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PHYSICAL SCIENCE

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Acids and Bases

酸，还是碱？

REBECCA L. JOHNSON (美) 著

外语教学与研究出版社

FOREIGN LANGUAGE TEACHING AND RESEARCH PRESS

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这套丛书秉承《国家地理》杂志图文并茂的特色，在书中配有大量精彩的图片，文字地道易懂、深入浅出，将科学性和趣味性完美结合，称得上是一套精致的小百科全书。特别值得一提的是本套丛书在提高青少年读者英语阅读能力的同时，还注重培养他们的科学探索精神、动手能力、逻辑思维能力和沟通能力。

本套丛书既适合学生自学，又可用于课堂教学。丛书各个系列均配有一本教师用书，内容包括背景知识介绍、技能训练提示、评估测试、多项选择题及答案等详尽的教学指导，是对课堂教学的极好补充。

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Having fun with bubbles—many soaps are bases.

Beware the Snottites!

小心那些“鼻涕”!

Acid drips¹ from stringy² colonies³ of sulfur-eating⁴ bacteria⁵ in Mexico's⁶ Villa Luz cave.

- | | | |
|------------------|-------------|----------------------------|
| 1. drip | <i>v.</i> | 滴下 |
| 2. stringy | <i>adj.</i> | 黏稠的 |
| 3. colony | <i>n.</i> | 菌落 |
| 4. sulfur-eating | <i>adj.</i> | 食硫的 |
| 5. bacterium | <i>n.</i> | (<i>pl. bacteria</i>) 细菌 |
| 6. Mexico | | 墨西哥 |

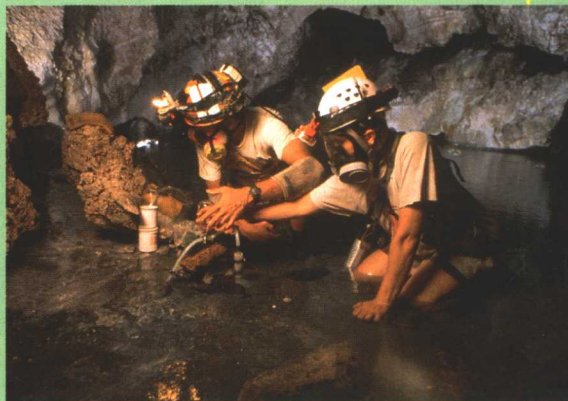
Mexico's Villa Luz cave stinks¹ like rotten eggs. Researchers pull on respirators² before entering. Air in the cave is thick with poisonous³ gas.

And that's not all. Hanging from the cave's damp⁴ walls are long, mucous-like⁵ strands⁶. Scientists joke that the cave has a cold. They call the slimy⁷ strands "snottites." But the scientists are careful not to touch them. Acid drips from the snottites. It can burn skin and dissolve⁸ metal.

Where does this acid come from? Water flowing through Villa Luz contains the mineral⁹ sulfur. Cave-dwelling¹⁰ bacteria "eat" this sulfur and produce a poisonous gas in the process. When the gas mixes with water, it forms sulfuric acid, a very powerful acid.

An acid-filled cave sounds like science fiction¹¹. But acids—some harmful¹², some helpful—are all around us. So are bases, their chemical¹³ counterparts¹⁴. Just what are acids and bases? What makes them different from other kinds of chemicals? And what roles do they play in our lives? In this book you'll explore¹⁵ acids and bases, plus a whole lot more!

- | | | |
|---------------------|------|--------------|
| 1. stink | v. | 发出恶臭 |
| 2. respirator | n. | 防毒面具; 人工呼吸装置 |
| 3. poisonous | adj. | 有毒的 |
| 4. damp | adj. | 潮湿的 |
| 5. mucous-like | adj. | 黏液状的 |
| 6. strand | n. | 丝状体 |
| 7. slimy | adj. | 似黏液的 |
| 8. dissolve | v. | 使溶解 |
| 9. mineral | n. | 矿物 |
| 10. cave-dwelling | adj. | 穴居的 |
| 11. science fiction | | 科学幻想小说 |
| 12. harmful | adj. | 有害的 |
| 13. chemical | adj. | 化学的 |
| 14. counterpart | n. | 对应物 |
| 15. explore | v. | 探索; 探究 |



Acids and Bases:

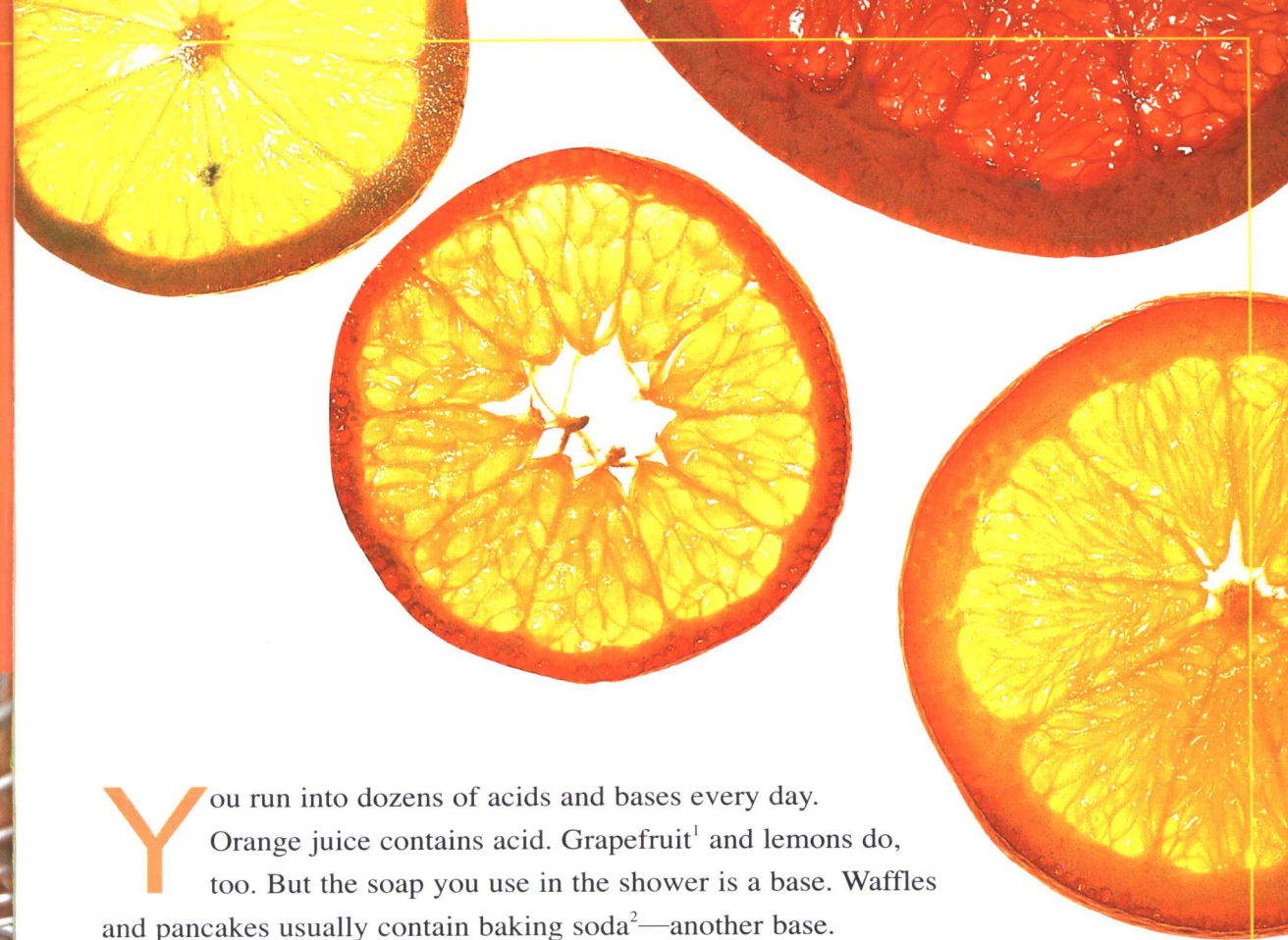
They're Everywhere!

酸和碱：它们无处不在！

The alarm¹ buzzes². In the shower you lather³ up with soap. At breakfast you wash down waffles⁴ with orange juice. Your day is just beginning, but acids and bases are already part of it!

- | | | |
|-----------|----|------------|
| 1. alarm | n. | 闹钟 |
| 2. buzz | v. | 发出嗞嗞(或嗡嗡)声 |
| 3. lather | v. | 以泡沫覆盖 |
| 4. waffle | n. | 华夫饼; 威化饼 |

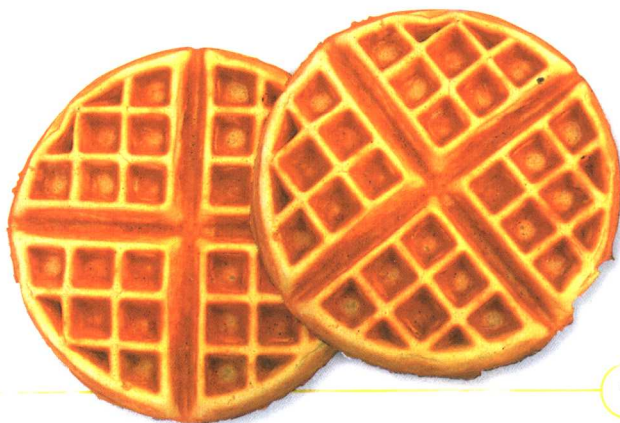




You run into dozens of acids and bases every day. Orange juice contains acid. Grapefruit¹ and lemons do, too. But the soap you use in the shower is a base. Waffles and pancakes usually contain baking soda²—another base.

Believe it or not, there are acids and bases in your own body. Your stomach makes acid that helps digest³ food. Acids are key ingredients⁴ in the proteins⁵ that make up your muscles⁶ and skin. Your tears contain a base. So does your blood.

- | | | |
|----------------|----|-----------|
| 1. grapefruit | // | 葡萄柚 |
| 2. baking soda | | 小苏打; 碳酸氢钠 |
| 3. digest | 1: | 消化 |
| 4. ingredient | // | 成分 |
| 5. protein | // | 蛋白质 |
| 6. muscle | // | 肌肉 |



Negative¹ or Positive²?

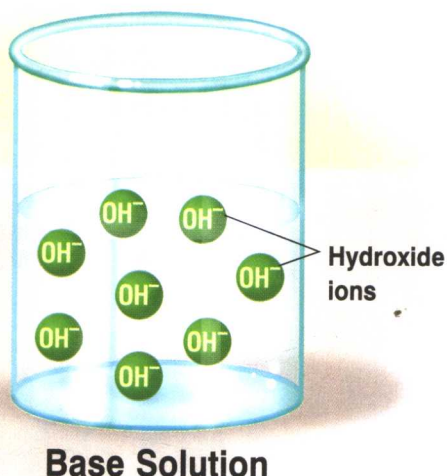
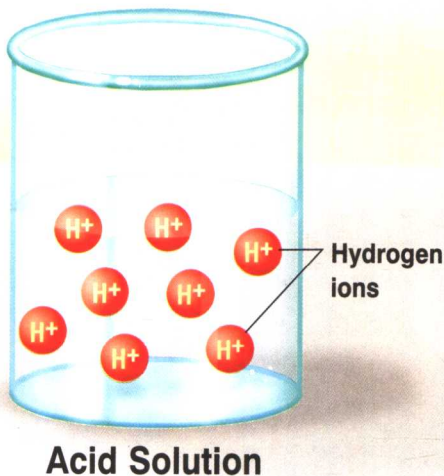
What makes an acid different from a base? The answer has to do with charged³ atoms⁴ called ions⁵. When two chemical substances⁶ interact⁷, atoms of one substance may lose negative charges⁸ to the other. The substance that loses a negative charge becomes a positive ion. The substance that gains a negative charge becomes a negative ion.

An acid is a substance that breaks apart in water in a way that releases⁹ positive hydrogen ions¹⁰ (H^+) into the solution¹¹. A base is a substance that breaks apart in water in a way that leaves negative hydroxide ions¹² (OH^-) in the solution.

Word Power

Another name for a base is an *alkali*¹³. “Alkali” comes from the Arabic¹⁴ word *al-qili*, which means “the ashes of a plant.” When ashes from burned wood are mixed with water, a base called lye¹⁵ is formed.

- | | | |
|-------------------|-------------|---------|
| 1. negative | <i>adj.</i> | 负的; 阴性的 |
| 2. positive | <i>adj.</i> | 正的; 阳性的 |
| 3. charge | <i>v.</i> | 使改变电荷性质 |
| 4. atom | <i>n.</i> | 原子 |
| 5. ion | <i>n.</i> | 离子 |
| 6. substance | <i>n.</i> | 物质 |
| 7. interact | <i>v.</i> | 互相作用 |
| 8. charge | <i>n.</i> | 电荷 |
| 9. release | <i>v.</i> | 释放 |
| 10. hydrogen ion | | 氢离子 |
| 11. solution | <i>n.</i> | 溶液 |
| 12. hydroxide ion | | 氢氧离子 |
| 13. alkali | <i>n.</i> | 碱 |
| 14. Arabic | <i>adj.</i> | 阿拉伯语的 |
| 15. lye | <i>n.</i> | 碱液 |



Telltale¹ Clues

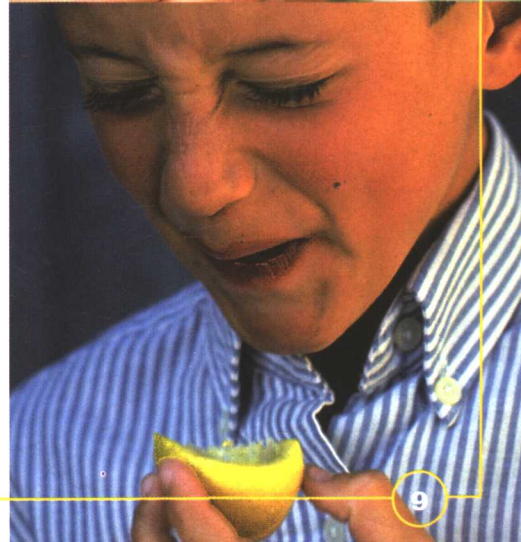
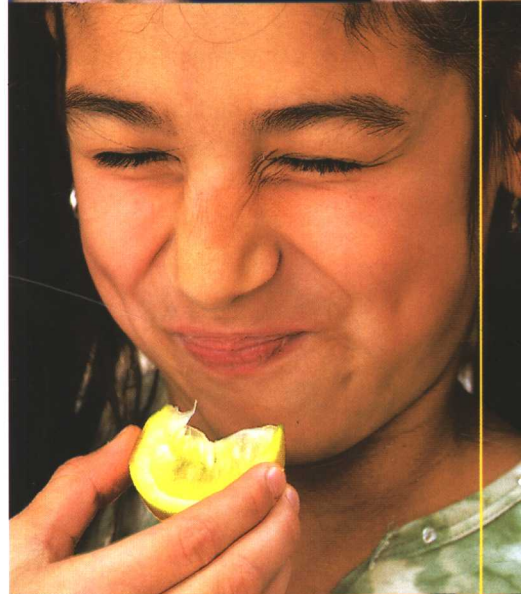
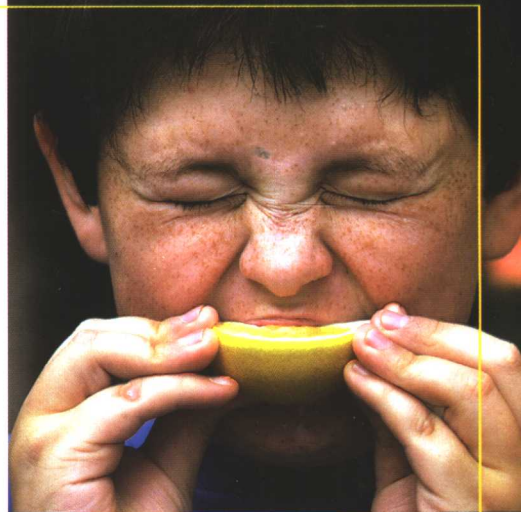
Wait a minute, you may be thinking. So we define² acids and bases by what's happening with ions. But ions are far too small to see, even with a microscope³. Are there other ways to tell if something is an acid or a base? Yes, indeed! Here are some clues:

Acids taste sour. What gives lemonade, orange juice, and grapefruit their zingy⁴ flavor⁵? An acid called citric acid⁶. It's found in lots of fruits. Lactic acid⁷ gives foods such as sour cream⁸, yogurt⁹, and sauerkraut¹⁰ their sharp, sour taste. When you crunch¹¹ into a dill pickle¹², does your mouth “pucker¹³ up”? Dill pickles are soaked¹⁴ in vinegar¹⁵, which is—you guessed it—another acid, one called acetic acid¹⁶.

1. telltale	<i>adj.</i>	能说明问题的
2. define	<i>v.</i>	给……下定义
3. microscope	<i>n.</i>	显微镜
4. zingy	<i>adj.</i>	令人愉快而激动的
5. flavor	<i>n.</i>	味道
6. citric acid		柠檬酸
7. lactic acid		乳酸
8. sour cream		酸奶油
9. yogurt	<i>n.</i>	酸奶
10. sauerkraut	<i>n.</i>	泡菜
11. crunch	<i>v.</i>	嘎吱嘎吱地咀嚼
12. dill pickle		加蒟蓍的腌黄瓜
13. pucker	<i>v.</i>	起皱纹; 缩拢
14. soak	<i>v.</i>	浸泡; 浸渍
15. vinegar	<i>n.</i>	醋
16. acetic acid		乙酸; 醋酸
17. figure out		推断

WARNING!

Although it's true that all acids taste sour, you should **NEVER** taste something to try to figure out¹⁷ if it's an acid. Some acids are poisons.



Interesting Questions . . .

Asking About Acid Rain

Q: What kinds of acids are found in acid rain?

A: Two of the most common acids are nitric acid⁵ and sulfuric acid⁶.

Q: What's being done about acid rain?

A: Factories that burn coal are installing⁷ scrubbers⁸ on smokestacks⁹. These devices¹⁰ help keep chemicals that cause acid rain from getting into the air.

Acids corrode¹, or dissolve, metal.

The scientists working in Villa Luz were careful to make sure that no acid dripped on their equipment². That's because acids can eat right through metal.

You don't have to visit Villa Luz to have acid dripping on you, though. In many parts of the world, acid rain³ falls from the sky. When coal and other fossil fuels⁴ are burned, chemicals are released into the air. Inside clouds, some of these chemicals combine with water to form acids. They fall to Earth as acid rain (or acid snow). Acid rain eats away at metal structures. It also dissolves some kinds of stone and kills living things such as trees and fish.

1. corrode	v.	腐蚀
2. equipment	n.	装备
3. acid rain		酸雨
4. fossil fuel		矿物燃料
5. nitric acid		硝酸
6. sulfuric acid		硫酸
7. install	v.	安装
8. scrubber	n.	涤气器; 洗涤剂
9. smokestack	n.	烟囱
10. device	n.	装置; 设备
11. destroy	v.	毁灭

Trees destroyed¹¹ by acid

Base Basics

While acids taste sour, bases taste bitter.

Like acids, bases have certain telltale characteristics¹. There aren't very many foods that are basic, probably because most people don't like the taste of bitter things.

Bases feel slippery² when you touch them.

They are good at dissolving certain substances, like grease³ and oily dirt. That's one reason why bases make good cleaning agents⁴. But beware—bases also break down proteins. Skin contains a lot of protein. Some bases can actually dissolve your skin.

Most hand soaps help wash away oily dirt without harming your skin. But other cleaning products, such as oven cleaners and drain openers⁵, contain much more powerful bases. Never sniff⁶ the fumes⁷

WARNING!

NEVER taste an unknown substance to try to figure out if it's a base. Some bases, like some acids, are poisonous.



Statue dissolved by acid rain

from these products or let them touch your bare⁸ skin. Acids and bases are everywhere, but some of them need to be used with care.

- | | | |
|-------------------|-------------|---------|
| 1. characteristic | <i>n.</i> | 特征; 特点 |
| 2. slippery | <i>adj.</i> | 滑的 |
| 3. grease | <i>n.</i> | 油脂 |
| 4. agent | <i>n.</i> | 剂 |
| 5. drain opener | | 下水道疏通剂 |
| 6. sniff | <i>v.</i> | 闻 |
| 7. fume | <i>n.</i> | 烟; 气; 汽 |
| 8. bare | <i>adj.</i> | 赤裸的 |



Picture This

读 图 地 带

Don't Mess with Mother Nature: Acids and Bases in the Natural World

不要打扰大自然母亲：自然界中的酸和碱

Going for a hike¹ in the woods? A picnic by the lake? Watch your step! Be careful where you sit and what you touch. Many plants and animals use acids and bases for protection. Contact² with them can be harmful.

WOOD SORREL³ The leaves of wood sorrel have a sour taste that comes from oxalic acid⁴. This sour taste discourages⁵ plant-eating animals.



STINGING⁶ ANTS Stinging ants are armed with formic acid⁷. When threatened⁸, they give their enemies a painful acid jab⁹.



- | | | |
|----------------|-------------|---------|
| 1. hike | <i>n.</i> | 远足 |
| 2. contact | <i>n.</i> | 接触 |
| 3. wood sorrel | | 酢浆草 |
| 4. oxalic acid | | 草酸 |
| 5. discourage | <i>v.</i> | 阻拦 |
| 6. stinging | <i>adj.</i> | 刺人的；蜇人的 |
| 7. formic acid | | 蚁酸 |
| 8. threaten | <i>v.</i> | 威胁 |
| 9. jab | <i>n.</i> | 刺；戳 |

1. deadly nightshade		颠茄
2. manufacture	<i>v.</i>	制造
3. alkaloid	<i>n.</i>	生物碱
4. toxic	<i>adj.</i>	有毒的
5. whip scorpion		有鞭蝎, 鞭尾蝎
6. arachnid	<i>n.</i>	蛛形纲动物
7. spider	<i>n.</i>	蜘蛛
8. irritate	<i>v.</i>	激怒, 使恼怒
9. emit	<i>v.</i>	射出, 散发
10. nasty	<i>adj.</i>	使人难受的
11. mist	<i>n.</i>	喷雾
12. stinging nettle		大荨麻
13. weed	<i>n.</i>	野草
14. blister	<i>v.</i>	起水疱
15. itch	<i>v.</i>	发痒

WHIP SCORPION⁵ It isn't really a scorpion. It's an arachnid⁶ that is related to spiders⁷. When it is irritated⁸, the whip scorpion emits⁹ a nasty¹⁰, vinegar-like mist¹¹ containing acetic acid.



STINGING NETTLES¹² These plants are common weeds¹³ and look harmless. But they have tiny hairs, which contain formic acid. Brush against them and, like stinging ants, they release their secret weapon. Formic acid causes skin to blister¹⁴, burn, and itch¹⁵.



DEADLY NIGHTSHADE¹ Plants can't run away from danger. Many plants protect themselves from hungry animals by producing substances that taste bad or are poisonous. Deadly nightshade plants are well named. They manufacture² bases, called alkaloids³, which are among the most toxic⁴ chemicals in the natural world.

Reading the Clues:

Acids or Bases?

解读线索：酸，还是碱？

Suppose you're a detective¹. Several clues in a crime² are vials³ of liquids⁴. They could be acids or bases. The answer solves⁵ the mystery⁶. But acids and bases can be dangerous. How can you figure out if the liquids are acids or bases without tasting, touching, or smelling them?

1. detective	//	侦探
2. crime	//	犯罪
3. vial	//	小瓶
4. liquid	//	液体
5. solve	v	解决
6. mystery	//	谜