

UNIT **A** Chemistry and You (page 10)

SUGGESTED TIMING

60 min including brainstorming
and Science and Literacy Link

BLACKLINE MASTERS

OHT A-1 Chemistry and Safety

Overall Expectations

SILV.02 – use appropriate scientific skills, tools, and safety procedures to investigate problems

SILV.03 – examine the connections between science and activities in daily life

CPMV.01 – explain the characteristics and classification of common materials, using appropriate scientific terminology

CPMV.02 – investigate the physical and chemical properties of common materials through laboratory activities

CPMV.03 – analyze how the use of various materials is based on their physical and chemical properties

Activity Planning Notes

As a class, use **OHT A-1 Chemistry and Safety** to brainstorm ideas and terms that students know already about chemistry and safety. You could do a think-pair-share activity. Give students a minute to write down words and/or pictures on page 10. Next, give students two minutes to share their ideas with a partner. Finally, ask for responses from the whole class. Record these responses on the overhead. Students can then add any extra ideas in their own student resource.

Have students look at the two pictures at the top of page 11. Ask them to describe any chemistry they see or know is happening in these two pictures. Answers may include: something is burning; something is growing or photosynthesis; pollution involves chemicals; manufacturing uses chemicals; and chemicals might be in the water.

Describe other chemical processes occurring in the pictures (e.g., plants making food, insects eating food, water freezing).

Complete one of the demos in the Alternative Activities or do another chemical demonstration you prefer. Use this to make the students excited about studying chemistry.

Read the short article on page 11 together as a class. It is probably best if you read this article to the students. You may have some reading volunteers. Don't expect or push this at this early stage in the course. Once students feel more comfortable, they may volunteer to read aloud.

Discuss with the class what Stan should do. You could use a think-pair-share activity here as well.

- Let students think by themselves for 30 seconds about what Stan should do.
- Have them share their ideas with a partner — about 30 seconds for each person.
- Finally, ask each group to give their ideas to the whole class.

Decide as a class the best answer to the question.

Diagnostic Assessment

Brainstorming with the class should provide a sense of students' general understanding of chemistry and safety. Some things to consider include

- What safety procedures are students already aware of?
- What safety procedures do they need to be made aware of?
- What chemistry terms do students already know?
- What laboratory equipment do students know?

Accommodations

- Many students will feel more motivated to write notes when they have different colours to use. You could encourage students to use a variety of colours on this concept map. If you give out achievement prizes periodically, a pack of coloured pens makes an excellent prize.

Making Connections Answer (page 11)

1. Students may say that Stan should be quiet so he doesn't get in trouble, but ideally they will say that he should notify the officials of the dangers.

Alternative Activity

- Get students interested in looking at situations scientifically with the following demonstrations. Encourage discussions of observations and hypotheses as you do the demos. Using a predict-explain-observe-explain format with students will help them start questioning why things happen the way they do.

– **Demo 1:** How did that egg get in there?

Use a hard-boiled egg that has the shell removed, vinegar, baking soda, and an Erlenmeyer flask or wide-mouth juice bottle. To get the egg in the flask, drop a lit match into the flask and quickly place the shelled egg in the opening. The flame uses up all the oxygen, then goes out. The egg will be sucked into the flask.

To get the egg out, pour about 75 mL of baking soda into the bottle, then add about 75 mL of vinegar and quickly invert the bottle so the egg blocks the opening. Do this over a sink or garbage can because the egg will come shooting out of the bottle! The vinegar and baking soda mix to form carbon dioxide gas.

– **Demo 2:** Hot pack

Calcium chloride is mixed with sodium bicarbonate to form sodium chloride, calcium carbonate, and hydrogen gas.

1. Place 5 g of calcium chloride and 2 g of sodium bicarbonate into a sealable plastic bag.
2. Pour 5 mL of phenol red indicator into a film canister. Add 5 mL of water and seal the canister.
3. Place the film canister in the bag. Remove as much air as possible from the bag, and then seal the bag.
4. Working from the outside of the bag, carefully remove the top from the film canister and mix the liquid and the powder.
5. Allow students to feel the plastic bag as well. This will show them that temperature change is another effect of chemical reactions.

Notes:

- The amount of hydrogen gas produced may not be noticeable if all the air is not removed from the bag before the chemicals are mixed.
- Accidental mixing of chemicals prior to sealing the bag will result in a less impressive chemical reaction.
- Increase the amounts of the reactants to get more gas and heat.

Activity Preparation for Chapter 1

Activity/Investigation	Advance Preparation	Time Required	Other Considerations
<i>Find Out: Is It an Acid or a Base?</i> (page 15) (TR page 20)	<ul style="list-style-type: none"> • 1 day before <ul style="list-style-type: none"> – Boil blueberries, carrots, and red cabbage in separate containers. When the water is deeply coloured (after at least five minutes of boiling), let the mixture cool. Strain the solids and divide the coloured water. You may want to make extra cabbage juice for further experimentation. – Soak cut-up beets in water for at least half an hour; divide up the coloured water for students (optional). – Pour out amounts of grape juice (optional). – Place the indicator solutions in dropper bottles labelled “Acid” and “Base” (optional). • Day of <ul style="list-style-type: none"> – Bring a cup of tea to class for the demo (optional). – Photocopy any blackline masters you decide to use. 	• 30 min	<ul style="list-style-type: none"> • Advanced students or students who finish early might enjoy seeing how many colours they can get by adjusting acid and base levels. Cabbage juice can provide at least eight colours. • If you want to have students boil their own cabbage, increase time to 60 minutes, and use either BLM 1–1 Using a Hot Plate or BLM 1–2 Using a Bunsen Burner.
<i>Find Out: A Closer Look at HHPS</i> (page 18) (TR page 25)	<ul style="list-style-type: none"> • 2 to 3 days before <ul style="list-style-type: none"> – Have students brainstorm a list of common household chemicals and then select your choices from this list. • 1 day before <ul style="list-style-type: none"> – Obtain household chemicals. Ensure that bottles are clean and labels are intact. 	• 20 min	<ul style="list-style-type: none"> • Some common products such as hair spray also have HHPS on them. You may want to include these in your choices. • Students may find household bottles without HHPS. Have them discuss which HHPS should appear and possible reasons manufacturers choose other formats for the information.
<i>Tech Link: Design a Safety Poster</i> (page 26) (TR page 31)	<ul style="list-style-type: none"> • 1 week before <ul style="list-style-type: none"> – Have students ask parents and other adults about chemicals they may use in the workplace. – Book the computer lab or library for research. – Photocopy BLM 1–6 Designing a Safety Poster, Assessment Master 17 Poster Checklist, Assessment Master 18 Poster Rubric and any assessment masters you decide to use. 	• 5–10 min	<ul style="list-style-type: none"> • You may want to quiz students about their job choices, and then assign student pairs to share the work of the poster. If so, you may wish to use Assessment Master 1 Co-operative Group Work Checklist and Assessment Master 2 Co-operative Group Work Rubric.
<i>Find Out: A Closer Look at WHMIS</i> (page 27) (TR page 33)	<ul style="list-style-type: none"> • 1 day before <ul style="list-style-type: none"> – Photocopy BLM 1–7 Sample MSDS and BLM 1–8 Sample WHMIS. – Locate additional MSDSs in the chemical store room and related WHMIS labels. 	• 30 min	<ul style="list-style-type: none"> • You may have other WHMIS labels and MSDS in the chemical storeroom of your school. These can be used for this activity in place of the provided blackline masters.

Materials Needed for Chapter 1

Activity/Investigation	Apparatus	Materials	Blackline Masters
<p><i>Find Out: Is It an Acid or a Base?</i> (page 15) (TR page 20)</p>	<ul style="list-style-type: none"> • 10 mL graduated cylinder • 4 test tubes and stoppers • 2 medicine droppers • dropper bottles <p>Teacher Demo</p> <ul style="list-style-type: none"> • beaker or pot for boiling • hot plates or Bunsen burners 	<ul style="list-style-type: none"> • red cabbage juice, beet juice, carrot juice, blueberry juice, and/or grape juice • base such as baking soda, ammonia or lye • acid such as vinegar or lemon juice 	<p>Recommended</p> <ul style="list-style-type: none"> Assessment Master 9 Safety Checklist Assessment Master 11 Using Tools and Equipment Checklist Assessment Master 13 Fair Test Checklist <p>Optional</p> <ul style="list-style-type: none"> BLM 1–1 Using a Hot Plate BLM 1–2 Using a Bunsen Burner Assessment Master 10 Safety Rubric Assessment Master 12 Using Tools and Equipment Rubric
<p><i>Find Out: A Closer Look at HHPS</i> (page 18) (TR page 25)</p>		<ul style="list-style-type: none"> • several household products such as window cleaner, bleach, oven cleaner, kitchen cleaner, drain cleaner 	
<p><i>Tech Link: Design a Safety Poster</i> (page 26) (TR page 31)</p>	<ul style="list-style-type: none"> • computers for research 	<ul style="list-style-type: none"> • poster paper and markers 	<p>Recommended</p> <ul style="list-style-type: none"> BLM 1–6 Designing a Safety Poster Assessment Master 17 Poster Checklist Assessment Master 18 Poster Rubric <p>Optional</p> <ul style="list-style-type: none"> Assessment Master 1 Co-operative Group Work Checklist Assessment Master 2 Co-operative Group Work Rubric
<p><i>Find Out: A Closer Look at WHMIS</i> (page 27) (TR page 33)</p>	<ul style="list-style-type: none"> • magnifying glasses for visually impaired students 	<ul style="list-style-type: none"> • sample WHMIS labels and related MSDS 	<p>Recommended</p> <ul style="list-style-type: none"> BLM 1–7 Sample MSDS BLM 1–8 Sample WHMIS <p>Optional</p> <ul style="list-style-type: none"> BLM 1–5 WHMIS Flash Cards

CHAPTER 1 Chemistry the Safe Way (page 12)

SUGGESTED TIMING

15 min

MATERIALS

- containers, or pictures of containers of several household and workplace chemicals
- chart paper and markers

Overall Expectations

SILV.01 – illustrate how science is a part of daily life

SILV.02 – use appropriate scientific skills, tools, and safety procedures to investigate problems

SILV.03 – examine the connections between science and activities in daily life

CPMV.01 – explain the characteristics and classification of common materials, using appropriate scientific terminology

Activity Planning Notes

Have several household and workplace chemicals available for students to see in the classroom. These products may include bleach, vinegar, oven cleaner, detergents, nail polish removers, disinfectants, and silver cleaners. If household items are placed on the front bench as students walk into the classroom, students will likely ask why they are there. This can start a useful discussion.

A good hook to use to introduce the chemistry section is, “What in the world is not chemistry?” Have students brainstorm ideas as a whole class or in small groups and write them down on chart paper. Post these papers and then talk about what is and is not chemistry. Students will begin to see how chemistry affects their everyday lives.

Check Your Understanding Answers (page 12)

- Answers will vary. For example:
 - hair styling; gel, hair spray; close my eyes when spraying
 - cooking; vinegar, lemon juice; wash my hands after cooking
 - spraying weeds; pesticides; wear a face mask, wash my hands when I'm done

Making Connections Answers (page 12)

- Answers will vary. For example:
 - coffee; I drank it.
 - glue; I pasted some pictures in my calendar.
 - cleaning spray; I cleaned the TV.

1.1 Chemicals Are Everywhere (page 13)

SUGGESTED TIMING

30 min
30-60 min for Find Out

BLACKLINE MASTERS

BLM 1–1 Using a Hot Plate
BLM 1–2 Using a Bunsen Burner
OHT A–2 Common Chemicals
Assessment Master 9 Safety Checklist
Assessment Master 10 Safety Rubric
Assessment Master 11 Using Tools and Equipment Checklist
Assessment Master 12 Using Tools and Equipment Rubric
Assessment Master 13 Fair Test Checklist

Specific Expectations

CPM1.02 – outline the hazards of common materials associated with safe and unsafe use

CPM2.01 – plan and conduct investigations on the physical and chemical properties of substances, using lab equipment and materials safely and accurately

CPM2.02 – use appropriate laboratory safety and disposal procedures while conducting investigations

CPM2.03 – organize and record the observations of the investigations, using appropriate formats

CPM2.04 – interpret and communicate the results of investigations

CPM3.01 – investigate the physical and chemical properties of the component materials of two similar products

SIL1.01 – describe how the procedures, skills, and tools employed in different areas of science are also evident in daily life

SIL2.03 – conduct investigations safely, using appropriate lab equipment

SIL2.04 – observe and record data, using a variety of formats, including the use of SI units, where appropriate

SIL3.03 – demonstrate an understanding of how problem-solving and decision-making activities in the workplace use scientific process skills

Key Terms Teaching Strategies

Have students complete some or all of the following activities to help them learn and remember the key terms:

- Create a word wall using the key terms for this chapter. A word wall is a place in the classroom where you place the words, definitions, and related pictures for students to see constantly. The words should be large enough for students to see from their desks. Add new key terms when they are introduced.
- Have students write definitions and draw pictures to illustrate these terms in their Science Log. You may wish to have your students keep their own glossary at the back of their Science Log.
- Have students write a paragraph that contains the key terms in this section.

Reading Icon Answers (page 13)

3. ammonia
4. chlorine gas

Reading Icon Answers (page 16)

1. • toluene: keep in ventilated areas, keep lid on unless in use

- muriatic acid: wear gloves, clean up spills immediately, dilute with water if it touches skin
- propylene glycol: do not use mascara if your eyes react
- methanol: keep lid on unless using, use only in well-ventilated area

2. Look for information about two chemicals.

- polystyrene: foam cups, packing material; causes poisonous fumes when burned; Do not burn it.
- acetone: nail polish remover; can cause brain damage from ingestion, flammable; Keep in

well-ventilated area away from children and heat sources.

- chlorine: swimming pool disinfectant, bleach; irritates skin cells and body tissues; Keep in a well-ventilated area away from children. Wear gloves when you use it.
- ammonia: window cleaner and other surfaces cleaner; irritates skin cells and can damage lungs if inhaled; Keep in a well-ventilated area away from children. Wear gloves when you use it.

Activity Planning Notes

Display selected chemicals at the front of the classroom.

Begin this section by looking at the key terms. All key terms throughout the student resource are boldfaced within the text and are found in the picture glossary at the back of the student resource.

Read the text as a group. Point out the pre-reading strategy that is being used; read the questions *before* you read the required text. Provide highlighters to those students who do not have one or keep a class set for use in your classroom.

Write down the correct answer for each Making Connections question.

Depending on your students, you may need to print. Many students will need assistance with answering the questions, perhaps for the entire course.

Have students complete the Find Out activity, then lead a class discussion about the uses and dangers of common chemicals from the table on page 16. Brainstorm the safety precautions that could be taken when dealing with these substances.

Consider using the following overhead transparency:

- **OHT A–2 Common Chemicals**

Accommodations

- Print all answers on the chalkboard or use an overhead projector. Use large print and simple sentences.
- Pair a student with vision challenges with a student who can help. The challenged student may find it easier to copy from a buddy than from the chalkboard.
- Wait for all students to have the answer copied down before moving on to the next piece of text.

Making Connections Answer (page 13)

1. Accept any reasonable answer. For example:
 - Carefully pour the cleaner into water instead of pouring pure cleaner and then water on top.
 - Keep the lids on the bottles at all times unless they are being poured. Chlorine bleach and ammonia should not be mixed, since that will produce chlorine gas.

Check Your Understanding Answer (page 14)

1. Look for ideas such as the following.
 - polystyrene: safe to use, touch, eat, and drink food that touches it; poisonous fumes when burned
 - acetone: safe to use on fingernails; can irritate skin, can cause brain damage if ingested, is flammable

Making Connections Answers (page 14)

2. The cups give off poisonous fumes when they burn, and that might be why the grandmother is coughing.
3. Kelli’s sister could be poisoned if she drank the nail polish remover.

Making Connections Answer (page 16)

3. If someone became sensitive to propylene glycol, I would advise them to stop using mascara and deodorant.

Find Out Activity (page 15)

Is It an Acid or a Base?

Purpose

- Students learn how to test whether a substance is an acid or a base.

Science Background

Many household chemicals can be classified as either an acid or a base. This activity provides students with a simple way to determine the difference between an acid and a base. In science, we use an indicator to distinguish between an acidic substance and a basic substance.

Indicators are weak acids that change colour in the presence of an acid or a base. Not all indicators will react to all acids and bases. Some will only change in the presence of an acid while others will only change in the presence of a base. Red cabbage juice is similar to a universal indicator. It will produce a range of colours at different levels of acidity and basicity. For best results use red cabbage juice in this activity.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 day before	<ul style="list-style-type: none"> • Boil blueberries, carrots, and red cabbage in separate containers. When the water is deeply coloured (after at least five minutes of boiling), let the mixture cool. Strain the solids and divide the coloured water. You may want to make extra cabbage juice for further experimentation. • Soak cut-up beets in water for at least half an hour; divide up the coloured water for students (optional). • Pour out amounts of grape juice (optional).

	<ul style="list-style-type: none"> Place the indicator solutions in dropper bottles labelled “Acid” and “Base” (optional).
Day of	<ul style="list-style-type: none"> Bring a cup of tea to class for the demo (optional). Photocopy any blackline masters you decide to use.

APPARATUS	MATERIALS
<ul style="list-style-type: none"> 10 mL graduated cylinder 4 test tubes and stoppers 2 medicine droppers dropper bottles <p>Teacher Demo:</p> <ul style="list-style-type: none"> beaker or pot for boiling hot plates or Bunsen burners 	<ul style="list-style-type: none"> red cabbage juice, beet juice, carrot juice, blueberry juice, and/or grape juice base such as baking soda, ammonia, or lye acid such as vinegar or lemon juice

Suggested Timing

- 30 min to prepare cabbage juice (optional)
- 30 min to perform lab

Safety Precautions

- Make sure students close the test tube with a stopper and use their thumb to keep the stopper in place while they shake the test tube.
- If any acids or bases are spilled, dilute with water if necessary and mop up immediately.
- Have students wash their hands and clean up the work area when they have completed the activity.

Activity Planning Notes

Use lemon juice as an example of an acid. Use soap as an example of a base. Discuss these examples to have students realize that not all acids and bases are dangerously corrosive. Acids taste sour, while bases taste bitter. A safer way of identifying an acid and a base is to use an indicator.

Give a general explanation for an indicator. Show students the step-by-step process of performing the lab. It is best to have a volunteer read the step and then you demonstrate it. Alternatively, you can read the instruction yourself and then perform the step.

You might start with a solution of tea to do the demo. Tea will lighten when you add an acid to it but makes no change when a base is added. This will show the students both a positive result (colour change) and a negative result (no change).

Let students perform the activity using the indicators provided.

If you have the time available, and want students to have the extra fun associated with stinking up the school, have students boil the cabbage themselves to make their indicator water. It works best if you make the indicator on one day and then use it the next day. That way students will not have too many instructions on one day. You may wish to use **BLM 1–1 Using a Hot Plate** or **BLM 1–2 Using a Bunsen Burner** before having students use these pieces of equipment. Have students practise lighting the Bunsen burner before you let them use it for this activity. Show students how to put the cabbage in the beaker, add distilled water, and then heat the beaker. Bring the mixture to a boil and simmer on low heat until it is a deep purple colour. Continue to boil for at least 5 minutes. If you have the time, let it boil for 10–15 minutes; the results will be better with the longer boiling time. Pour the solution off the top and discard the solids. Cover the solution until it is needed the next day. Refrigerate if possible. These juices will also be fine set on a shelf out of the way overnight. Note that if you leave them for longer than overnight, mould may begin to grow.

Accommodations

- Have students work in lab pairs. Pair a student with reading ability with a weaker reader.
- You could also perform this activity as a demonstration where you ask volunteers to perform

the different steps. This way, you will be able to constantly monitor each student's performance for this first lab activity. You can assess each student's individual lab skills and provide positive reinforcement in front of the class. Save the constructive criticism for a private time.

- To assess if students understand the concept of acids and bases, you could ask them what they think happens to the colours of the vegetable juices if they add a chemical that is not an acid or a base. (Answer: usually nothing.)

What Did You Observe? Answers (page 15)

6. The following results are easily obtained. If time is limited, choose boiled cabbage juice first. Carrot juice is the most subtle and trickiest to see changes with.

Juice Type	Original Colour	Add an Acid (water + vinegar)	Add a Base (water + baking soda)
beet, uncooked	purply pinkish solution	a little more orangey	a little less purply (almost no change)
beet, boiled	brick red	no change	no change; still no change with ammonia
carrot, uncooked	clear	no change	no change
carrot, boiled	yellow	clearer, lighter yellow	no change; deeper yellow with ammonia
red cabbage, uncooked	blue (greenish blue)	purply pink then pink	darker blue
red cabbage, boiled	dark blue	pink	not much change; turns emerald green with ammonia
blueberry, uncooked	purply blue	pink	dark blue (also with ammonia)
blueberry, boiled	purple	ruby pink	greenish yellow
grape juice	deep purple	no change	black

Activity Wrap-up

- Make the link to students' kitchens at home. Ask students how they could use this testing procedure to determine whether a household chemical is an acid or a base. Students could boil red cabbage, take the juice and add a few drops to a sample of the unknown liquid.

- You may wish to have students complete **Assessment Master 9 Safety Checklist**, **Assessment Master 11 Using Tools and Equipment Checklist**, and/or **Assessment Master 13 Fair Test Checklist**.

Alternative Activities

- Invite the school's health and safety representative or school nurse to explain the first aid procedures that should be followed for exposure to substances such as chlorine and burning foam. Possible discussion topics might include the following.
 - If chlorine is a skin and eye irritant, why do they put it in swimming pools?
 - What might people do with their foam cups instead of throwing them in the fire?
- Have students practise the double bubble comparison diagrams, similar to those found on pages 25 and 29, to summarize safe and unsafe uses of the chemicals. Students can make notes from the student resource, and then make diagrams of other chemicals. You may want to have students work in groups to complete these concept diagrams. Note that these diagrams have the same function as the more common Venn diagrams, but the separate bubbles allow students to distinguish between ideas better.
- You may want to make a lot of cabbage water, and allow students extra time to experiment and see how many colours they can come up with from the cabbage juice by varying the amount of acid and base added. At least eight distinct shades are possible, including pale pink, deep pink, red-purple, blue-purple, blue, blue-green, green, and yellow. The greens and yellows require a stronger base such as lye or ammonia.
- Use some of all of the activities in the following *Chemistry ActiveFolders*: Acids and Bases.

Ongoing Assessment

- Note which Check Your Understanding questions students can answer before class discussions. This will give you a good idea of student understanding. Check that understanding has increased after class discussions.
- Look for the correct answers. Students who are having trouble with these may have trouble reading, since the answers can be pulled right from the text.
- You may wish to assess students using **Assessment Master 10 Safety Rubric** and **Assessment Master 12 Using Tools and Equipment Rubric**.

Technology Links

- For more information on the Find Out Activity on page 15, go to www.mcgrawhill.ca/books/Se9 and follow the links to Cabbage Lab.

1.2 Chemical Safety at Home (page 17)

SUGGESTED TIMING

20 min for introduction
 20 min for Find Out
 30 min for Science and Literacy
[Link](#)

MATERIALS

- variety of household products that have safety labels, such as oven cleaners, detergents, nail polish removers, disinfectants, silver cleaners
- coloured pencils

BLACKLINE MASTERS

BLM 1–3 Safety Procedures
 OHT 1 HHPS Symbols

Specific Expectations

CPM1.01 – recognize the symbols used to classify hazardous materials at home and in the workplace

CPM1.02 – outline the hazards of common materials associated with safe and unsafe use

CPM2.03 – organize and record the observations of the investigations, using appropriate formats

SIL2.04 – observe and record data, using a variety of formats, including the use of SI units, where appropriate

SIL3.03 – demonstrate an understanding of how problem-solving and decision-making activities in the workplace use scientific process skills

Key Terms Teaching Strategies

Have students complete some or all of the following activities to help them learn and remember the key terms:

- Add to the word wall using the key terms for this section.
- Have students write definitions for these terms in their Science Log. You may wish to have your students keep their own glossary at the back of their Science Log.
- Have students write a paragraph that contains the four key terms in this section.

Activity Planning Notes

Have students examine the labels of the household chemicals you have brought in. Ask them to consider which product would be the most dangerous substance based on the information on the labels.

Use the student resource to introduce the idea of HHPS. Have students colour in the symbols in their student resource using coloured pencils and **OHT 1 HHPS Symbols**. Many times the symbols on the household products are not coloured but they may be. As you work through each description of the symbols, brainstorm the safety precautions that could be taken when dealing with these substances. Discuss a safe way of storing items with these symbols.

Note that students may find products with phrases instead of symbols. Symbols are more likely to be found on hardware products such as WD-40 and spray paint. Encourage students to correlate the purposes of the phrases they may find with the symbols.

Consider providing students with **BLM 1–3 Safety Procedures** and discussing the information together before they complete the Find Out activity.

Finish the section by completing the Science and Literacy Link. Use the pre-reading strategy of reading the questions as a group before reading the text. Students can try to guess what they think the article will be about based on the questions being asked or the related picture.

Consider using the following blackline master and overhead transparency:

- **BLM 1–3 Safety Procedures**
- **OHT 1 HHPS Symbols**

Check Your Understanding Answer (page 17)

1. Students should copy the symbols from the table on page 17.

Check Your Understanding Answers (page 19)

1. chlorine gas
2. She mixed chlorine bleach and ammonia.

3. She left the room and got fresh air.
4. herbicide
5. Do not use the chemical, or use a protective face mask to avoid breathing the fumes. Avoid situations where other people might breathe the fumes.

Find Out Activity (page 18)

A Closer Look at HHPS

Purpose

- Students become familiar with the HHPS symbols and the dangers associated with common household products.

Science Background

HHPS is a system that communicates safety information about a substance. These symbols can be found on common household chemicals. Manufacturers of consumer products containing chemicals are required under the Canadian Hazardous Products Act to include a symbol that specifies both the nature of the primary hazard and the degree of this hazard. In addition, any secondary hazards, first aid treatment, storage, and disposal must be noted.

HHPS uses shaped borders to communicate the level of danger. Danger, warning, and caution borders are based on the familiar shape of traffic signs. Stoplight colours are sometimes used with these shapes. The

colours emphasize the level of danger: red for most dangerous, yellow for caution.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
2 to 3 days before	<ul style="list-style-type: none"> • Have students brainstorm a list of common household chemicals and then select your choices from this list.
1 day before	<ul style="list-style-type: none"> • Obtain household chemicals. Ensure that bottles are clean and labels are intact.

APPARATUS	MATERIALS
	<ul style="list-style-type: none"> • several household products such as window cleaner, bleach, oven cleaner, kitchen cleaner, drain cleaner

Suggested Timing

20 min

Activity Planning Notes

Show students how to fill in the chart on page 18 using one product.

Make sure each student has one sample product to start with. Allow for a few extras as some students may finish quickly.

Have students draw the symbol and include a reasonable storage solution.

Accommodations

- Students can work in pairs. Pair a student with good art ability with someone who is not as strong in this area.

What Did You Observe? Answers (page 18)

3. Answers will vary. Make sure students draw the symbol. If there is none, have them draw the symbol that the verbal warning suggests.
4. Students should mention keeping the product out of reach of children and in a cool, well-ventilated area.

Making Connections Answers (page 18)

5. Possible answers include, but are not limited to: bleach, oven cleaner, paint, lighter fluid, paint thinner.
6. Accept any reasonable plan. For example:
 - Store products in a locked cupboard out of reach of children.

Activity Wrap-up

- Have students go home and find a different product with an HHPS symbol. Ask them to sketch the product and any HHPS symbols. Have them present their findings to the class. If students find only danger phrases, ask them to record the phrases. Discuss why manufacturers might use phrases instead of symbols.

Alternative Activities

- Have students make flash cards for HHPS. They can design the cards themselves with the symbol on one side and the description on the back. Provide cards for them to use and coloured pencils.
- Have students design a hazardous household product symbol of their own. Ask them to consider the following points:
 - Why is this symbol important?
 - Is your symbol clear and easy to understand?
 - What action have you chosen to show to represent the danger? Why?
 - How could you improve your symbol?
- Have students draw a simple floor plan of their home and indicate where household products are located. If they live in a multi-storey home, they should sketch each floor separately. Emphasize that sketches and drawings are a very important part of science, and that the most important point is for the drawing or sketch to be a clear representation for someone to be able to read and understand, not for the drawing to be a beautiful work of art. Have students focus on accuracy rather than aesthetic beauty. Limiting them to pencils may help with this goal.

- Use one or more of the following discussion topics:
 - What happens if poisonous products are poured down drains that end in the sewage system?
 - What is the best way to know how to handle a chemical you have never seen before? (Answer: Read the label.)
 - What traffic sign symbols are used in hazardous product symbols?
- Challenge students to design a workshop. Tell them that they have the following list of materials: paint thinner, two cans of oil-based paint, flammable caulking, tacks, nails, fire extinguisher, two spray cans of latex paint, poisonous spray cleaner, hand cleaner, and a car battery. Ask them to design a storage system for a workshop that would properly store all of the items. Remind them that children may visit the workshop. Have students who finish early add three other products to the workshop and show how to store each one.
- Use some or all of the activities in the following Chemistry *ActiveFolders*: Chemical Reactions.

Ongoing Assessment

- Have students use HHPS flash cards to quiz each other on their knowledge of HHPS symbols.
- Provide an unknown container to students and challenge them to explain what safety precautions should be taken with this substance.

Technology Links

For information on the 1990 tire fire in Hagersville, Ontario, go to www.mcgrawhill.ca/books/Se9 and follow the links to Common Materials Set Aflame.

1.3 Science Lab Safety (page 20)

SUGGESTED TIMING

75 min

BLACKLINE MASTERS

Master 1 Centimetre Grid Paper
 BLM 1–4 Safety Scavenger Hunt
 OHT 2 Science Lab Safety
 OHT A–3 Classroom Safety Rules
 Assessment Master 9 Safety
 Checklist
 Assessment Master 10 Safety
 Rubric

Specific Expectations

CPM1.02 – outline the hazards of common materials associated with safe and unsafe use

SIL2.03 – conduct investigations safely, using appropriate lab equipment

SIL2.05 – assess data to make inferences and conclusions and to answer questions and refine procedures

SIL2.06 – communicate plans, observations, and results using a variety of oral, written, and graphic representations, and including the use of SI units, where appropriate

SIL3.03 – demonstrate an understanding of how problem-solving and decision-making activities in the workplace use scientific process skills

Key Terms Teaching Strategies

- Add to the word wall using the key term for this section.
- Have students write the definition for this term in their Science Log. You may wish to have your students keep their own glossary at the back of their Science Log.

Reading Icon Answers (page 20)

1. Students should circle 9 hazards.
 long hair loose near Bunsen burner; test tube pointing toward face being heated over Bunsen burner; water fight, drawers left open; spills not cleaned up (on lab bench and on floor); horseplay near glassware on shelf; eating in the laboratory; sniffing test tubes without using proper wafting method; lifting hot beaker from hotplate with bare hand instead of tongs; several students not wearing safety goggles; broken glass; emergency exit is blocked; glassware is left on floor.
2. Accept all reasonable risky situations. For example:
 - bare feet in the lab
 - glassware or container with liquid near the edge of a table
 - books too near an open flame

Reading Icon Answers (page 21)

3. Answers will vary. For example:
 - b) loose hair near Bunsen burner
 - c) sniffing without wafting method, eating in the lab
 - d) horseplay in the lab, water fight
 - e) Water spilled on the floor could cause a fall. There could be something corrosive in the water bottle.
 - f) glass on floor or rolling around on lab top, horseplay near glass shelves, water fight
 - g) bare feet in the lab; Poison from chemicals left on the floor could enter the skin. A student could cut his feet on broken glass.

Activity Planning Notes

As a class, encourage students to discuss the dangers they see on page 20. Consider using **OHT 2 Science Lab Safety** to project an enlarged visual of the cartoon. There are at least 14 dangers shown. Lead students in a discussion of dangers that could occur in your own classroom or lab and point out possible danger areas and appropriate safety measures. Have students circle safety violations first by themselves and then in pairs. Have each pair orally present one of the violations to the class. Record the violations on the chalkboard or on an overhead.

Use these violations to have the class create a set of safety rules. Use **OHT A-3 Classroom Safety Rules** to record these rules. Have students copy the rules on to page 21. Suggested rules include the following:

1. Wear safety goggles at all times.
2. Wear gloves or an apron when they are required.
3. Tie back long hair and roll up sleeves.
4. No running, eating, or drinking in the science lab.
5. Report any accidents or problems to your teacher immediately.
6. Clean up the work area and wash your hands thoroughly when you have finished the activity.
7. Complete only the experiments that you are told to do.
8. Do not smell or taste chemicals.
9. Do not leave a Bunsen burner or hot plate turned on when you leave.
10. Dispose of all chemicals and broken glass as directed by your teacher.
11. Always slant test tubes away from yourself and others when heating them.

Use the rules you feel are appropriate.

Have students create a map of the safety features of your classroom.

During this section, you may wish to use the following overhead transparencies:

- **OHT 2 Science Lab Safety**
- **OHT A-3 Classroom Safety Rules**

Alternative Activities

- Have students complete **BLM 1-4 Safety Scavenger Hunt**.
- Consider giving students a copy of **Master 1 Centimetre Grid Paper** to take home. Have them draw a map of their home and locate any hazardous materials. Offer one piece of grid paper for each floor of their home.

Accommodations

- Have a buddy for those who are weaker at copying notes. Allow lots of time for all students to copy down the safety rules. Have a handout ready with the typed safety rules in large fonts for those who have trouble copying from the overhead.

Ongoing Assessment

- Assess how students work together in pairs.
- Assess the map for completeness and make suggestions for improvements.

Technology Links

For more information on science lab safety, go to www.mcgrawhill.ca/books/Se9 and follow the links to Be Prepared!

1.4 Chemicals at Work and School

(page 23)

SUGGESTED TIMING

75 min for introduction and flash cards
 45 min for Two Types of Labels
 2–3 classes for Tech Link including research and planning time
 25 min for MSDS
 30 min for Find Out

MATERIALS

- samples of chemicals with WHMIS labels
- Workplace labels for different chemicals, preferably the sample chemicals
- small index cards
- scissors
- glue
- poster paper and markers
- MSDS for several chemicals, preferably the ones above

BLACKLINE MASTERS

BLM 1–5 WHMIS Flash Cards
 BLM 1–6 Designing a Safety Poster
 BLM 1–7 Sample MSDS
 BLM 1–8 Sample WHMIS
 OHT A–4 WHMIS Symbols
 OHT A–5 WHMIS Labels
 OHT A–6 Comparing WHMIS Labels
 Assessment Master 17 Poster Checklist
 Assessment Master 18 Poster Rubric

Specific Expectations

CPM1.01 – recognize the symbols used to classify hazardous materials at home and in the workplace

CPM1.02 – outline the hazards of common materials associated with safe and unsafe use

CPM2.03 – organize and record the observations of the investigations, using appropriate formats

CPM2.04 – interpret and communicate the results of investigations

CPM3.03 – present a recommendation based on the results of the investigation and the research of the product, appropriate for someone interested in using the product

SIL1.01 – describe how the procedures, skills, and tools employed in different areas of science are also evident in daily life

SIL2.04 – observe and record data, using a variety of formats, including the use of SI units, where appropriate

SIL2.05 – assess data to make inferences and conclusions and to answer questions and refine procedures

SIL2.06 – communicate plans, observations, and results using a variety of oral, written, and graphic representations, and including the use of SI units, where appropriate

SIL3.03 – demonstrate an understanding of how problem-solving and decision-making activities in the workplace use scientific process skills

Key Terms Teaching Strategies

There is only one key term in this section; however, you may wish to have students learn and remember the meaning of each WHMIS symbol. Have students complete some or all of the following activities to help them learn and remember these terms:

- Add the key term, the symbols, and the meaning of each symbol to the word wall.
- Have students write definitions for these terms in their Science Log. You may wish to have your students keep their own glossary at the back of their Science Log.
- Have students write a paragraph about WHMIS that contains the key term and all of the WHMIS label meanings.

Reading Icon Answer (page 26)

1. Answers will vary. For example:

- gardeners: pesticides, herbicides, fertilizers
- doctors and nurses: sterilizers, medicines
- artists: paints, solvents, paint cleaners, dust

Activity Planning Notes

For many students this will be the first exposure to the WHMIS labelling system and symbols before they get a job. Many jobs these students get will involve chemicals to some degree. It is important to spend an adequate amount of time to begin to prepare them for what they might face in the workplace.

Begin by reading and discussing the chart on page 23. Fill in the last box with students. There are many difficult words in this table that you will need to explain to students as you go along. Use the What Might Happen column to help you explain what the more difficult words mean. **OHT A-4 WHMIS Symbols** may be useful as you teach this material.

After you have introduced the eight symbols and their meaning, create flash cards using **BLM 1-5 WHMIS Flash Cards** and the following instructions:

1. Cut out each of the WHMIS symbols on the blackline master.
2. Glue each of these symbols on to a small index card. Place the symbol at the top of the card (save some room for the next step).
3. Cut out What the Symbol Means. Glue this under the correct symbol.
4. Cut out the Risks. Glue the correct risk to the top of the back of the appropriate index card.
5. Cut out the Precautions. Glue the correct precaution to the bottom back of the index card.

In pairs, have students use these flash cards to learn the various WHMIS symbols and names.

Advance to the entire WHMIS labels. You may wish to use **OHT A-5 WHMIS Labels** as you teach the material on pages 24 and 25.

Read and discuss the section on Two Types of WHMIS Labels. Have students complete the Check Your Understanding questions to ensure that they have a clear understanding of the two label types. This may be the first time your students use a double bubble map to show the differences and similarities between two things. They will use this skill throughout the student resource so it is important to ensure they understand how to complete this graphic organizer. Use **OHT A-6 Comparing WHMIS Labels** to guide them in completing this task.

Use the chart on page 26 as you discuss careers that involve chemicals. Begin work on Design a Safety Poster. Provide an opportunity for students to research their chosen career using the Internet. Use **BLM 1-6 Designing a Safety Poster**

Accommodations

- Enlarge the information on **BLM 1-5 WHMIS Flash Cards** for students with vision difficulties.
- Photocopy individual copies of **OHT A-6 Comparing WHMIS Labels** for students who have difficulty writing in small spaces and who therefore will have difficulty filling in the double bubble organizer on page 25. Students can glue this sheet into their student resource.

Technology Links

For information about chemicals in the workplace, go to www.mcgrawhill.ca/books/Se9. Follow the links to Careers.

to help students with their poster. You may wish to have students work over several days on their poster. **Assessment Master 17 Poster Checklist** may help to keep them on task. As well, if you intend to use **Assessment Master 18 Poster Rubric** to assess the activity, inform students what the categories are, or show them a copy by making an overhead transparency of it.

During this period, introduce the idea of MSDS. Bring in some MSDSs from the chemical storeroom at your school. There are also many Internet sites that have MSDSs available for downloading. Have students complete Find Out Activity: A Closer Look at WHMIS.

You may wish to use the following blackline masters and overhead transparencies during this section:

- **BLM 1–5 WHMIS Flash Cards**
- **BLM 1–6 Designing a Safety Poster**
- **OHT A–4 WHMIS Symbols**
- **OHT A–5 WHMIS Labels**
- **OHT A–6 Comparing WHMIS Labels**
- **Assessment Master 17 Poster Checklist**
- **Assessment Master 18 Poster Rubric**

Answers to Table (page 23)

Corrosive: These substances can cause severe burns to skin or other body tissues. They can even “eat” through substances such as metal or rock.

Flammable: This product or the fumes from it can catch fire quickly.

Check Your Understanding Answers (page 24)

1. rubber gloves and a safety apron
2. Wear a face shield, goggles, and rubber gloves.
3. Treat with baking soda, milk of magnesia, or a lot of milk. Do not induce vomiting.

Making Connections Answer (page 24)

4. I would flush her eyes with a lot of water and then take her to the doctor or emergency room.

Check Your Understanding Answers (page 25)

5. and 6. Answers may vary. For example:
Workplace Label Differences: may have different formats; has less information; is found on repackaged containers of chemicals
Similarities: refers to MSDS; includes hazard symbols; includes information for safe handling; includes name of product
Supplier Label Differences: stricter format; includes first aid treatment; includes risk phrases

Find Out Activity (page 27)

A Closer Look at WHMIS

Purpose

- Students become more familiar with a WHMIS label and the related MSDS.

Science Background

WHMIS (Workplace Hazardous Materials Information System) is a system used to label all chemicals in the workplace. Laws in Canada state that all chemicals in the workplace must have WHMIS labels on them. There may be a Supplier label, which has a strict format, or there may just be a Workplace label on the container.

Students may have seen some of these symbols if they work at fast-food restaurants, photography stores, landscaping businesses, or golf courses. All chemicals used in the workplace (including schools) are labelled with WHMIS symbols and have an associated MSDS (Material Safety Data Sheet). If you are conducting labs, you should have WHMIS training and be able to find the MSDS for every substance you use. You should also be able to find information on the MSDS.

MSDS are available from the product's manufacturer or distributor. You may also be able to find them on the manufacturer's web site or in an on-line database for another workplace. Use the name of the product, chemical name, and "MSDS" as keywords in a computerized search.

There is no standard format for MSDS. Answers given here are based on the sample MSDS provided in **BLM 1–7 Sample MSDS**. MSDSs should be available for all chemicals stored on site at the school.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 day before	<ul style="list-style-type: none"> • Photocopy BLM 1–7 Sample MSDS and BLM 1–8 Sample WHMIS. • Locate additional MSDS in the chemical storeroom and related WHMIS labels.

APPARATUS	MATERIALS
<ul style="list-style-type: none"> • magnifying glasses for visually impaired students 	<ul style="list-style-type: none"> • sample WHMIS labels and related MSDS

Suggested Timing

30 min

Activity Planning Notes

Read through **BLM 1–7 Sample MSDS** and **BLM 1–8 Sample WHMIS** with the class. There are many new sections in the MSDS compared to the WHMIS label. You may want to explain the new vocabulary as you go through the MSDS worksheet. Or, you could define and discuss the words before you pass out the sheet. Once you distribute the worksheet, have students highlight the new words they have just learned.

As an alternative, you could create enlarged MSDS and WHMIS labels on poster-size paper for a side-by-side comparison. Label each of the sections on the MSDS and the WHMIS that are the same using one colour and the areas that are different using a second colour. As you label the sections, discuss what you find in each section.

Accommodations

- Enlarge the MSDS and WHMIS labels for students who have trouble with the tiny size of the printing.

Activity Wrap-up

- Have students complete a new double bubble organizer that shows the similarities and differences between a WHMIS label and the related MSDS.

What Did You Find Out? Answers (page 27)

Answers are based on **BLM 1–7 Sample MSDS** and **BLM 1–8 Sample WHMIS**. You may use other labels that will work just as well.

2. The MSDS provides more information than the WHMIS label.
3. MSDS provides special instructions for disposal, storage, and use.
4. acetone
5. Wear gloves, respirator, and eye protection.
6. Breathe fresh air if inhaled, drink water if ingested. Do not induce vomiting. Seek medical attention. If there is skin or eye contact, flush with flowing water for 20 minutes and seek medical attention.
7. Store in a well-ventilated, cool area away from direct sunlight, heat, and ignition sources, in a fire-resistant room.

Ongoing Assessment

- Check individual student resources for completion of answers.
- Have students complete a second double bubble diagram the day after they learn the skill. Provide feedback to them on completing the diagram.
- Have students answer questions similar to those on page 27 for the MSDS of a different chemical.
- Have students assess themselves as they work using **Assessment Master 17 Poster Checklist**.
- You may wish to assess student posters using **Assessment Master 18 Poster Rubric**. Show students this rubric before they begin work on the project so that they know what they are reaching for.

Technology Links

For a worksheet (with answers) and a label to interpret, go to www.mcgrawhill.ca/books/Se9 and follow the links to WHMIS.

Alternative Activities

- Show one of the following videos, which are available from Danatec Educational Services, 201, 11450-29 Street S.E., Calgary, Alberta T2Z 3V5, 1-800-465-3366, www.danatec.com.
 - *The Winning Label*, 9 minutes. Two workers race each other. One worker follows the advice of the WHMIS symbols and the other doesn't.
 - *WHMIS Working for You*, 18 minutes. This video has good connections to the workplace and explains why students need to learn about WHMIS.
- Have students role-play a situation in which a supplier does not put a proper workplace label on a container, and a worker has problems because of the supplier's negligence. Encourage them to emphasize the information available to the supplier and the information that should have been supplied to the worker.
- The website of Danatec Educational Services, www.danatec.com, has some interesting articles on current events related to WHMIS issues. You may wish to discuss these articles with students.
- *Live Safe! Work Smart! Resources for Science Teachers Grade 9–12* is a CD that provides health and safety resources for Ontario Secondary School Teachers. ISBN: 0-7794-9109-2. Available from Queen's Printer for Ontario, 2005. You may wish to review this material and use some of the ideas.

Chapter 1 Review (page 28)

SUGGESTED TIMING

40 min to complete and take up the review, and assign the Practice Test

BLACKLINE MASTERS

Master 3 Certificate
Master 4 List of Skills
BLM 1–9 Chapter 1 Word Puzzle
BLM 1–10 Chapter 1 Practice Test
BLM 1–11 Chapter 1 Test

Using the Chapter Review

Depending on your class, students should be able to work through the review at their own pace. In order to have success with the Chapter Review, some students may need to do it in chunks, by completing several questions and then taking them up before continuing. This process will prevent students from completing many questions incorrectly.

Alternatively, you could have groups of students place the review questions on cards. Divide the class into teams and have them select a card and then answer the review questions as a team. You can also create point-value cards that students also select to give each question a certain point value. Put a time limit on answering the questions. Once all the questions have been answered, have students put the answers into their student resource. This should decrease the number of incorrect answers.

To provide additional reinforcement of key terms, have students complete **BLM 1–9 Chapter 1 Word Puzzle**. Once the review is completed and taken up, assign **BLM 1–10 Chapter 1 Practice Test** for students to answer individually. They may wish to use their completed review to help them. Encourage students to treat the practice tests like real tests to assess their own knowledge.

Accommodations

- Allow students to make a chapter summary page of the key ideas/skills from the chapter. The back of the student resource provides space to do this. Alternatively, you might develop a chapter summary as an entire class.
- If students have difficulty with a particular review question, use the Review Guide to identify the section they need to review.
- **BLM 1–10 Chapter 1 Practice Test** can be customized to produce extra reinforcement questions.

Review Guide

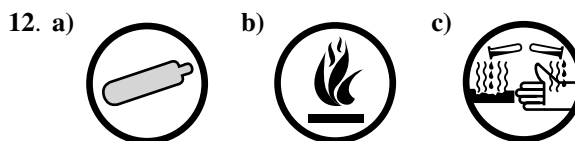
Question	Section(s)	Refer to
1	1.4	WHMIS chart (page 23)
2	1.4	WHMIS chart (page 23)
3	1.4	WHMIS chart (page 23)
4	1.2	HHPS chart (page 17)
5	1.4	WHMIS chart (page 23)
6	1.2	HHPS chart (page 17)
7	1.2	HHPS chart (page 17)
8	1.4	Material Safety Data Sheets (page 27)
9	1.4	Two Types of WHMIS Labels (page 24)
10	1.2	Chemical Safety at Home (page 17)
11	1.2 and 1.4	Chemical Safety at Home (page 17) and Chemicals at Work and School (page 23)
12	1.4	Chemicals at Work and School (page 23)
13	1.2	A Closer Look at HHPS (page 18)

Chapter 1 Review Answers (pages 28–29)

- a) 6. toxic effects, WHMIS
 - b) 5. biohazard, WHMIS
 - c) 2. corrosive, WHMIS
 - d) 7. flammable, HHPS
 - e) 1. dangerously reactive, WHMIS
 - f) 4. poisonous, HHPS
 - g) 3. explosive hazard, HHPS
8. c) Hazardous Household Product Symbol
9. Look for three pieces of information: precautionary statements, risk phrases, name of product, first aid treatment, hazard symbols.
10. Hazardous Household Product Symbol
11. Answers may vary. Look for similarities and two differences. For example:
WHMIS Label Differences: found on substances in the workplace; includes training, labels, and MSDSs; required in all workplaces that use chemicals

Similarities: provide safety and first aid information; use symbols; found on chemicals

HHPS Label Differences: found on consumer products; shape of symbols match traffic signs; colour of symbol communicates level of danger; manufacturers not required to use them



13. Look for ideas such as the following:
- Keep them in a locked cupboard.
 - Keep them out of children's reach.
 - Store them in cool, ventilated areas.

Summative Assessment

- Have students complete **BLM 1–11 Chapter 1 Test** to assess individual skills.
- You may wish to develop **Master 3 Certificate** to show students what they have learned during this chapter. Cut and paste the related skills from **Master 4 List of Skills**.