Science 30 provides an opportunity for you to explore connections among societal issues, technologies, and science. Science 30 organizes these explorations into four units. They are Unit A: Maintaining Health; Unit B: Chemistry and the Environment; Unit C: Electromagnetic Energy; and Unit D: Energy and the Environment. Each unit opens with an introduction that establishes the theme. In the case of Energy and the Environment, the theme is balancing the need for human progress with environmental stewardship.

The introduction includes key questions that encourage you to begin to think about the main ideas to be explored in that unit.

Each chapter begins with an activity. This is a hands-on learning activity that provides immediate contact with the science concepts developed in the chapter.

Each of the chapters within a unit focuses on one aspect of the theme for that unit. Chapter 1 of Unit D begins by considering how most people in the modern world use energy. Patterns of energy consumption are investigated by considering the energy technologies that are used to make energy available for everyday activities.

The opening of a lesson often begins by making links to things you have learned in other chapters or in previous courses.

Each lesson within a chapter focuses on a key science concept that links to the chapter’s story line and the unit’s overall theme. Throughout each lesson, a concept is presented in a story that weaves the science knowledge and skills, societal issues, and technological applications.
Learning with Technology

Science 30 Textbook CDs
Many activities require the use of a computer. In many cases, this means that you will have to access information on the Science 30 Textbook CDs, which are attached to the back cover of the textbook. The information may be in the form of an applet, a computer simulation, a video, a spreadsheet, or a handout needed to complete an activity.

LearnAlberta.ca
LearnAlberta.ca is a protected digital learning environment for Albertans. This Alberta Education portal, found at http://www.learnalberta.ca, is a place where you can support your learning by accessing resources for projects, homework, help, review, or study.

For example, LearnAlberta.ca contains a large Online Reference Centre that includes multimedia encyclopedias, journals, newspapers, transcripts, images, maps, and more. The National Geographic site contains many current video clips that have been indexed for Alberta Programs of Study. The content is organized by grade level, subject, and curriculum objective. Use the search engine to quickly find key concepts. Check this site often as new interactive multimedia segments are being added all the time.

If you find that a password is required, contact your teacher or school to get one. No fee is required.

Alternative Learning Environments and Distributed Learning
Although many students who enrol in Science 30 will be in a traditional classroom with a teacher, an increasing number of students will find themselves in alternative learning environments. The options include online or virtual schools, home education, outreach programs, and alternative programs.

Distributed learning students can find customized resources on the Science 30 Textbook CDs in the folder called Distributed Learning Student Guide.
Visual Cues
Visual cues are provided throughout the textbook to help remind you about the special requirements of a particular learning activity.

Technology indicates that you will be using specialized computer software to complete the learning activity. The software could be designed for developing spreadsheets, multimedia presentations, or documents.

Internet Search is a cue reminding you that the activity requires you to complete a search to gather specific topic information. The activity will provide focusing questions that will help direct your searching.

Science 30 Textbook CD is a cue reminding you to access information on either CD. The information could be in the form of an applet, a data table, a spreadsheet, or some form of a handout.

Safety
Many learning activities in this course require you to be especially cautious because you will be dealing with potentially hazardous materials. The caution icon alerts you to the hazards and indicates helpful procedures and techniques.

**CAUTION!**
Use gloves, safety glasses, and a lab apron for this activity.

Science Skills
The specific skills that you will be practising in an investigation or in an activity are indicated by a visual cue. Some activities may require you to use only one skill, while others may require you to practise all of them.

Science Skills
- Initiating and Planning
- Performing and Recording
- Analyzing and Interpreting
- Communication and Teamwork

Special Learning Activities

Investigations
Investigations are opportunities to practise the inquiry skills of science.

**Investigation**
Dissecting a Mammal’s Heart

**Purpose**
You will identify the main parts of a dissected heart, and you will trace the path of oxygenated and deoxygenated blood through the heart. You will choose one of two possible pathways for this activity; one that uses instruments to dissect the heart of a mammal, and the other that involves a virtual dissection.

**Materials**
- heart of a mammal (e.g., pig, cow)
- set of dissecting instruments: scissors, scissors, probe, forceps
- 2 pieces of yarn 80 cm long
- handout: “Labels for the Parts of the Heart” and “The Human Heart—Labelled” from the Science 30 Textbook CD
- dissecting tray
- latex or vinyl gloves
- apron
- digital camera

**Procedure**
step 1: Begin “Human Heart.” Then scroll to “Heart Plans.” Practice naming each part of the heart, and then move the cursor over each part to confirm your prediction.
step 2: Select the pupil card called “Animated Heart.” Carefully watch the animation, focus on the action of the valves. As the animation plays, add a soundtrack by selecting “Lip” and “Dial” at the correct times. Adjust the heart rate and observe the differences in your own sound track.
step 3: Select the pupil card called “Narrated Tour.” Locate the position of your own heart as you listen to the description.

These experiments have been carefully designed so that you can use materials to learn skills and deepen your understanding of concepts.

Utilizing Technology
Utilizing Technology activities require the use of a computer.

**Utilizing Technology**
The Animated Heart

**Purpose**
You will have an opportunity to observe the systolic and diastolic phases of the heart’s cycle by using the applet “The Human Heart.” This applet is located on the Science 30 Textbook CD.

**Science Skills**
- Analyzing and Interpreting

**Procedure**
step 1: Begin “Human Heart.” Then scroll to “Heart Plans.” Practice naming each part of the heart, and then move the cursor over each part to confirm your prediction.
step 2: Select the pupil card called “Animated Heart.” Carefully watch the animation, focus on the action of the valves. As the animation plays, add a soundtrack by selecting “Lip” and “Dial” at the correct times. Adjust the heart rate and observe the differences in your own sound track.
step 3: Select the pupil card called “Narrated Tour.” Locate the position of your own heart as you listen to the description.

Many students find that an applet is a very effective way to learn about an abstract concept because the learning process is highly visual and the pace of the activity is determined by the learner.

Try This Activity
A Try This Activity is a hands-on demonstration or exploration completed with simple equipment.

**Try This Activity**
Measuring Your Heart Rate Before and After Exercise

**Purpose**
You will measure your heart rate in three different situations: when you are resting; immediately after exercising, otherwise often compare their heart rates to their waking heart rate. This procedure measures their level of fitness and the intensity of their training program.

**Science Skills**
- Analyzing and Interpreting

**Procedure**
Using a watch or clock, count the number of beats in fifteen seconds and then multiply by four to get the beats per minute. It is best to measure your pulse two or three times and calculate an average to get the most accurate heart rate while you are resting. Record this number as your resting heartbeat per minute (atp).

CAUTION!
If you have a medical condition that prevents you from participating in physical education classes, you should not participate in the resting part of this activity.

These activities are more concise than investigations.
Special Features

Did You Know?
The Did You Know? feature identifies interesting information that relates to the concepts.

DID YOU KNOW?
The average thunderstorm releases the same amount of energy as a 20-kilotonne nuclear weapon.

Health File
This feature, found only in Unit A, identifies opportunities for you to add to your personal health file throughout the unit.

Science Links
This advanced organizer identifies connections to related topics in the other units.

Science Links
Many scientists suspect that skin cancers caused by exposure to UV light could become more of a problem in the future because a key component of the atmosphere that protects people from this radiation is being depleted. Most of the UV photons emitted by the Sun are absorbed by ozone in the stratosphere. As described in Unit B, human activities release compounds, such as CFCs, that reduce the concentration of ozone in the stratosphere.

Career Profile
Each unit ends with a career profile about how one individual established a science career.

Career Profile
Tara (Williams) Vojak, a descendant of the Mohawk People, studied biology at the University of Montreal. Upon graduation, Tara searched for career opportunities in fields that interested her and would utilize her skills. While traveling in Russia, she was fortunate enough to meet NASA employees working in Moscow supporting the Manned Space Flight Program; they led her in the right direction.

Tara was hired as a Biomedical Flight Controller at the Johnson Space Centre in Houston, Texas. After several years of training, she worked in Mission Control as a member of the flight control team for the International Space Station (ISS). During missions, Tara advised the ISS crews on the operation, maintenance, and repair of the extensive Crew Health Care System, which includes medical, fitness, and environmental analysis equipment. In addition, she ensured a safe and healthy environment onboard the space station by monitoring the temperature, pressure, and atmospheric gas composition.

Tara is currently working with a team of doctors, engineers, scientists, and astronauts to develop the medical requirements necessary to safely return a human crew to the Moon, and eventually to Mars. With missions lasting up to two-and-a-half years, they need to consider long-term exposure to weightlessness, increased radiation, and, of course, how much food to pack.

Tara loves her job with NASA and advises other Aboriginal students to set their career goals high and reach for the stars.

Summarize Your Learning
At the end of each chapter you will have the opportunity to summarize the key ideas in a number of ways.
Features at the Back of the Textbook

**Reference**

The Reference section at the back of this textbook contains helpful information that you will need to refer to throughout the course. In addition to tables and charts, you can find information related to safety and to a variety of learning strategies.

**Glossary**

As you read the textbook, important terms are identified with a bold font. These terms are defined close to where they occur in the lesson, and they are also defined in the Glossary at the back of this textbook.

**Lesson Answers**

Short answers to questions asked within lessons can be found in the Lesson Answers section. This includes answers to practice questions and lesson review questions. Answers to investigations, chapter review questions, and unit review questions must be obtained from your teacher.

Assessment

**Example Problems**

When you first encounter a new type of problem that applies a concept to the unit’s theme, an example problem will give you the essential coaching needed for success. When you reach the end of a chapter or a unit, use example problems as a tool for studying. If you cover up the solution and then re-attempt the problem, you can then compare your answer with the detailed solution.

**Example Problem 1.7**

A balloon is given a charge of \(-4.5 \text{ nC}\).

a. Determine the electric field strength 30 cm from the centre of the balloon.

b. Sketch a diagram of the electric field lines around the balloon.

**Solution**

\[
E = \frac{q}{4\pi \varepsilon_0 r^2} \\
E = \frac{4.5 \times 10^{-9} \text{ C}}{(0.30 \text{ m})^2} \\
E = 4.5 \times 10^7 \text{ N/C}
\]

The negative sign is not used in the equation. The negative sign is used to determine direction in part b.

The electric field strength 30 cm from the balloon’s centre is 4.5 \times 10^7 \text{ N/C}.

b. Since the direction of the electric field is determined by the force on a positive test body, the electric field lines are directed toward the negatively charged balloon.
Practice Questions
Practice questions can be found throughout the lessons of each chapter. These questions are in the context of the lesson and are designed to check your understanding of the concepts.

33. Evaluate the categories used in the Toxic Substances List by indicating both good and bad points about the categories.
34. DDT is a substance on the Toxic Substances List and is not permitted for use in Canada. Use the Internet to identify the evidence used to place DDT on the list. Use this evidence to determine under which categories DDT would appear.

Lesson Review Questions
Each lesson ends with review questions. These questions check your knowledge of important terms, your understanding of key concepts, and your ability to relate this learning to real-world applications.

Chapter Review Questions
Chapter review questions provide an opportunity for you to apply knowledge, skills, and concepts from all lessons within a chapter. To answer one question, you will often be required to apply what you have learned in several lessons to a new situation.

Unit Review Questions
Unit review questions require you to apply what you have learned from all chapters within a unit. These questions focus less on specific details and more on connections between the key concepts, and on how these concepts relate to the unit theme.