PEARSON

Investigating SCIENCE 9

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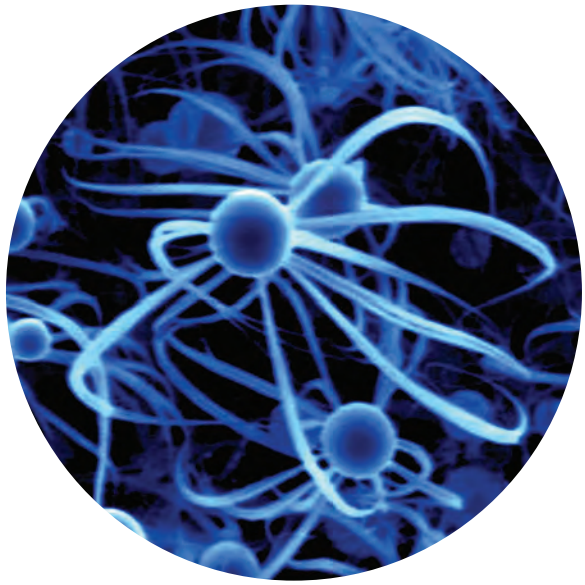

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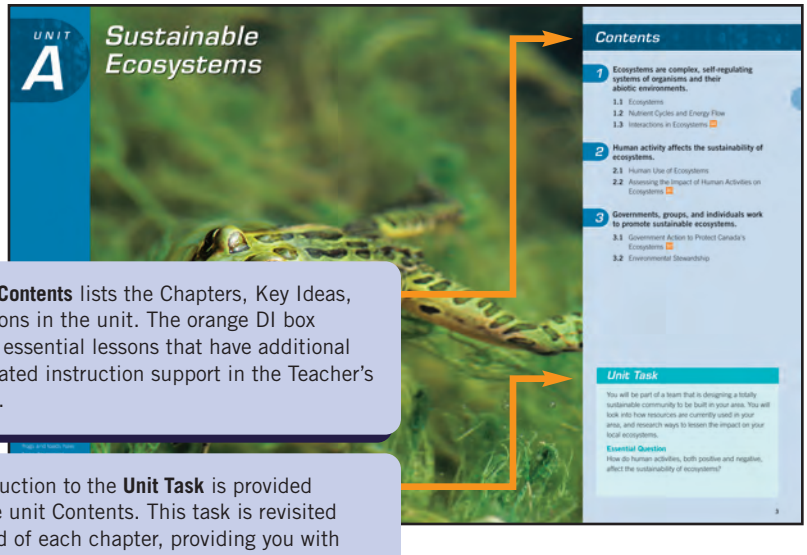
12 **Cool Ideas** A Light Show in Your Mouth 499

You are about to begin a scientific exploration using *Investigating Science 9*. To assist you in your journey, this book has been designed with the following features to help you.

1. Unit Overview — what you will learn

The book is divided into four units. Each unit opens with a large photograph that captures one of the ideas that will be covered in the unit.

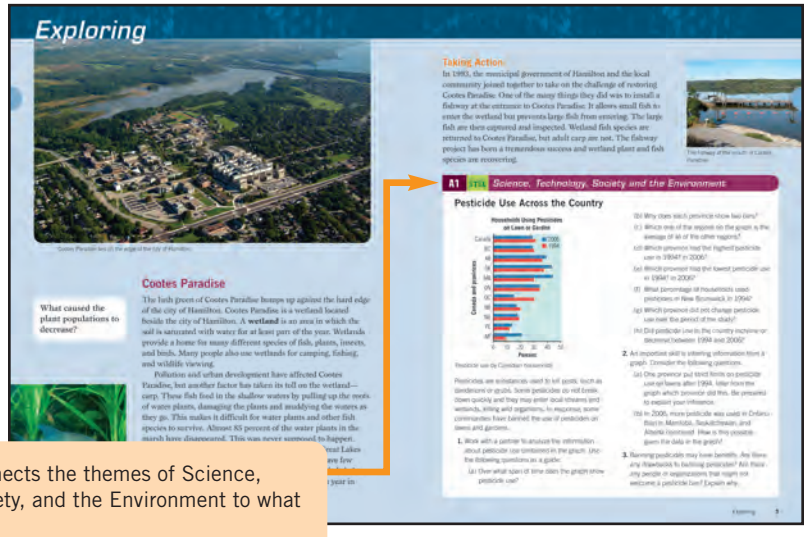


The unit **Contents** lists the Chapters, Key Ideas, and sections in the unit. The orange DI box indicates essential lessons that have additional differentiated instruction support in the Teacher's Resource.

An introduction to the **Unit Task** is provided below the unit Contents. This task is revisited at the end of each chapter, providing you with an opportunity to review key ideas covered in the chapter that will be required to successfully complete the Unit Task.

2. Exploring — adds interest

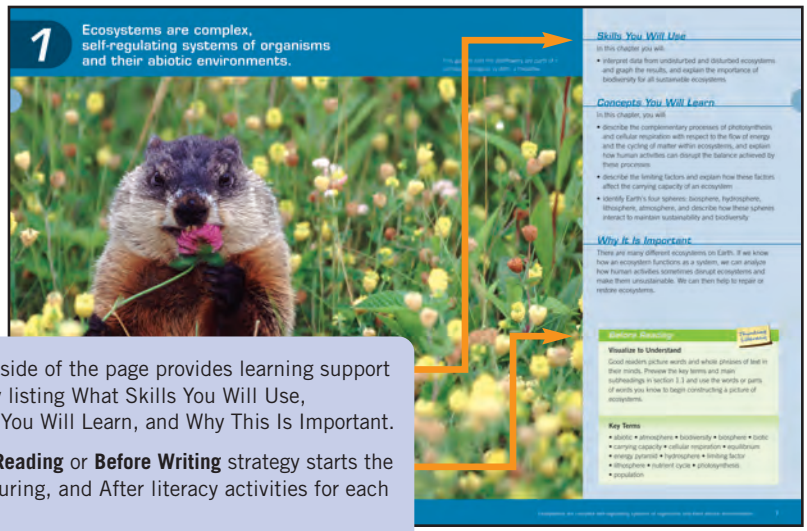
This spread is an introduction. It has an interesting real-world example to introduce the unit.



This activity connects the themes of Science, Technology, Society, and the Environment to what you are learning.

3. Chapter Introduction — organizes the topics

Each chapter starts with an engaging visual designed to motivate your interest and provide discussion opportunities for the class.

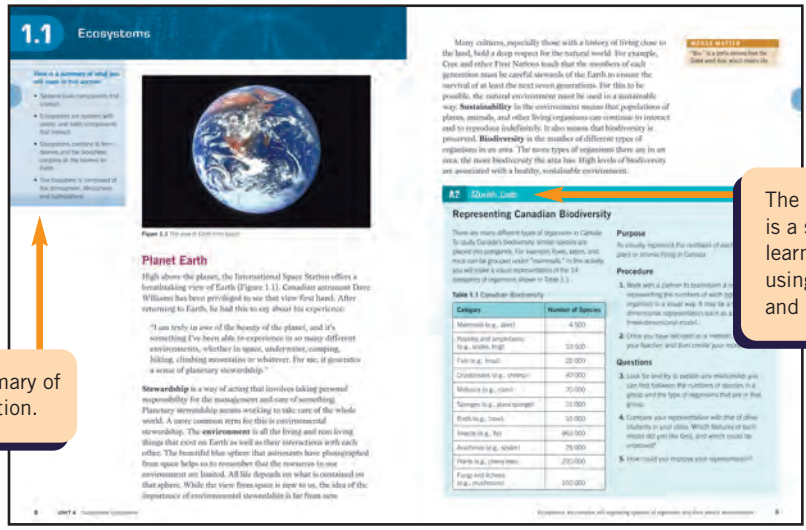


The right side of the page provides learning support for you by listing What Skills You Will Use, Concepts You Will Learn, and Why This Is Important.

A **Before Reading** or **Before Writing** strategy starts the Before, During, and After literacy activities for each chapter.

4. Sections — engaging information on the topics

There are two or three sections in each chapter. Each section starts with a reading and a Quick Lab activity.



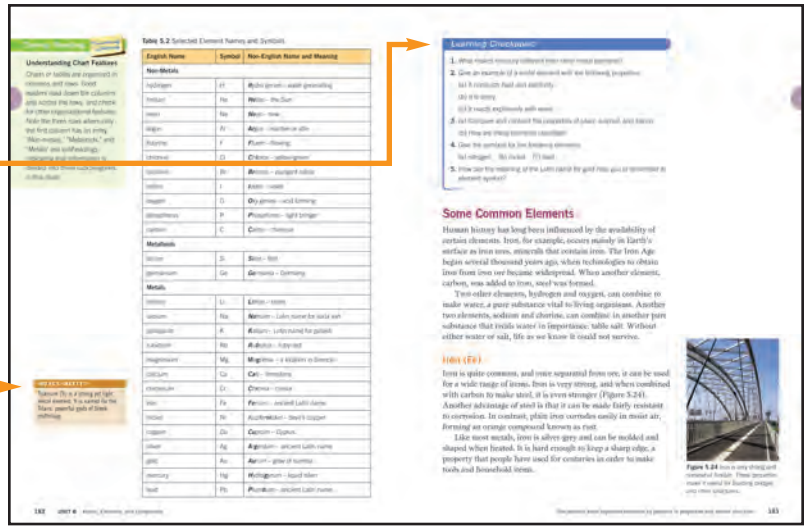
The **Quick Lab** activity is a short, informal learning experience using simple materials and equipment.

Each section includes a summary of what you will learn in the section.

During Reading and **During Writing** literacy activities provide you with an opportunity to consolidate your understanding.

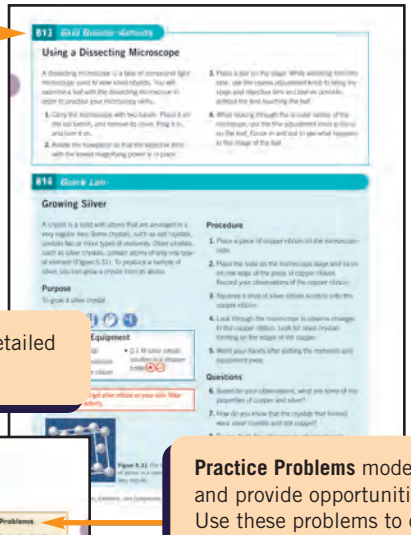
The **Learning Checkpoint** allows you to check your understanding of what you have just read.

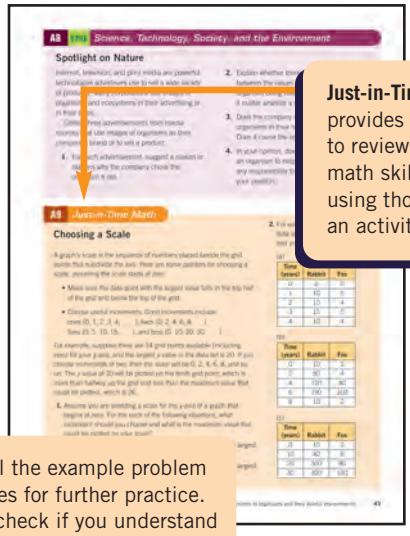
Words Matter helps you understand a term by describing its origin.



4. Sections — engaging information on the topics *(continued)*

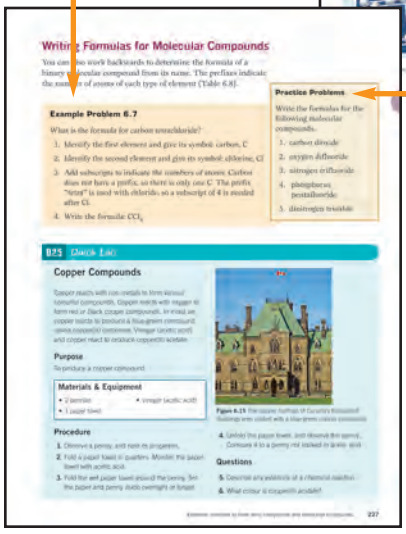
Skill Builder Activity reviews or reinforces certain skills necessary for completing some of the activities.





Just-in-Time Math provides an opportunity to review some of your math skills before using those skills in an activity.

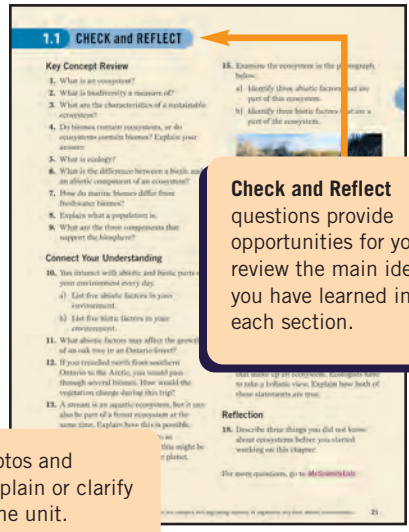
Example Problems show the detailed steps in solving problems.



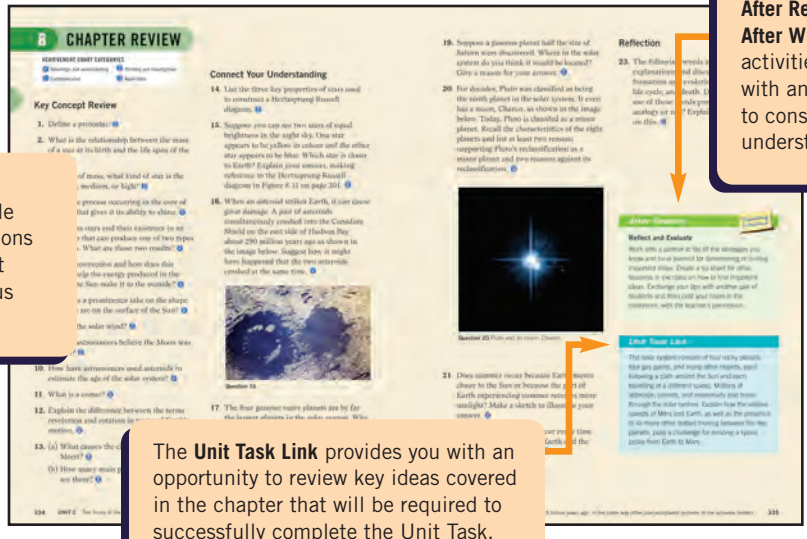
Practice Problems model the example problem and provide opportunities for further practice. Use these problems to check if you understand the concept being discussed.

At the end of the section is a **Take It Further**. This is an additional way to study one of the ideas in the section.

You will find many photos and illustrations to help explain or clarify many of the ideas in the unit.



Check and Reflect questions provide opportunities for you to review the main ideas you have learned in each section.



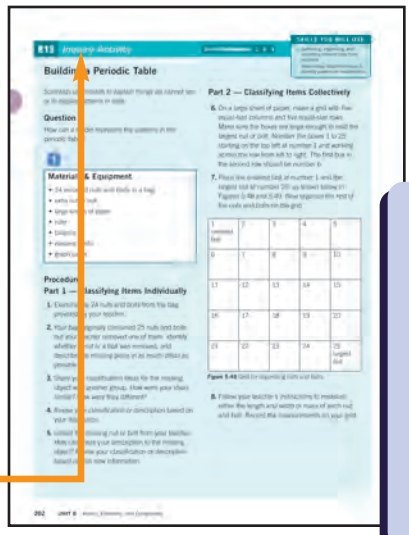
The **Chapter Review** contains questions relevant to the whole chapter. Answering the questions will help you consolidate what you have learned in the various parts of the chapter.

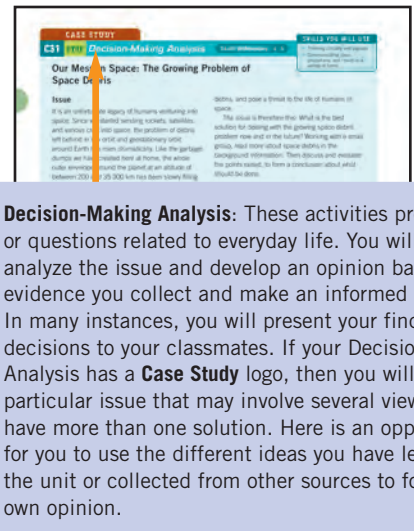
After Reading or **After Writing** literacy activities provide you with an opportunity to consolidate your understanding

The **Unit Task Link** provides you with an opportunity to review key ideas covered in the chapter that will be required to successfully complete the Unit Task.

5. Activities — develop your science skills

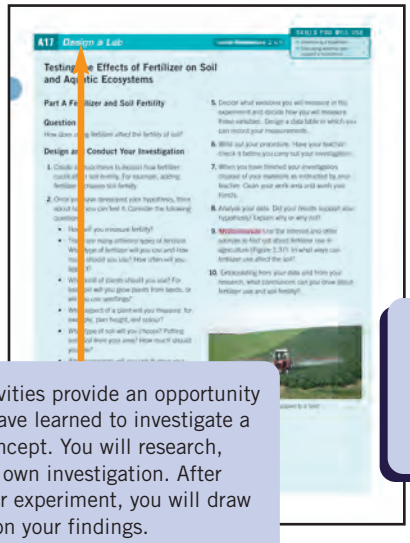
There are five main types of activities: Inquiry Activities, Quick Labs, Decision-Making Analyses, Problem-Solving Activities, and Design a Lab activities. The Quick Lab was discussed on page xix.

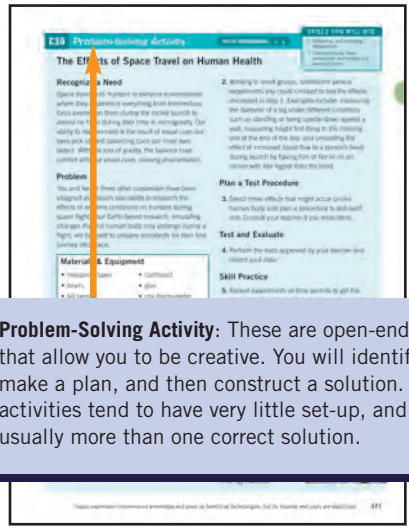




Inquiry Activity: These activities provide the oportunity for you to work in a lab setting. You will develop scientific skills of predicting, observing, measuring, recording, inferring, analyzing, and many more. In these activities, you will investigate many different phenomena found in our world.

Decision-Making Analysis: These activities present issues or questions related to everyday life. You will need to analyze the issue and develop an opinion based on the evidence you collect and make an informed decision. In many instances, you will present your findings and decisions to your classmates. If your Decision-Making Analysis has a **Case Study** logo, then you will analyze a particular issue that may involve several viewpoints or have more than one solution. Here is an opportunity for you to use the different ideas you have learned from the unit or collected from other sources to form your own opinion.



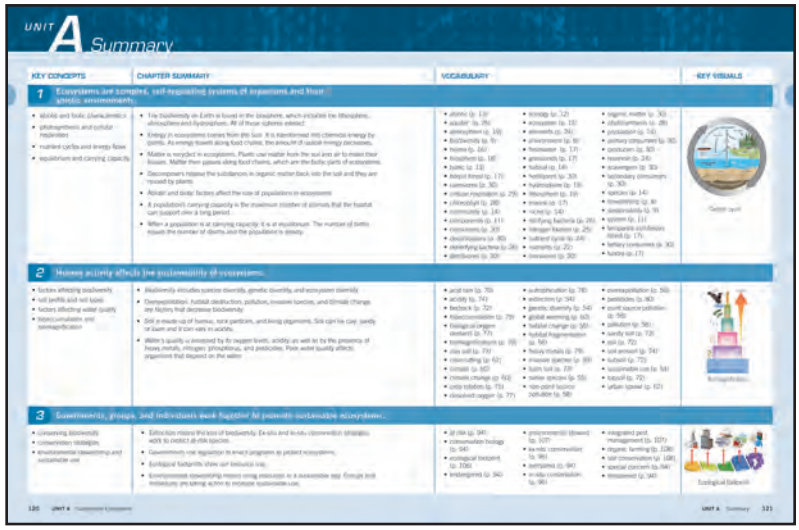


Problem-Solving Activity: These are open-ended activities that allow you to be creative. You will identify a problem, make a plan, and then construct a solution. These activities tend to have very little set-up, and there is usually more than one correct solution.

Design a Lab: These activities provide an opportunity to apply the skills you have learned to investigate a question related to a concept. You will research, plan, and carry out your own investigation. After collecting data from your experiment, you will draw conclusions and report on your findings.

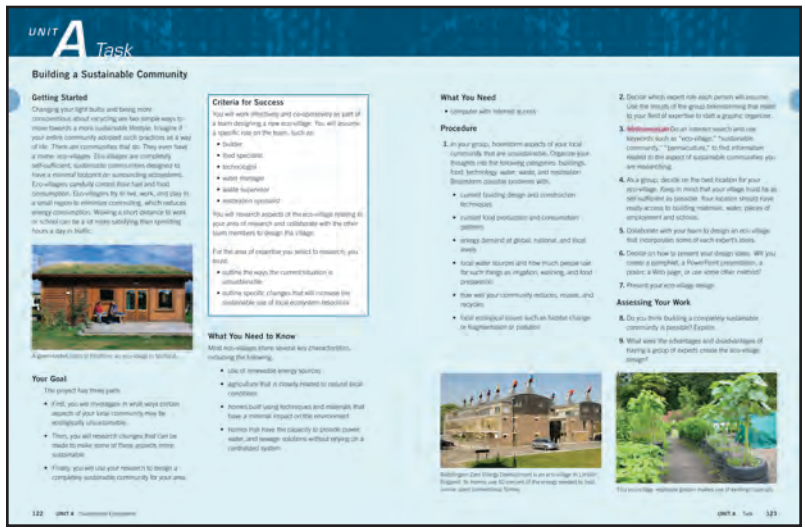
6. Unit Summary — a review of what you've learned

At a glance, you can find all of the key concepts you have learned within the unit. You can also read the summary of ideas in each section of the unit as well as review vocabulary and key visuals. These pages can help you organize your notes for studying.



7. Unit Task — lets you demonstrate learned skills

A task at the end of each unit presents an opportunity for you to demonstrate what you've learned. You'll work in a group or individually. The task requires you to apply some of the skills and knowledge that you have acquired during the unit.


UNIT A Task

Building a Sustainable Community

8. Unit Review — connects what you have learned

The Unit Review is an opportunity to review the concepts, skills, and ideas you have learned in the unit.

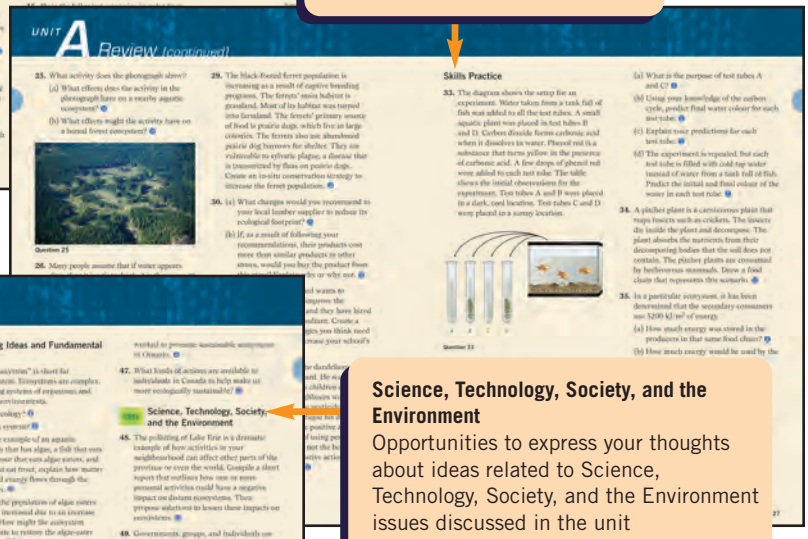

UNIT A Review

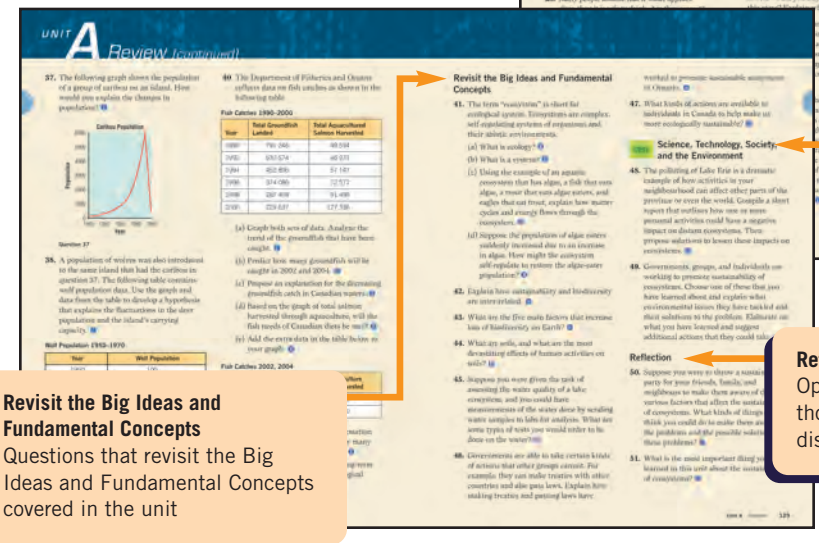
Key Terms Review
This is a chance to review the important terms in the unit

Key Concept Review
Questions designed to review your basic understanding of the key concepts in each chapter of the unit

Connect Your Understanding
Questions that require you to use the ideas in more than one chapter in your answers

Skills Practice
Questions related to specific skills you have learned in the unit


UNIT A Review (continued)


UNIT A Review (continued)

Revisit the Big Ideas and Fundamental Concepts
Questions that revisit the Big Ideas and Fundamental Concepts covered in the unit

Science, Technology, Society, and the Environment
Opportunities to express your thoughts about ideas related to Science, Technology, Society, and the Environment issues discussed in the unit

Reflection
Opportunities to express your thoughts about ideas you have discovered in the unit

9. Other Features — bring science to life

Here are other features you will find in each unit. Each one has a different purpose and is designed to help you learn about the ideas in the unit.

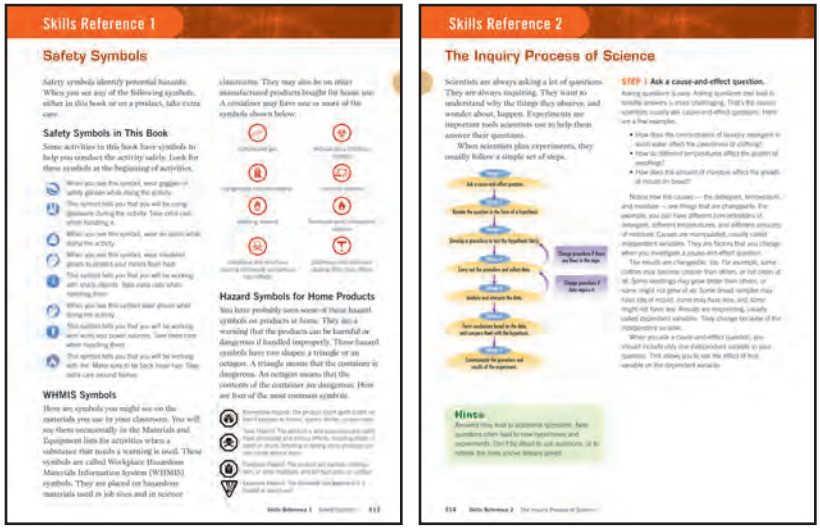
Investigating Careers in Science
Here you will find profiles of great Canadians in science as well as careers in science based on the different types of science studied in each unit.

Science Everywhere
This feature presents interesting information about concepts covered in the unit.

Cool Ideas
This feature is written by Discovery Channel *Daily Planet* host Jay Ingram to connect concepts covered in the unit to findings coming from current research.

10. Skills Reference — provides skills information and practice

These pages provide references to lab safety and other basic scientific skills that will help you as you do the activities. Remember to check the Skills Reference when you need a reminder about these skills.



Now it is time to start. We hope you will enjoy your scientific exploration using *Investigating Science 9*!

Biology
UNIT A: Sustainable Ecosystems

Big Ideas

- Ecosystems are dynamic and have the ability to respond to change, within limits, while maintaining their ecological balance.
- People have the responsibility to regulate their impact on the sustainability of ecosystems in order to preserve them for future generations.

Fundamental Concepts

- Systems and Interactions
- Sustainability and Stewardship
- Change and Continuity

Overall Expectations

1. assess the impact of human activities on the sustainability of terrestrial and/or aquatic ecosystems, and evaluate the effectiveness of courses of action intended to remedy or mitigate negative impacts
2. investigate factors related to human activity that affect terrestrial and aquatic ecosystems, and explain how they affect the sustainability of these ecosystems
3. demonstrate an understanding of the dynamic nature of ecosystems, particularly in terms of ecological balance and the impact of human activity on the sustainability of terrestrial and aquatic ecosystems

Chemistry
UNIT B: Atoms, Elements, and Compounds

Big Ideas

- Elements and compounds have specific physical and chemical properties that determine their practical uses.
- The use of elements and compounds has both positive and negative effects on society and the environment.

Fundamental Concepts

- Matter
- Structure and Function
- Sustainability and Stewardship

Overall Expectations

1. assess social, environmental, and economic impacts of the use of common elements and compounds, with reference to their physical and chemical properties
2. investigate, through inquiry, the physical and chemical properties of common elements and compounds
3. demonstrate an understanding of the properties of common elements and compounds, and of the organization of elements in the periodic table

Earth and Space Science
UNIT C: The Study of the Universe

Big Ideas

- Different types of celestial objects in the solar system and universe have distinct properties that can be investigated and quantified.
- People use observational evidence of the properties of the solar system and the universe to develop theories to explain their formation and evolution.
- Space exploration has generated valuable knowledge but at enormous cost.

Fundamental Concepts

- Matter
- Energy
- Systems and Interactions
- Structure and Function
- Change and Continuity

Overall Expectations

1. assess some of the costs, hazards, and benefits of space exploration and the contributions of Canadians to space research and technology

2. investigate the characteristics and properties of a variety of celestial objects visible from Earth in the night sky

3. demonstrate an understanding of the major scientific theories about the structure, formation, and evolution of the universe and its components and of the evidence that supports these theories

Physics
UNIT D: The Characteristics of Electricity

Big Ideas

- Electricity is a form of energy produced from a variety of non-renewable and renewable sources.
- The production and consumption of electrical energy has social, economic, and environmental implications.
- Static and current electricity have distinct properties that determine how they are used.

Fundamental Concepts

- Energy
- Systems and Interactions
- Structure and Function

Overall Expectations

1. assess some of the costs and benefits associated with the production of electrical energy from renewable and non-renewable sources, and analyze how electrical efficiencies and savings can be achieved, through both the design of technological devices and practices in the home

2. investigate, through inquiry, various aspects of electricity, including the properties of static and current electricity, and the quantitative relationships between potential difference, current, and resistance in electrical circuits

3. demonstrate an understanding of the principles of static and current electricity

Science Safety Procedures

You will be doing many activities in this book.

When doing an activity, it is very important that you follow the safety rules below. Your teacher may have safety instructions to add to this list.

Before You Begin

1. Read and make sure you understand the instructions in the text or in any handouts your teacher may provide. Follow your teacher's direction always. Never change or start an activity without approval.
2. Watch for "Caution" notes such as the one below. These notes will tell you how to take extra care as you work through the activity. Make sure you understand what the cautions mean.

CAUTION: Tie back long hair, and be careful around open flames. Do not touch calcium metal with your bare hands as the metal will react with moisture in your skin.

3. Learn to recognize the safety symbols and the warning symbols for hazardous materials as seen on the next page. These include WHMIS symbols. WHMIS is the Workplace Hazardous Materials Information System.
4. Keep your work area uncluttered and organized.
5. Know the location of fire extinguishers and other safety equipment.
6. Always wear safety goggles and any other safety clothing as requested by your teacher or identified in this book.
7. If you have long or loose hair, tie it back. Roll up long sleeves.
8. Inform your teacher if you have any allergies or medical conditions or anything else that might affect your work in the science classroom.
9. Review the Material Safety Data Sheet (MSDS) for any chemicals you use in the lab. See an example of one on the next page.

Wear proper safety equipment when doing science activities.

Safety Symbols


When you see this symbol, wear goggles or safety glasses while doing the activity.


This symbol tells you that you will be using glassware during the activity. Take extra care when handling it.


When you see this symbol, wear an apron while doing the activity.


When you see this symbol, wear insulated gloves to protect your hands from heat.


This symbol tells you that you will be working with sharp objects. Take extra care when handling them.


When you see this symbol, wear gloves while doing the activity.


This symbol tells you that you will be working with wires and power sources. Take extra care when handling them.


This symbol tells you that you will be working with fire. Make sure to tie back loose hair. Take extra care around flames.

WHMIS Symbols


compressed gas


biohazardous infectious material


dangerously reactive material

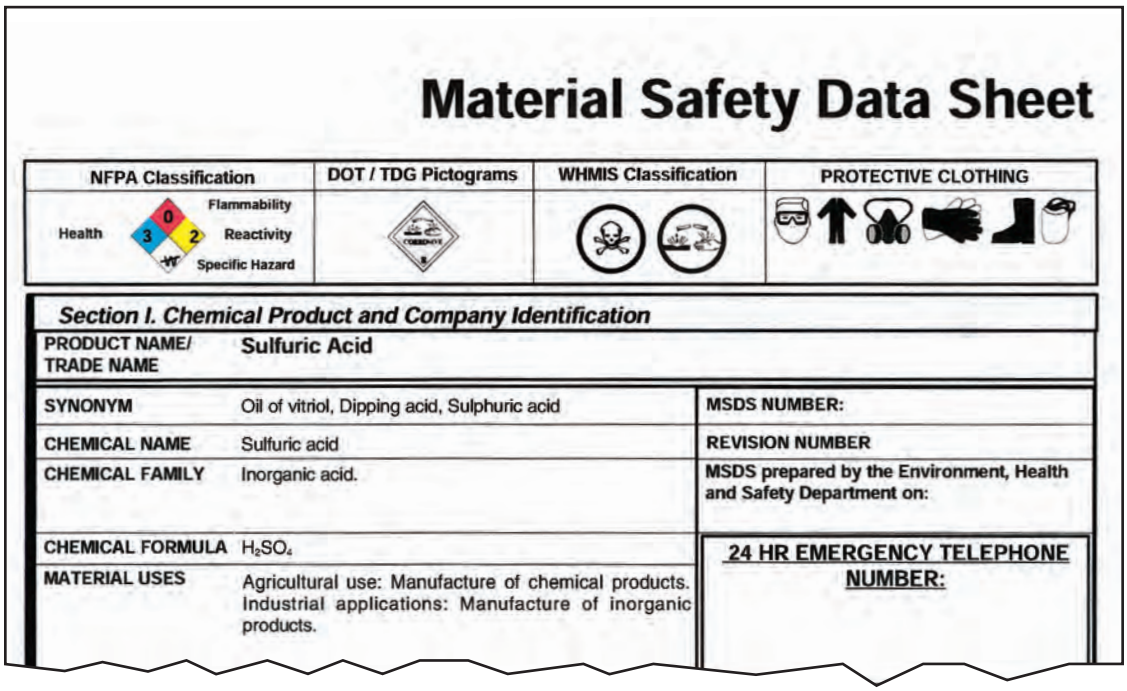

corrosive material


oxidizing material


flammable and combustible material


poisonous and infectious material causing immediate and serious toxic effects


poisonous and infectious material causing other toxic effects



Material Safety Data Sheet

NFPA Classification	DOT / TDG Pictograms	WHMIS Classification	PROTECTIVE CLOTHING
Health 3, Flammability 0, Reactivity 2, Specific Hazard W			

Section I. Chemical Product and Company Identification

PRODUCT NAME/ TRADE NAME	**Sulfuric Acid**	
SYNONYM	Oil of vitriol, Dipping acid, Sulphuric acid	MSDS NUMBER:
CHEMICAL NAME	Sulfuric acid	REVISION NUMBER
CHEMICAL FAMILY	Inorganic acid.	MSDS prepared by the Environment, Health and Safety Department on:
CHEMICAL FORMULA	H_2SO_4	24 HR EMERGENCY TELEPHONE NUMBER:
MATERIAL USES	Agricultural use: Manufacture of chemical products. Industrial applications: Manufacture of inorganic products.	

In Canada, manufacturers of all hazardous products used in workplaces, including schools, must provide information sheets about their products. The Material Safety Data Sheet (MSDS) identifies the chemical and physical hazards associated with each substance. It includes physical data, such as melting point and boiling point, toxicity, health effects, first aid, and spill and leak cleanup procedures. WHMIS regulations require employers to make these sheets available to employees who use hazardous substances in their work. The above is an example of an MSDS for a substance that you might use in a science activity.

During the Activity

10. Report any safety concerns you have, or hazards you see (such as spills) to your teacher.

11. Don't chew gum, eat, or drink in your science classroom.

12. Never taste anything in science class.

13. Never smell any substance directly. Instead, gently wave your hand over it to bring its vapours toward your nose.

14. Handle all glassware carefully. If you see cracked or broken glass, ask your teacher how to dispose of it properly.

15. Handle knives and other sharp objects with care. Always cut away from yourself, and never point a sharp object at another person.

16. Heat solids and liquids only in open heat-resistant glass containers and test tubes. Use tongs or protective gloves to pick up hot objects.

17. When you heat test tubes, make sure that the open end is pointing away from you and anyone else in the room.

18. When heating a substance, make sure the container does not boil dry.

19. If any part of your body comes in contact with a chemical, wash the area immediately and thoroughly with water. If you get anything in your eyes, do not touch them. Wash them immediately and continuously with water for 15 min. Inform your teacher.

20. Keep water or wet hands away from electrical outlets or sockets.

21. Use tools safely when cutting, joining, or drilling. Make sure you know how to use any tools properly.

22. Use special care when you are near objects in motion, gears and pulleys, and elevated objects.

23. Make sure equipment is placed safely so that people will not knock it over or trip

over it. Report any damaged equipment to your teacher immediately.

24. Treat all living things with respect. Follow your teacher's instructions when working with living things in the classroom or on a field trip.

When You Finish the Activity

25. Make sure you close the containers of chemicals immediately after you use them.

26. Follow your teacher's instructions to safely dispose of all waste materials.

27. Always wash your hands well with soap, preferably liquid soap, after handling chemicals or other materials. Always wash your hands after touching plants, soil, or any animals and their cages or containers.

28. When you have finished an experiment, clean all the equipment before putting it away. Be careful with hot plates and equipment that have been heated as they may take a long time to cool down.

Learning Checkpoint

Your teacher will give you a copy of an MSDS for bleach solution. Use this MSDS to answer questions 1–8.

1. List three synonyms for the name "bleach."

2. Bleach solution has two ingredients. What are they? Which of these ingredients is hazardous?

3. Find the hazard identification section. Under "Emergency Overview," there is a short summary. Find the summary, and record it.

4. Read the list of potential health effects. Copy down the potential health effect caused by eye contact.

5. Find the section under "First Aid Measures," and record the instructions for what to do in case of eye contact.

6. If a fire were to break out near bleach, should the bleach itself be considered a fire hazard? What special equipment is required to fight a fire in which bleach is present?

7. Suppose someone drank bleach. Should the first aid procedure include inducing vomiting to get the solution out of the person? What other treatments are possible?

8. Find out what is meant by the term "chronic exposure."

9. Why is it important for all students to follow the safety rules in a science class?

10. List precautions used in the science laboratory to minimize the following risks.
(a) poisoning
(b) scalding
(c) eye damage

11. List the steps you should take before starting a science activity.

12. Draw a sketch of your classroom or science lab indicating the location of all emergency equipment and exits.