

Topic 1.5

How do technology, substances, and environmental factors affect human health?

Specific Expectations

- **B1.1** analyse, on the basis of research, medical imaging technologies used in Canada to explore, diagnose, or treat the human body, and communicate their findings
- **B1.2** evaluate the effects that use of or exposure to a technology, substance, or environmental factor may have on the function of human tissues, organs, or systems
- **B2.1** use appropriate terminology related to human cells, tissues, organs, and systems, including, but not limited to: *absorption, anaphase, capillaries, concentration, differentiation, diffusion, interphase, metaphase, osmosis, prophase, red blood cells, regeneration, and telophase*
- **B2.6** use scientific investigation skills to research health problems related to tissues, organs, or systems in humans, and communicate their findings

Skills

- formulate scientific questions
- identify and locate relevant resources
- gather, organize, and interpret data from various sources
- analyze information for reliability and bias
- draw and justify conclusions
- communicate ideas using a variety of formats
- identify and describe careers related to biology
- identify scientists who have made a contribution to biology

Materials

Please see the teaching notes for each activity for a list of the materials required. Please see pages TR-38 to TR-41 for a summary of the materials required in this topic.

Overview

In this topic, students will discover how technology, substances, and environmental factors affect human health. Medical imaging technologies such as X rays, CT scans, ultrasound, MRI scans, PET scans, endoscopy, and microscopy all allow individuals in the medical community to explore, diagnose, and treat the human body. Exposure to various technologies, substances, and environmental factors such as second hand smoke, pesticides, and cellphones can impair health. Technologies such as the i-Pill, regenerative medicine, and artificial blood will affect human health in new ways in the future. As new medical breakthroughs appear and are developed, our understanding, diagnosis, and treatment of the human body can be improved. Students will use their scientific investigative skills to research the ramifications of these medical developments.

Common Misconceptions

- **Students may believe that all medical technologies are safe, or that all medical technologies are unsafe.** In reality, every technology has certain risks, but when proper precautions are taken, the risks can be minimized. The X ray that you receive at the dentist emits harmful radiation, so the frequency at which X rays are given is regulated. When you receive an X ray, you are also shielded with a lead blanket.
- **Students may believe that airport terminal scans do not emit radiation.** Any scanning technology emits some form of radiation, including security scans at airports.
- **Students may believe that stem cell research is dangerous.** So far, there is no evidence that stem cell research using fetal tissue and/or adult tissue is dangerous to human health.
- **Many people believe that pesticides sprayed on lawns are completely safe to all forms of life except the pests they are designed to kill.** Residues from pesticides can harm family pets that may walk on the lawn because the animals will ingest the chemicals when they clean their paws. They may also harm children who play on the lawn, and animals that eat the pests that are affected by the pesticide.
- **Cell phones and tanning parlours are often regarded as completely safe technologies.** New studies indicate that prolonged cell phone use can damage the ear and the hand (repetitive stress injuries). It may also play a role in the later development of brain cancer. Any exposure to UV light, such as that in tanning parlours, will lead to premature aging of skin and can lead to skin cancers.

Background Knowledge

Medical imaging technologies are used to make images of cells, tissues, and organs more accessible to viewing. The development of these sophisticated technologies for diagnosis and treatment must take into account such factors as effectiveness of treatment, cost to the individual and to the hospital or clinic, equity of access, and safety. Most of these technologies have been developed in the last 50 years; however traditional and alternative remedies such as herbs and acupuncture may still hold promise for some individuals. All members of society must learn to appreciate the inherent dangers of any technology and must become more aware of the consequences that such advances in medicine and diagnosis might have. Our students will be asked in the future to make decisions that will affect their health or the health of a loved one. We must ensure that they are well informed about the use and misuse of technology. Awareness will allow members of our society to make informed decisions, taking into account both the benefits and the risk factors of any new medical technology. For more information about emerging medical technologies, such as i-Pills and regenerative medicine, please visit www.scienceontario.ca.

Literacy Strategies

Before Reading

- Use think-pair-share. Have students consider the questions below, and then discuss the responses with a classmate to create a written answer.
 - What are some examples of medical imaging technologies?
 - How does medical imaging technology help us explore, diagnose, and treat human diseases?
- Invite pairs of students to share their ideas about medical imaging technology. Make a concept map to summarize what students already know.
- Ask students to suggest possible effects of cellphone use, smoking, and exposure to pesticides or UV rays on their body systems based upon their prior knowledge.

During Reading

- **ELL** Have students use sticky notes to flag words or phrases that they do not understand. At the end of every subsection, discuss the meanings of these terms with students.
- Students can rewrite the headings in the form of questions, and then take notes to answer the questions. Alternatively, they can use Table 1.4, on page 78, as a model and construct their own tables to record notes about the things that can damage our health (pages 80 and 81), and new medical technologies (pages 82 and 83).
- Have students complete three summary statements for this topic: one about medical imaging technology, one about exposure to technologies, substances and environmental factors, and one about future medical developments. They can use **BLM G-37 Summarizing** to help them organize information for each summary.

After Reading

- Have students reflect on what they have read by sharing three things they have learned in this topic with a classmate.
- Students can consolidate their understanding of medical imaging technologies, and create a review sheet, by completing **BLM 1-37 Medical Imaging Technologies**.
- Add to the concept map about medical imaging technology that you developed before reading.
 - **ELL** Consider providing a hard copy of this concept map to English language learners. This allows them to attend fully during lessons and know they will be receiving accurately written and detailed notes.

Assessment FOR Learning		
Tool	Evidence of Learning	Supporting Learners
Learning Check, page 79 Activity 1.24, page 84 Activity 1.25, page 85	Students identify the purposes and features of common medical imaging technologies, and use the results of these technologies to make reasonable predictions.	<ul style="list-style-type: none"> • BLM 1-37 Medical Imaging Technologies can help students consolidate the features and purposes. • Students can complete Activity 1.24 and Activity 1.25 in pairs to discuss their predictions and the reasons for them.
Activity 1.22, page 80 Learning Check, page 81 Investigation 1F, pages 88 and 89	Students describe possible effects of exposure to common substances, technologies, and environmental factors.	<ul style="list-style-type: none"> • Students can complete cause-and-effect maps or flowcharts to summarize and consolidate the effects of these factors. See BLM G-39 Cause-and-Effect Map and BLM G-43 Flowchart. • Encourage students to choose a presentation format that suits their strengths and interests. For some this may include a performance component. For others this may be a written product.
Activity 1.23, page 83 Learning Check, page 83	Students describe some possible effects of changing medical technologies.	<ul style="list-style-type: none"> • Read pages 82 and 83 together. As you do, work with students to create a spider map summarizing new health care technologies. This should help them comprehend the text as well as providing phrases they can use to answer the questions.

Topic 1.5 (Student textbook pages 76–93)

Using the Topic Opener

- Invite a medical specialist to visit the class to discuss how their role has changed over the last ten years and what they might foresee in newer technologies.
- Discuss what students know about how medicine was practiced in the past. Emphasize that our knowledge and understanding continues to grow. Just as we have learned a great deal in the past 100 years, due to the efforts of researchers, things we think we know today may change in the future.
- Ultrasounds of babies are available on the Internet. Project two or three, and ask what students can see in each image.

Starting Point Activity (Student textbook page 77)

Pedagogical Purpose

Prior to the introduction of medical imaging technology, the medical community relied more upon their intuition and their other senses. In this activity, students will be exposed to a model “digestive system” and are asked to determine the organs represented. Students will use their prior knowledge of organ systems to assist them in “sensing” their model. Skills of investigation and communication are developed here.

Planning

Materials	materials to create four or five model digestive systems (for example: balls, tubing, paper towel rolls, elastics, film canisters, candy, screws, nuts, bolts, and so on) a box for each model flexible foam to cover each model
Time	30 min in class 30 min preparation

Activity Notes and Troubleshooting

- Refer to pages 62 and 63 in Topic 1.4 for details about the digestive system. Build four or five model digestive systems by taping or gluing appropriate materials together to approximate their position in the abdomen. The models should be similar but not unique. Place each model in a box and cover the open top of the box loosely with foam so that students can feel the model but cannot see it.
- Have students work in groups of four to six. Each group gets one model to examine. Groups could examine all four or five models but should focus on one model when drawing their diagrams.
- Students will find this exercise in intuition quite challenging. Provide plenty of guidance and encouragement but do not reveal the models until all students have exhausted their resources.
- Have students share their diagrams with the class.
- After students have drawn their diagrams, you could show them pictures of the digestive system that are not in student textbook.
- Debrief the activity to get students thinking about the important roles modern imaging technologies can play. Ask: “What difficulties did you encounter in this activity? What could have made it easier to figure out what was in the box?”

Additional Support

- Develop student responsibility. Allow students to work in pairs or groups, but require each student to submit their own diagram based on their observations.
- **ELL** Write the names of organs in the digestive system on the chalkboard for students to use as a reference when labelling their diagrams.

Starting Point Activity Answers

2. The layer of foam represents skin and fat.
3. Diagrams should resemble Figure 1.25 on page 63.
4. Answers may vary.
5. The technology has improved the life or lifespan of people who are sick or injured by helping health care workers make more accurate diagnoses of what is wrong, and allowing them to avoid amputation and treat infections. Most of the newer technologies are non-invasive and eliminate the need for anaesthetic and surgery.

Instructional Strategies for Topic 1.5

Student textbook pages 78-79

- Project a large image of **BLM 1-37 Medical Imaging Technologies** to help students focus as you discuss the medical imaging technologies and their purposes.
- Both 3-D and 4-D ultrasounds are now available to most pregnant women in Canada. 3-D ultrasound is a picture and 4-D ultrasound is a moving image. Have students research how this technology is different from the technology that they might have been exposed to as an embryo or a fetus.
- Create magnetic cards that define each of the new terms introduced and let students take turns using them to explain the features of each technology.
- Students can create picture glossaries for each type of technology in this topic.

Student textbook pages 80-81

- Show large photographs of people in everyday situations who are engaging in one of the activities shown on this spread. Have students identify any risks the person may be exposed to. Students could also create a collage for each type of risk, cutting images out of newspapers and magazines.
- Have students work in groups or pairs to create a t-chart showing the positive and negative effects of some of these factors. For example, living in an urban (or rural) area can have negative effects on their health but it can have benefits, too.

Student textbook pages 82-83

- Have pairs of students read one of the sections on this spread, and create a summary of it, including words and visuals. Then have students form groups of six—three pairs who read different sections—and teach one another about the technology they summarized. Students can take notes based on these discussions. Require that students hand in their summaries.

Learning Check Answers (Student textbook page 79)

1. The development of medical imaging technology allowed doctors and others in the medical community to observe what was occurring inside the patient. As a result, diagnosis and treatment are more accurate and easier for the patient.
2. Answers may vary. For example: to diagnose bone injuries and malformations, to monitor fetal development, and to diagnose cancer or to track cancer treatments.
3. Microscopy would be an appropriate technology to use.
4. An X ray or CT scan would be an appropriate technology.

Activity 1.22 What Are The Health Risks? (Student textbook page 80)

Pedagogical Purpose

Every day, students are exposed to a barrage of health risks as well as the possible effects of exposure to several harmful technologies, substances, and environmental factors. In this activity, they will identify these factors and rank them in terms of highest to lowest health risk both individually and as a class. Students then develop an action plan to reduce their health risks. By providing students with opportunities and information to make informed and responsible decisions about their health, we enable them to take more control and to make better choices.

Planning

Materials	brochures about teenage health problems such as smoking, X rays and CT scans, UV exposure, noise levels in headphones, computer use, cell phone use, and so on
Time	30 min in class 15 min preparation

Skills Focus

- collect and analyze data from a variety of sources
- make predictions and inferences
- share and receive ideas in a group situation
- make decisions based on research findings

Activity Notes and Troubleshooting

- Check with the school nurse, local pharmacy, guidance counsellor, or other personal contacts for brochures about the risks associated with the activities listed in this activity.
- Begin by having students complete the first two columns of a K-W-L chart to show what they already know and would like to learn about health risks from substances, technology, and environmental factors.
- Place copies of the brochures at four stations around the classroom. Allow students some time to read about some of the health risks involved. After the activity, you can leave these on display for interested students to read more. Have students complete the third column of their K-W-L chart.
- To rank the activities formally, give each student 6 sticky notes. Have them write one number from 1 through 6 on each note. Write the six activities on the chalkboard, and have students place one of their sticky notes under each activity, to indicate its ranking. Have volunteers find the total for each activity. The activity with the lowest total will be the one the class ranks as the highest risk.
- Have students place their action plan in a place where they will notice it, such as in the front of their notebook or on their mirror at home.

Additional Support

- **ELL** Municipal or provincial health groups may have brochures available in other languages. Make these available to students, if possible. Alternatively, students could use the Internet to find resources in their first language about these issues.

Activity 1.22 Answers

3. Most authorities would rank the activities as follows, from highest to lowest risk: smoking, second-hand smoke, UV rays or sunlight without sunscreen, X Ray or CT scan, loud music, cellphone use.
4. Action plans to reduce health risks could include: stop smoking or ask that the other individuals to smoke in other locations, use sunscreen and avoid tanning parlours, limit the number of medical screenings that you have each year by using alternatives, limit the volume of music, and limit cell phone use.

Learning Check Answers (Student textbook page 81)

1. Smoking may affect the circulatory system's ability to function by allowing fatty deposits to build up and limit the blood flow through the arteries. The heart will have to pump harder and a heart attack may result. As well, the alveoli in the lungs will become clogged with tars and other additives in cigarettes that will limit gas exchange. This limits energy production, causing the circulatory system to work harder, and placing additional stress on it.
2. People sometimes engage in such risky behaviours because of peer pressure, to gain group acceptance, and because of the pleasures such risk taking provides. Young people are often easily manipulated by older students into taking risks that they might not normally engage in. As well, some are not even aware of the risk that some environmental hazards might present.

Activity 1.23 Medical Technology Breakthrough! (Student textbook page 83)

Pedagogical Purpose

In this activity, students will choose a disease, disorder, or injury that they are familiar with such as paralysis or a severe burn. After identifying a problem associated with the chosen condition, students design a technology that will “solve” the problem and describe the technology in detail using words, pictures, or a graphic organizer. Students apply their knowledge of the basic concepts that they have studied to a real-life scenario and analyze their technology to evaluate its overall effect in solving their problem.

Planning	
Materials	Internet access or research materials supplied by students BLM G-5 Technological Problem-Solving Organizer (optional) BLM G-6 Technology Innovation Worksheet (optional)
Time	60 min in class 10 min preparation

Skills Focus

- formulate scientific questions
- select, organize, and interpret information from various sources
- communicate plans, procedures, and results using a variety of formats and appropriate terminology

Activity Notes and Troubleshooting

- Review **BLM G-5 Technological Problem-Solving Organizer** with students to prepare them for the design process.
- Continue to provide opportunities to experience a variety of group dynamics by using different strategies to form groups. For this activity, you might allow students to survey the research material and select a disease, disorder, or injury, and then group students who have selected a similar condition and have them work together to identify a problem and design a solution for it.

- As students work in groups, reinforce positive behaviours related to productive sharing and collaboration. Use these as models for others who require support in these areas.
- Time each part of the activity to ensure that students remain on task. For example, allow 20 min for research and identifying a problem. After that time, have students write or tell you the problem they have identified and then have them begin designing a solution.

Additional Support

- Consider allowing students to work individually, in pairs, or in groups of three for this activity, to suit individual learning styles.
- **ELL** Pair English language learners with students with strong English skills.
- **DI** Encourage students to choose a presentation format that suits their interests and skills. A variety of presentations, from a poster to a television interview, will capture their audience's interest.
- For further practice with technological design, students can complete **BLM G-6 Technology Innovation Worksheet** on their own or in pairs.

Activity 1.23 Answers

1.-3. Answers will vary. Students should identify a problem they want to solve related to a chosen medical condition. They should describe the purpose and function of the technology they have designed to solve the problem in some detail.

Learning Check Answers (Student textbook page 83)

1. The i-Pill will change medical treatment by delivering the medication directly to where it is needed; it then releases a pre-measured amount at that location. This will reduce the negative side effects of large doses of medications on the body.
2. Artificial blood mimics the human's blood oxygen transport ability. It does not carry out all of the functions of real blood but simply carries oxygen on fluorocarbons or on specific proteins. It is used mostly by paramedics and by emergency medical technicians.
3. Some scientists research how to destroy tissue because certain diseases or conditions such as endometriosis or cancer cause tissue to build up and this might interfere with other body functions. As well, if we can determine what destroys tissue, then we should be able to determine how to regenerate tissue.

Activity 1.24 Interpreting X Rays (Student textbook page 84)

Pedagogical Purpose

In this activity, students are asked to compare a variety of X rays and make a diagnostic assessment of them. Given that on X rays the bone appears white, air appears black, and other structures appear in various shades of grey, students must make informed decisions about their observations and predict the best treatment for each condition.

Planning	
Materials	real X rays (optional)
Time	20 min in class 5 min preparation

Skills Focus

- analyze and interpret qualitative data
- draw conclusions
- communicate using appropriate terminology
- collaborate with peers

Activity Notes and Troubleshooting

- If possible, display real X rays for students to examine. Visit a local hospital to ask if they have any you can use. Display them at workstations around the room, with a question for students to answer beside each one. Or display the x rays on an overhead.
- Have students work on their own and then use a think-pair-share activity to compare and revise answers.
- After the activity, have students work on their own to write a short statement summarizing any new knowledge they have acquired.

Additional Support

- **DI** Invite volunteers to pose as medical technologists and present their diagnoses to the class.
- Enrichment—Interested students can do further research on each of the conditions and treatments described in the text image

Activity 1.24 Answers

1. Image A shows a fracture. This may not be obvious to students.
2. **a)** Image C shows damage due to the large amount of air present in the wrist.
b) The bones and joints in image C are distorted and crooked, and have more bone build up.
c) The tissues in image C are swollen around the joints.
3. This X ray shows a metal implant/pin in the lower leg just below the knee probably to replace lost bone.
4. **a)** I would use image A and image C to decide on a treatment.
b) I would use image D and the image in question 3 to determine the success of a treatment.

Activity 1.25 Determining the Diagnosis (Student textbook page 85)

Pedagogical Purpose

In this activity, students are asked to play the role of the chief pathologist in a large urban hospital. They are provided with information about a 57-year-old female patient who died under suspicious circumstances and are asked to determine the cause of death and provide their reasoning. Students then research the condition and describe the causes, symptoms, and risk factors for this condition. Students complete a brief pathologist's report to identify and describe the cause of death. They must also explain how they came to their conclusion. As students analyze and interpret the information, they are gaining experience in making informed decisions about real-life situations.

Planning	
Materials	Internet access or print resources about common health issues, including atherosclerosis BLM G-39 Cause-and-Effect Map to BLM G-49 Venn Diagram (optional)
Time	60 min in class 10 min preparation

Skills Focus

- select and analyze information from a variety of sources
- make decisions
- communicate in a variety of formats, using appropriate terminology

Activity Notes and Troubleshooting

- Consider developing two additional scenarios, to avoid having students share results, and to reduce the demand for the same research materials.
- Have students create an appropriate graphic organizer to record the information they will use in a diagnosis for this activity. They can use **BLM G-39 Cause-and-Effect Map** to **BLM G-49 Venn Diagram** as templates. Work with students as necessary to build analytical skills as they create and use their graphic organizer.
- Students should work independently for this activity.
- Help students develop responsibility for their work. Require them to submit their research, as well as the names of resources they consulted, with their report.

Additional Support

- **ELL** English language learners can conduct research in their first language.
- Enrichment—If students are interested, encourage them to conduct further research and report back to class.

Activity 1.25 Answers

Students' diagnosis and report should include the following information: The build up of fatty deposits in the patient's arteries indicates possible atherosclerosis and that she was a smoker. Both of these are risk factors for heart disease. It is possible that the patient died of a heart attack, brought on by her underlying condition and by stress.

Investigation 1E Advances in Medical Technology

(Student textbook pages 86-87)

Pedagogical Purpose

In this activity, students will research the history, benefits, and limitations of a medical imaging technology that they have learned about in this Topic. Using their findings, students will create a pamphlet, poster, or Web page to educate patients about the pros and cons of treatment with this medical imaging technology.

Planning	
Materials	Internet access brochures and other resources about medical technologies BLM 1-38 Investigation 1E, Advances in Medical Technology {optional} BLM 1-39 Researching a Medical Technology (optional) BLM 1-40 Medical Isotopes (optional)
Time	120 min in class 30 min preparation

Skills Focus

- gather, record, and interpret relevant information from a variety of sources
- draw conclusions
- communicate in a variety of formats, using appropriate technology

Activity Notes and Troubleshooting

- This investigation requires detailed research and analysis. It will be challenging for most students in Applied Science. Proceed slowly with interim checkpoints.
- Outline fully what expectations you have of students and what product you expect them to create at the beginning of the investigation. Save pamphlets, posters, and Web pages created by students in previous years and show these to students as examples of previous work.
- Students should work independently for this activity.
- You could supply students with **BLM 1-38 Investigation 1E, Advances in Medical Technology**.
- Students can use **BLM 1-39 Researching a Medical Technology** to help them organize their answers to the What To Do questions.
- Students can use **BLM 1-40 Medical Isotopes** to organize their response to the Inquire Further question.
- If your school has access to software for generating pamphlets or Web pages, make it available for students to use and ensure they know how to use it.

Additional Support

- **ELL** Meet individually with English language learners to ensure they understand the instructions. Make yourself available to them as they work to help them understand information or instructions. Provide them with flexibility of product. For example, a poster does not necessarily require information presented in sentences and can be highly visually supportive.
- You may decide to assign the research as homework. If you do, provide students with some suggestions of sources of information.
- **DI** Encourage students to choose a suitable format for their presentation. To choose a format they should consider what they are comfortable with, but also what might best suit the content. Suggest that they choose a format that might help them build skills that they do not believe come naturally to them.
- Guests could be invited to oral presentations. Presentations in other formats could be displayed for a larger audience to view.

Investigation 1E Answers

What Did You Find Out?

Answers will vary. Students should describe the main features of their chosen technology and use their research to justify their opinions and conclusions.

Inquire Further

Medical isotopes are radioactive atoms. They are used in very small quantities to diagnose and treat diseases such as cancer. They give off small amounts of energy that can be detected by special technology. Medical isotopes are made in nuclear reactors in Canada and other countries, such as Belgium, France, the Netherlands, and South Africa.

Investigation 1F How Much Exposure Is Too Much?

(Student textbook pages 88-89)

Pedagogical Purpose

In this activity, students create a presentation about the health effects of exposure to a technology, substance, or environmental factor. Initially students will determine what they already know and then determine what sources they will use to investigate the impact of a technology on the tissues, organs, and organ systems in the human body. Students present the results of their research in the form of a blog, a podcast, or an advertising campaign that describes any potential health risks linked to exposure. After the presentation, students must draw conclusions about the effects of the exposure and then complete an inventory of their peers' opinions. It is also suggested that students might determine how safe their food is after the foods have been exposed to heavy metals, pesticides, preservatives, colouring agents, and other additives in order to measure the potential effects of this exposure on human tissues, organs, and organ systems.

Planning	
Materials	Internet access art supplies podcasting capability BLM 1-41 Investigation 1F, How Much Exposure Is Too Much? (optional) BLM 1-42 How Much Exposure Is Too Much? Summary (optional) BLM G-39 Cause-and-Effect Map to BLM G-49 Venn Diagram (optional)
Time	120 min in class 10 min preparation

Skills Focus

- gather, record, and interpret relevant information from a variety of sources
- draw conclusions
- communicate in a variety of formats, using appropriate technology

Activity Notes and Troubleshooting

- This investigation requires detailed research and analysis. It will be challenging for most students in Applied Science. Proceed slowly with interim checkpoints.
- Outline fully what expectations you have of students and what product you expect them to create at the beginning of the investigation. Save pamphlets, posters, and Web pages created by students in previous years and show these to students as examples of previous work.
- Students should work independently for this activity.
- You could supply students with **BLM 1-41 Investigation 1F, How Much Exposure Is Too Much?**
- Students can use **BLM 1-42 How Much Exposure Is Too Much? Summary** to help them record the information they find in their research.
- Have students create a graphic organizer of their choice to help them interpret and organize the information they find in their research. Students can use **BLM G-39 Cause-and-Effect Map to BLM G-49 Venn Diagram** if they need scaffolding.
- Locate any resources your school has available to help students write a blog or a podcast and ensure they know how to use them.

Additional Support

- **ELL** Meet individually with English language learners to ensure they understand the instructions. Make yourself available to them as they work to help them understand information or instructions. Provide them with flexibility of product, for example, a podcast does not require information presented in writing.
- You may decide to assign the research as homework. If you do, provide students with some suggestions of sources of information.
- **DI** Encourage students to choose a suitable format for their presentation. To choose a format they should consider what they are comfortable with, but also what might best suit the content. Suggest that they choose a format that might help them build skills that they do not believe come naturally to them.
- Guests could be invited to oral presentations. Presentations in other formats could be displayed for a larger audience to view.

Activity 1F Answers

What Did You Find Out?

Answers will vary. Students should explain the health risks of their chosen topic and use their research to justify their opinions and conclusions.

Inquire Further

The information students locate will vary. This would be a good time to discuss how to evaluate resources, including Internet resources, for reliability and bias. Refer students to Science Skills Toolkit 7, How to Do a Research Based Project, on page 386 of the student textbook.

Using the Case Study Investigation (Student textbook pages 90-91)

Literacy Support

Before reading

- Bring in news articles about performance-enhancing substances. Share them with the class and display them for students to read on their own.
- Many factors, including a healthy diet and practice, enhance performance. Create a graphic organizer, such as a Venn diagram, with students to display their current understanding of the differences between these factors and performance-enhancing substances such as steroids and hormones. Use this discussion to build key vocabulary for the case study.

During reading

- Invite a volunteer to read each section aloud. Pause after each section to clear up any new vocabulary, and to have students explain why various organs and organ systems may be affected by that substance. For example, the kidneys may be affected by creatine because they are overworked trying to filter the poisonous formaldehyde out of the blood. You could have students work in pairs to consider how organs may be affected and then share their thoughts with the class.

After reading

- Revisit the Venn diagram the class created to contrast diet and exercise with these performance-enhancing substances. Encourage additions and revisions to the diagram to show what students have learned in this case study.
- Have students complete the Over To You questions.

Activity Notes

- Students could use a flow chart to answer question 1.
- Some students may have personal experience with performance-enhancing substances, or with pressure to use them. Students may also know of sports figures who have been involved with performance-enhancing substances. As well as addressing the risks, consider discussing with students strategies to deal with any pressure they may feel to use these substances.
- Campaigns designed in question 4 could be shared with others in the school community. Encourage students to plan a medium for their campaign suitable to the information being presented and their own interests. Posters, announcements, slideshows, or other media could be suitable.

Case Study Investigation Answers

1. Students should explain that large amounts of creatine are changed into formaldehyde. The circulatory system would carry the formaldehyde to all parts of the body. The liver cleans poisons out of the blood and the poison could accumulate there.
2. Sample answers:
Diuretics: Causes the loss of water, resulting in lower weight for a competition. Also dilutes urine to pass drug tests. Side effects are dehydration, muscle cramps, exhaustion, heart arrhythmias, low blood pressure, and even death.
Androstenedione: Promotes muscle growth and improves recovery. Side effects are aggression, growth of facial hair, acne, liver tumours, and depression. They can also inhibit growth, and cause prominent breasts in men, infertility, or baldness.
Stimulants such as caffeine and amphetamines: Causes the perception of improved performance. Side effects are lack of judgement, headaches, high blood pressure, insomnia, nerve damage, weight loss, hallucinations, convulsions, and heart attacks.
3. Criteria should relate to fairness and safety. Students may wish to debate the fairness and safety of some of the criteria suggested.
4. Campaigns should outline several of the key risks associated with performance-enhancing substances, and present information in a clear, engaging way.

Using Making a Difference (Student textbook page 92)

Literacy Support

Before Reading

- Have students list what they already know about community involvement and what they would like to learn. After reading, students can determine what they learned and where they might find out more information.

During Reading

- After each profile, have students summarize the actions and community involvement of the person profiled in one sentence.
- Have students close their eyes and visualize what it might have been like for Kristopher on his walking tour or for Prashanthi as she began her research.

After Reading

- Have students write a statement about what they learned in this feature about different types of community involvement. Then have them share their statements with a classmate.
- Have students work in pairs to create a concept map or other graphic organizer showing how the community was changed as a result of Kristopher or Prashanthi's community involvement.

Instructional Strategies

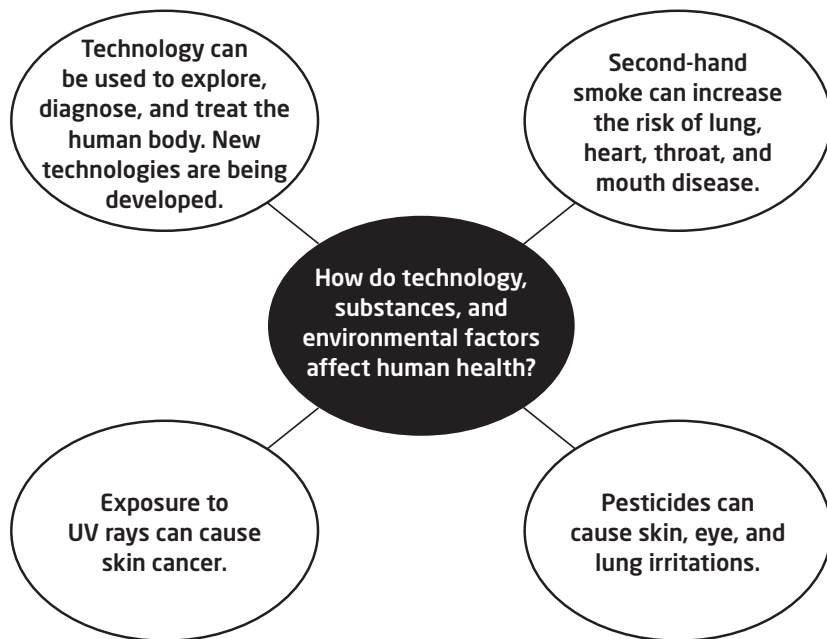
- Have students read together as a class or read the passage to students.
- After each profile, invite students to highlight key points or phrases.
- Discuss the responsibility we have to our community and why stewardship is vital to the future of all communities. Students can visualize a community where everyone takes an active role, and a community where no one does.
- Invite a local celebrity or resident to visit the class to highlight his or her community involvement. This could be a relative or acquaintance of one of the students, or one of the students themselves.

Topic 1.5 Review (Student textbook page 93)

Please see also **BLM 1-43 Topic 1.5 Review (Alternative Format)**.

Answers

1. Answers may vary. For example:



2. Ultrasound has improved health care by allowing us to view soft tissues. This has allowed us to monitor fetal development, observe organ functions, and detect cancer.
3.
 - a) An X ray is shown in the photograph.
 - b) It is best used to view hard tissue such as bone or to diagnose bone injuries and malformations.
4.
 - a) Exposure to cellphone radiation may cause brain damage or may lead to cancer.
 - b) Children are at a higher risk from exposure to radiation because they are still undergoing rapid cell division that could be altered by such exposure.
5.
 - a) The i-Pill is a technology that will deliver medications directly to the location in the body where they are most required.
 - b) The i-Pill avoids any invasive treatment and avoids the problems associated with giving patients large doses of medication that could make them very ill.
6. The following factors must be considered when deciding upon a medical technology to diagnose a problem:
 - Which is most suitable to the problem?
 - Which is most available?
 - Which has the lowest cost?
 - Which presents the lowest risks to the patient?
 - Which presents the best results for the patient?
7. The health risks of smoking can include: possible cancer of the mouth, throat, or lungs, premature aging, wrinkled skin, emphysema, atherosclerosis, and breathing difficulties.
8.
 - a) I would order an MRI scan to diagnose severe hip pain.
 - b) I would order an endoscopy to observe the small intestine.
9. Answers will vary but should include references to pesticides' links to skin, eye, and lung irritations as well as damage to reproductive and nervous systems. They might also include the idea that naturalization is much healthier for other organisms in the environment than a uniform green lawn.