

# Concept Development

Concepts fundamental to each unit in the curriculum are developed through the use of both text and visual images (photographs, illustrations). Students learn and apply a variety of strategies such as headings, photograph captions, and illustration labels to acquire understanding of the concepts presented in the text.

Student Record of Learning corresponding pages.

## Concise Presentation

Concise text focus on fundamental concepts, often using bullet format, rather than excessive details.

## 2.2

### Properties of Acids and Bases

You have observed that both acids and bases will cause certain chemicals, called **indicators**, to change colour. Do acids and bases have any other similar behaviours, or properties?

Have you ever eaten sour candies? Did you know that the sour taste was caused by citric acid? Check it out! Look at the list of ingredients that appear somewhere on the package (Figure 1). Is citric acid listed as an ingredient?

Did you know that sour milk is caused by another acid, lactic acid? Apparently, acids are **sour-tasting**.

Other acids that can be safely consumed are shown in Table 1.

Acid (common name)	Source or use
vinegar (10% acetic acid)	salad dressing
citric acid	fresh fruit
ascorbic acid	Vitamin C
lactic acid	sour milk
carbonic acid	carbonated soft drinks
acetylsalicylic	Aspirin

Some acids react with metals and glass (Figure 2).

These acids, such as sulphuric acid and nitric acid are described as **corrosive**.

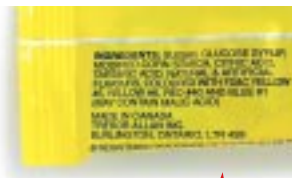
If released into the environment, both of these acids can cause serious damage.

Bases have common characteristics, or properties, as well. Like acids, some bases are safe enough to be consumed.

Base	Source or use
sodium bicarbonate	baking soda/baked goods
potassium sulphite	food preservative
aluminum hydroxide	antacid

These bases are **bitter-tasting** and **slippery** when rubbed between the fingers.

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**Figure 1**  
The ingredient list on a package of sour candies shows that citric acid is one of the ingredients.



**Figure 2**  
Nitric acid reacts quickly with copper metal. This reaction can be used to produce works of art.

Some bases are just as dangerous as acids. They can burn the skin. No one should try to determine if it might be a base.

Bases which are not safe to consume include

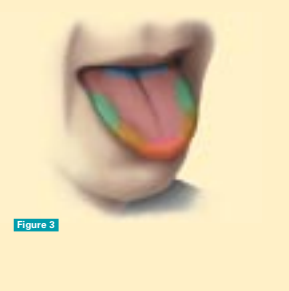
Base	Source or use
sodium hydroxide	drain cleaner
potassium hydroxide	soap
ammonium hydroxide	window cleaner

In addition to having a bitter taste, and feeling slippery to the touch, these bases are described as **corrosive**.

### Try This Activity Tasting Acids and Bases

How does your tongue recognize tastes like sour and bitter? The sense of taste depends on chemical reactions between what you eat and the taste buds on the tongue. Where are the taste buds that recognize sour and bitter located on the tongue?

- To create the sour taste, dip one end of a Q-tip (or a cotton swab rolled onto the end of a toothpick) into vinegar.
- Apply the wet cotton to each of the areas of the tongue illustrated below.
- Repeat the process with another cotton swab dipped into a solution of baking soda.
- Label each taste bud on the tongue as sour, bitter, or neither.



**Figure 3**

SKILLS HANDBOOK: Graphic Organizers

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## Challenge Connection

The *Challenge* is introduced in the *Unit Overview* and referenced throughout the unit. Students are directed as to how they might use knowledge or skills acquired in the section to complete the *Challenge* later in the unit.

## Illustrations and Photos

High quality illustrations and photographs integrated with text to enhance comprehension for a wide range of students.

## Try This

A short activity, using readily available materials, to illustrate a concept and/or develop skills.

## Skills Handbook Cross-References

References indicate to students where they can find added information and extra help in the Skills Handbook.

**2.2**

### Properties of Acids and Bases

In the space below, summarize what you have learned about indicators and how they change colour in the presence of acids and bases.

Indicator	Acid Colour	Base Colour
Litmus		
Red cabbage		

**Activity 1: Consumer Product Survey, Part A**  
Which ingredient is most easily responsible for the "sour" taste?

**Procedure**

- Examine the ingredients list from a package of "sour" candy.

List in order the first five ingredients.

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- Collect the ingredients list from several consumer products around the place where you live. How many acids can you identify in these products?

*Give yourself*

- 3 points for each "sour acid" you discover
- 2 points for a previously discovered acid
- 2 points for a "top 5" ingredient acid
- 100 points for 15 points

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# Challenge

There are three *Challenges* in each unit providing students with opportunities to demonstrate evidence of their knowledge and skills as they solve a problem.

## Assessment Criteria

Several possible assessment criteria for the *Challenges* are made explicit for the students. Rubrics for assessment of the *Challenges* are provided in the Teacher's Resource.

## Unit 2 Challenge

### Chemical Processes and Society

Chemical reactions create various products that have an enormous impact on society. The demand for these products has created a huge chemical industry that employs millions of people around the world. But the same chemical reactions that are used to create products have also created environmental challenges. Each of the challenges presented below provides an opportunity to explore how chemical processes affect society.



#### 1 Making a Consumer Product

You will build a display to explain to local people how a new factory, that will be built in their town, will affect them. The factory will produce a new consumer product. Identify the raw materials that it is made of, find out where the raw materials come from, how they are transformed in the chemical industry, and what effects these processes have on local people.

#### Design and build a display that includes

- a flow chart that shows the progression from raw materials to the final product;
- the names and formulas of the substances involved;
- a diagram of a key component in the production of the product or one of its raw materials;



#### 2 Marketing Alternative Fuels

You will prepare a marketing proposal to promote an alternative energy source as the fuel of the future. Most conventional vehicles burn gasoline, but there is increasing interest in developing and using alternative fuels, such as hydrogen, methane, and alcohol. First, research the substances and chemical processes that are used to power vehicles today. Then research alternative sources of chemical energy. Choose one of these sources as your focus.

#### Prepare and present a proposal that includes

- the names, chemical structures, and chemical formulas of conventional and alternative fuels;
- the chemical reactions that are used to power vehicles today;
- examples of alternative energy sources;

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#### 3 Acid Rain Action Plan

You know that air pollution is an environmental problem. The demand for electricity to power our technological devices and our consumption of fossil fuels create huge amounts of air pollutants. Perhaps you have decided that people are accepting environmental pollution—specifically acid rain—as a consequence of their lifestyle choices. You want to change people's attitudes and encourage them to think about how their actions affect the environment. Create a local or community action plan to encourage people to "Think Globally, Act Locally."

#### Prepare a community action plan that includes

- an environmental awareness poster that describes how acid rain is produced as a consequence of human actions;
- the names and chemical formulas of the reactants, and the chemical reactions that are involved in the production of acid rain;

 When preparing to use a chemical test, carry out an experiment, or to build or test a device, be sure to have your plan approved by your teacher before you begin.

## Assessment

Your completed Challenge may be assessed according to the following:

#### Process

- understand the specific challenge
- develop a plan
- choose and safely use appropriate tools, equipment, materials, and computer software
- analyze the results


#### Communication

- prepare an appropriate presentation of the task
- use correct terms, symbols, and SI units
- incorporate information technology

#### Product

- meet established criteria
- show understanding of the concepts, principles, laws, and theories
- show effective use of materials
- address the identified situation/problem

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## Safety Precaution

Safety instructions for students are included where appropriate, along with visual clues or WHMIS symbols to reinforce safety procedures when conducting the investigation.