** 

- ✔ Properties and changes of properties in matter
- ✓ Transfer of energy

**History and Nature of Science** 

- ✓ Science as a human endeavor
- ✓ Visit www.kidsdiscover.com/standards to find out more about how KIDS DISCOVER meets state and national standards.

#### · IN THIS TEACHER'S GUIDE ·

2 Prereading Activities

3 Get Set to Read (Anticipation Guide) Blackline Master



4 Discussion & Writing Questions

5–6 It's in the Reading (Reading Comprehension)



7 Everything Visual (Graphic Skills)



**8 Cross-Curricular Extensions** 

9–12 Answer Keys to Blackline Masters

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### PREREADING ACTIVITIES

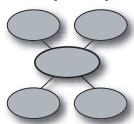
efore distributing KIDS DISCOVER *Chemistry*, activate students' prior knowledge with these activities.

#### Discussion

To get students thinking about how this topic relates to their interests and lives, ask:

- ✓ Have you had a fizzy drink that lost its fizz? Why did this happen?
- ✓ Have you watched fireworks on a summer night? What makes them so beautiful?
- ✓ When do you use sunscreen? Why?

#### Concept Map



xplain to students that they will be reading Chemistry. Ask: What are some words related to chemistry? List students' responses on the board. (See box below for some terms they may suggest.) After creating a list,

ask students to group the words into categories, such as Makeup of Matter, State of Matter, Elements, and Scientists. Create a concept map by writing Chemistry on the board and circling it. Write the categories around the circle and draw lines between the ideas to show the connections. Then list examples and write the words from the list around the appropriate categories. Encourage students to add more words to the concept map as they read Chemistry.

	KEY TERMS	S
✓ chemical	✓ reaction	✓ nitrogen
✓ atom	✓ formula	✓ formula
✓ element	✓ chemist	physical
✓ molecule	✓ oxygen	✓ gas
✓ matter	✓ hydrogen	✓ solid
✓ compound	✓ carbon	✓ liquid

#### Get Set to Read (Anticipation Guide) Master



opy and distribute the **Get Set to Read** blackline master (page 3 of this Teacher's Guide). Explain to students that this **Anticipation Guide** will help them find out what they know and what misconceptions they have about the topic. Get Set to Read is a list of statements—some true, some false. Ask students to write whether they think each statement is true or false in the Before Reading column. Be sure to tell students that it is not a test and they will not be graded on their answers. The activity can be completed in a variety of ways for differentiated instruction:

- ◆ Have students work on their own or in small groups to complete the page.
- ◆ Assign pairs of students to focus on two statements and to become "experts" on these topics.
- ◆ Ask students to complete the Before Reading column on their own, and then tabulate the class's answers on the chalkboard, an overhead transparency, or your classroom computer.
- ◆ Review the statements orally with the entire class.

If you predict that students will need assistance finding the answers, complete the Page Number column before copying Get Set to Read.

#### **Preview**

istribute *Chemistry* and model how to preview it. Examine titles, headings, words in boldface, pictures, diagrams, and captions. Then have students add new information to the Concept Map. If students will be reading only a few pages at one sitting, preview only the selected pages.

### BE WORD WISE WITH POWER VOCABULARY!

**7** ou have exclusive access to additional resources including Power Vocabulary blackline masters for every available KIDS DISCOVER title! These activities introduce students to 15 specialized and general-use vocabulary words from each KIDS DISCOVER title. Working with both types of words helps students develop vocabulary, improve comprehension, and read fluently. Follow the links from your Teacher's Toolbox CD-ROM and find your title to access these valuable resources:

- ◆ Vocabulary cards
- ◆ Crossword puzzle
- ◆ Word find
- ◆ Matching
- ◆ Cloze sentences
- ◆ Dictionary list

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Name	Date

### **Get Set to Read**

What do you know about chemistry? In Before Reading, write *true* if you think the statement is true. Write *false* if you think the statement is not true. Then read KIDS DISCOVER *Chemistry*. Check back to find out if you were correct. Write the correct answer in the After Reading column and its page number.

CHALLENGE: Rewrite each false sentence in a way that makes it true.

Before Reading		After Reading	Page Number
<b>1.</b> All matter is made up	of atoms.		
<b>2.</b> Oxygen makes up alm percent of the air we b	•		
<b>3.</b> Carbon is the most ple element in the universe			
<b>4.</b> The ripening of a bana chemical change.	na is a		
<b>5.</b> According to Dalton's atomic theory, all elemmade up of molecules.	ents are		
<b>6.</b> Different elements are produce the different c fireworks.			
7. Glow sticks light up w chemical reaction take between two liquids in	s place		
<b>8.</b> Penicillin was the first medicine.	antibiotic		
9. Only a few animals ca pheromones, which are compounds that affect other members of their	behavior of		
<b>10.</b> Investigators use a lum solution to detect unse fingerprints.	•		



# DISCUSSION & WRITING QUESTIONS

Use the following questions as discussion starters or as writing prompts for journals. For additional in-class discussion and writing questions, adapt the questions on the reading comprehension blackline masters on pages 5 and 6.

#### Cover

Before students read *Chemistry*, have them look at the cover. Ask:

- ✓ Why do you think this photograph is used to illustrate this issue?

#### Pages 2-3

Everything around us is made up of matter. Ask:

- ✓ What makes up matter?
- **✓** What is chemistry?
- ✓ How do crime scene investigators use chemistry to detect fingerprints?

#### Pages 4-5

Four elements are building blocks of life and more. Ask:

- ✓ Which two chemicals are the most abundant gases in the air?
- ✓ How are diamonds and the graphite in pencils alike? How are they different?

#### Pages 6-7

Chemistry interactions are happening all the time. Ask:

- ✓ Why do carbonated drinks lose their fizz?
- ✓ How is a scab a natural bandage?
- ✓ Is your hair straight or curly? Why?

#### Pages 8-9

Many chemists have made important discoveries. Ask:

- ✓ For scientists, what is meant by "each 'stands upon the shoulders' of others"?
- ✓ Give an example of conservation of matter.

#### Pages 10-11

Fireworks come in many colors. Ask:

- ✓ What elements would pyrotechnic chemists use to produce a red, white, and blue colored firework?

#### Pages 12-13

Chemistry in action is part of many ordinary and extraordinary objects. Ask:

- **✓** Explain how trick candles work.
- ✓ How are liquid bandages and bubble gum alike?

#### Pages 14-15

Nature's chemicals help plants, animals, and people. Ask:

- ✓ How has the white willow tree helped ease pain in humans?
- ✓ How do some species of spiders use pheromones to trap moths?
- ✓ How do some plants help other plants discourage plant eaters from champing on them?

#### Pages 16-17

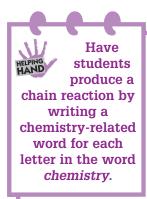
Chemistry leads to innovations that improve life. Ask:

- ✓ Try to write the decimal number that equals one nanosecond.
- How does green chemistry help make waterways healthier?
- ✓ How are petro-plastics and bioplastics alike and different?

#### **All Pages**

After students read the issue, ask:

✓ Identify three facts you have learned about chemistry in this issue of KIDS DISCOVER.



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Name	Data
name	Date

# It's in the Reading

After reading KIDS DISCOVER Chemistry, choose the best answer for each question. Fill in the circle.



Find your answer on the pages shown in the book icon next to each question.

- 1. Why must investigators use the chemical ninhydrin to reveal fingerprints on paper?
  - O A. Paper can be crumpled.
  - O B. Paper is porous.
  - O C. Paper has a rough surface.
  - O **D.** Dusting powder will not stay on paper.



- 2. Which element is the most abundant and has the smallest atom?
  - O A. carbon
  - O B. hydrogen
  - O C. oxygen
  - O **D.** nitrogen



- 3. Which statement is true about molecules?
  - O A. All molecules are made up of two or more elements.
  - O B. All molecules form compounds.
  - O **C.** All molecules are made up of two or more atoms.
  - O **D.** A molecule may have a single atom.



- 4. What causes a carbonated drink to lose its fizz?
  - O A. Molecules of carbon dioxide in the drink separate into oxygen and carbon.
  - O B. Carbon dioxide from the air dissolves in the drink.
  - O C. Too much carbon dioxide is in the drink.
  - O **D.** Carbon dioxide leaves the drink and enters the air.



- 5. What kind of change results in a banana ripening?
  - O A. chemical change
  - O B. physical change
  - O C. change in the form of matter
  - O **D.** change in the shape of matter





# It's in the Reading (continued)

<ul> <li>6. What explains that when pressure on a gas decreases, the gas expands and its volume increases?</li> <li>A. conservation of matter</li> <li>B. radioactivity</li> <li>C. Boyle's law</li> <li>D. modern atomic theory</li> </ul>	89
<ul> <li>7. What happens when fluorescent dye and hydrogen peroxide mix in a glow stick?</li> <li>A. Nothing happens.</li> <li>B. The glow stick emits light.</li> <li>C. The glow stick loses light.</li> <li>D. The glow stick gets smaller.</li> </ul>	12 13
<ul> <li>8. How are bubble gum and liquid bandages alike?</li> <li>A. Both are made from tree sap.</li> <li>B. Both are liquids.</li> <li>C. Both are made out of polymers.</li> <li>D. Both are colorless.</li> </ul>	12 13
<ul> <li>9. What was the source of the first antibiotic, penicillin?</li> <li>A. the bark of a white willow tree</li> <li>B. the yew tree</li> <li>C. pheromones</li> <li>D. a mold</li> </ul>	14 15
<ul> <li>10. Which of the following is an example of green chemistry?</li> <li>A. the use of a luminol solution to detect bloodstains</li> <li>B. the development of bioplastics</li> <li>C. the use of antibiotic stitching thread</li> <li>D. the development of snack foods with nanoparticles of vitamins</li> </ul>	16 17
11. What are some ways that chemists have helped to improve life?	



Name	Date
	Everything Visual preaders understand illustrations, diagrams, and
Look at the diagram on pages of a state of the diagram should be diagram should be diagram.	6–7. w? How does the caption help you know what is being shown?
2. According to the diagram, we chambers?	what does water pass through to reach underground water
3. Why do you think a label is	not used to identify what the dashed lines from the clouds mean?
Look at the pictures of chemist  4. What information is provide understand how the picture	d by the labels under each picture? How do the labels help you

Look at the key list of chemicals on page 11.

- 5. What chemicals may have been used to produce the fireworks shown?
- **6.** Smoke trails can be seen in the picture. Which chemical produced the smoke?



# **CROSS-CURRICULAR EXTENSIONS**

# Have students try these activities to expand their knowledge and interest in chemistry.

#### Language Arts

◆ *Spandex* is an anagram of the word *expands*. An *anagram* is a word or phrase made by rearranging the letters of another word or phrase. Write the following anagrams on the board and have students work with partners to rearrange the letters to form chemistry-related terms: *try chimes* (chemistry), *moats* (atoms), *mound cops* (compounds), *close mule* (molecules), *go dry hen*, (hydrogen), *meet Len* (element).

#### Science and Language Arts

◆ Gold is a soft metal that bends easily. For jewelry and other items, gold alloys are used. Have students dig for gold by finding out about uses of this precious metal and its properties. Their report should include information about karats and the percentage of gold in 14-karat, 18-karat, and 24-karat gold objects. Have students prepare a short report with visuals to present their research findings to the class.

#### **Social Studies**

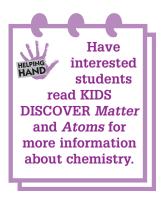
◆ The Hindenburg was a German airship that burst into flames as it was docking in New Jersey on May 6, 1937. Have students research information about the Hindenburg and its disastrous end and report their findings to the class.

#### Science and Art

◆ Have students build computer models of atoms and molecules. Have students choose an element, find out about its structure, and create a computer model of the element or a compound that has the element. Encourage students to label their model and write a short description of the element.

#### **Language Arts and Art**

♦ Have students produce a Chemistry Book of Records. Have them find examples of the superlatives and firsts identified in the magazine. Encourage students to compile the information into an illustrated book of records. They might list, for example, hydrogen as the smallest atom and Marie Curie as the first woman to win a Nobel Prize and the first person to receive two Nobel Prizes. Encourage students to add to the book whenever they encounter chemistry topics throughout the year.





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Date					

## **Get Set to Read**

What do you know about chemistry? In Before Reading, write *true* if you think the statement is true. Write *false* if you think the statement is not true. Then read KIDS DISCOVER *Chemistry*. Check back to find out if you were correct. Write the correct answer in the After Reading and its page number.

CHALLENGE: Rewrite each false sentence in a way that makes it true.

Before Reading	After Reading	Page Number
<b>1.</b> All matter is made up of atoms.	True	p. 2
2. Oxygen makes up almost 90 about 20 percent of the air we breathe.	False	p. 4
<b>3.</b> Carbon Hydrogen is the most plentiful element in the universe.	False	p. 5
<b>4.</b> The ripening of a banana is a chemical change.	True	<u>p. 7</u>
<b>5.</b> According to Dalton's modern atomic theory, all elements are made up of molecules atoms.	False	<u>р.</u> 8
6. Different elements are used to produce the different colors of fireworks.	True	p. 11
7. Glow sticks light up when a chemical reaction takes place between two liquids in the sticks.	True	p. 13
<b>8.</b> Penicillin was the first antibiotic medicine.	True	p. 14
9. Only a few animals Many animals and some plants can produce pheromones, which are compounds that affect behavior of other members of their species.	False	p. 14
10. Investigators use a luminol solution to detect unseen fingerprints bloodstains.	False	p. 16



### Name **ANSWER KEY**

# It's in the Reading

After reading KIDS DISCOVER Chemistry, choose the best answer for each question. Fill in the circle.



Find your answer on the pages shown in the book icon next to each question.

- 1. Why must investigators use the chemical ninhydrin to reveal fingerprints on paper?
  - O A. Paper can be crumpled.
  - B. Paper is porous. (details)
  - O C. Paper has a rough surface.
  - O **D.** Dusting powder will not stay on paper.



- 2. Which element is the most abundant and has the smallest atom?
  - O A. carbon
  - B. hydrogen (details)
  - O C. oxygen
  - O **D.** nitrogen



- 3. Which statement is true about molecules?
  - O A. All molecules are made up of two or more elements.
  - O **B.** All molecules form compounds.
  - C. All molecules are made up of two or more atoms. (details)
  - O **D.** A molecule may have a single atom.



- 4. What causes a carbonated drink to lose its fizz?
  - O A. Molecules of carbon dioxide in the drink separate into oxygen and carbon.
  - O B. Carbon dioxide from the air dissolves in the drink.
  - O C. Too much carbon dioxide is in the drink.
  - D. Carbon dioxide leaves the drink and enters the air. (cause and effect)



- 5. What kind of change results in a banana ripening?
  - A. chemical change (details)
  - O B. physical change
  - O C. change in the form of matter
  - O **D.** change in the shape of matter





# It's in the Reading (continued)

# 6. What explains that when pressure on a gas decreases, the gas expands and its volume increases?

- O A. conservation of matter
- O B. radioactivity
- C. Boyle's law (details)
- O **D.** modern atomic theory



# 7. What happens when fluorescent dye and hydrogen peroxide mix in a glow stick?

- O A. Nothing happens.
- B. The glow stick emits light. (cause and effect)
- O C. The glow stick loses light.
- O **D.** The glow stick gets smaller.



#### 8. How are bubble gum and liquid bandages alike?

- O A. Both are made from tree sap.
- O **B.** Both are liquids.
- C. Both are made out of polymers. (comparison and contrast)
- O **D.** Both are colorless.



#### 9. What was the source of the first antibiotic, penicillin?

- O A. the bark of a white willow tree
- O **B.** the yew tree
- O C. pheromones
- D. a mold (details)



#### 10. Which of the following is an example of green chemistry?

- O A. the use of a luminol solution to detect bloodstains
- B. the development of bioplastics (details)
- O C. the use of antibiotic stitching thread
- O **D.** the development of snack foods with nanoparticles of vitamins



#### 11. What are some ways that chemists have helped to improve life?

Essay: Answers will vary. Students may cite chemistry's role in producing medicines or the development of fun or useful products.



Name	<b>ANSWER</b>	KEY	Date
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# **Everything Visual**

Labels and captions can help readers understand illustrations, diagrams, and photographs better.

Look at the diagram on pages 6-7.

- 1. What does the diagram show? How does the caption help you know what is being shown?
  - The diagram shows how water filters under Earth's surface and settles into underground water chambers. The caption explains how sparkling water can be produced underground.
- 2. According to the diagram, what does water pass through to reach underground water chambers?

Water passes through the surface and layers of porous limestone, cracked marl, and pure white sand.

3. Why do you think a label is not used to identify what the dashed lines from the clouds mean?

A reader can easily infer that the dashed lines represent precipitation.

Look at the pictures of chemists on pages 8-9.

**4.** What information is provided by the labels under each picture? How do the labels help you understand how the pictures were ordered?

The labels provide the chemists' names, the dates when they lived, and their countries. The labels make it clear that the pictures are arranged chronologically.

Look at the key list of chemicals on page 11.

5. What chemicals may have been used to produce the fireworks shown?

The chemicals probably included lithium, sodium, and magnesium.

**6.** Smoke trails can be seen in the picture. Which chemical produced the smoke? zinc