UNIT A A Daily Dose of Chemistry (page 16)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
45 min	• sample product bottles and labels	OHT A–1 Daily Chemistry OHT A–2 Information Labels

Overall Expectations

SIMV.01 – explain how science-related information is presented in print and electronic media for different purposes and audiences
SIMV.03 – evaluate claims and presentations of science-related information in media
CIMV.01 – understand how chemicals in common household and workplace materials interact
CIMV.02 – investigate the types and rates of interactions between commonly used materials through laboratory activities
CIMV.03 – analyse how material interactions affect our daily lives

Activity Planning Notes

As a class, brainstorm chemistry ideas and terms that students already know. Encourage them to spot the chemistry in their daily lives. You could do a think-pair-share activity. Give students a minute or two to brainstorm words and/or pictures for page 16. 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 blackboard or overhead of **OHT A–1 Daily Chemistry**. Students can add ideas to their own brainstorm.

Begin a class list of the chemicals we buy on a daily basis; include all products. Then turn to the Science and Media Literacy Link and examine the product labels. You may wish to use **OHT A–2 Information Labels**. Read the labels aloud as students follow in their workbooks. Pronounce each of the ingredients listed as some of these words will be difficult for students to read but may be recognized when heard. Have students answer the Check Your Understanding questions and take them up as you go.

As a wrap-up and tie-in to the first chapter, elaborate a bit on the fact glucose-fructose is another way of writing sugar. It is just one of the chemical forms of sugar. Ask students why the companies might use different names for sugar. They may suggest it is done to hide the fact it has sugar or to make it sound either more complicated or natural. Share some of the other forms of sugar that can be found in ingredient lists. You may wish to have students read the examples in "Some Sugars in Disguise" on page 287 of the student resource. There is also a wide range of artificial sugar substitutes.

At the end of this unit, have students repeat the brainstorming exercise, using the fresh mind map on page 17 of the student resource. Have students cover up their first mind map while completing the new one. Students should then compare the two mind maps, highlighting any new items to reveal how much they have learned in this unit.

Accommodations

- Read each ingredient aloud so struggling readers can also hear the words.
- Have students identify unfamiliar words and look up synonyms for drowsiness, physician, persist, and citric acid.

Diagnostic Assessment

The brainstorming with the class should provide a sense of students' general understanding of the unit content. Students may already have discussed some concepts in previous science classes. Some things to consider:

- What do students already know?
- How familiar are students with the language of chemistry?
- Do students use any chemical names?
- What issues do students identify when reading labels?

Check Your Understanding Answers (pages 18–19)

2. directions; caution
3. Rinse thoroughly with water.
4. No, because it can make you drowsy.
5. water
6. **a)** Students should circle sugar and glucose-fructose.
   b) Sugar is higher in the list of ingredients for the Strawberry Kiwi Cocktail. This juice might be sweeter.
7. **a)** second
   b) sixth
   c) The mango drink is more pure, and the cocktail is made mostly of fruit juices that aren't in the title.

Alternative Activities

- Have students survey their homes for safety symbols. They can create a simple table of at least five product names and symbols shown on the packaging. Have them make note of any special safety instructions listed on these items. For example, a AA battery might have "do not dispose of in fire."
- Carry out a rapid series of demonstrations that illustrate unexpected reactions with everyday chemicals. Be sure to use appropriate safety precautions such as ventilation, eye protection, and disposal procedures. Conclude by saying "Didn't expect that! Guess I can learn more about these chemicals."
  1. Polish an old penny with ketchup or vinegar. Place some ketchup on the penny at the beginning of the class. Continue with other demonstrations and then come back to this one at the end. After a rinse in water, the copper penny should be nice and shiny.
  2. Use nail polish remover to try to clean a re-usable calendar; the water-soluble marker will not be erased.
  3. Drop a Mentos® mint into a small glass of Diet Coke™ for a messy reaction.
  4. Pour acetone nail polish remover into a polystyrene cup so that the cup dissolves.
  5. Blow up a balloon by inserting 40 g of baking soda and sealing the balloon over a bottle containing 50 mL of vinegar. Invert the balloon so the substances mix in the bottle, then watch the balloon inflate.
  6. Dip a piece of magnesium or aluminum into muriatic acid (1 Mol/L hydrochloric acid available in hardware stores) and watch the hydrogen gas bubble up.
  7. Swirl 5 mL of ethanol inside a large *dry*, *plastic* bottle, then drain the excess. Place the bottle on the desktop pointing up, behind a shield to protect students. Stand clear as you use a match or glowing splint to light the alcohol vapours so that the bottle shoots up in the air with a pop.

Technology Links

For more information on chemistry in daily life, go to **www.mcgrawhill.ca/books/Se10** and follow the links to Everyday Chemistry.

Activity Preparation for Chapter 1

Activity/Investigation	Advance Preparation	Time Required	Other Considerations
Find Out: What Chemicals Are in the Bottles? (page 22) (TR page 27)	• 2 days before – Collect *empty* over-the-counter medicine containers showing ingredient lists, at least one per student. – From the chemical stores, select some pure chemicals listed on the medicines; for example, ASA. – Photocopy **Assessment Master 2 Co-operative Group Work Rubric**. • Day of – Set out materials.	• 30–45 min	• Select sample containers such as pain killers, cough syrups, allergy pills, muscle rubs, or cold remedies. • You may also decide to provide the box or insert as these often list more ingredients than are on the container itself. • Enlarge one ingredient list into a handout or overhead.
Find Out: How Do Acids React with Shells? (page 28) (TR page 35)	• 2 days before – Buy eggs, vinegar, and marble chips (available at garden supply stores). – Boil eggs (optional). – Collect other materials. – Photocopy **BLM 1–2 How Do Acids React With Shells?** (optional). • Day of – Distribute materials.	• 30 min plus 5 min each day to observe over 4 days	• Alternatively, set up a time-lapse observation by preparing samples one day apart, for four days. Students can then compare the effect of four different time frames all at once. • You may substitute chalk pieces or seashells for the marble chips. Or you may wish to divide all material options among student groups so that they are each testing a different material. • Boiled eggs eliminate the potential for mess.
What's Going On? Invisible Ink (page 30) (TR page 36)	• 2 days before – Collect materials and apparatus. – Prepare a 0.5 Mol/L solution of sodium hydroxide and put it into a spray bottle labelled "Teacher Message Detector." • Day of – Set out materials.	• 45–60 min	• Include the chemical name on the label, per WHMIS standards.
Try This! (page 30) (TR page 37)	• 2 days before – Book computers with Internet access or the library. – Collect print resources. • Day of – Photocopy **BLM 1–3 Make a Flyer for a Common Chemical**, **Assessment Master 15 Visual Presentation Checklist**, and **Assessment Master 16 Visual Presentation Rubric** (optional).	• 105 min	• Have pre-printed information about several chemicals ready for students to use in the classroom.
What's Going On? How Does an Oxidizer Work? (page 32) (TR page 38)	• 2 days before – Collect necessary materials and apparatus. – Photocopy **Assessment Master 7 Safety Checklist** and **Assessment Master 8 Safety Rubric** (optional). • Day of – Set up one apparatus as a model for students.	• 60 min	• Do not use salt water in this investigation; it will produce toxic chlorine gas. • You may wish to provide gas samples to students, either from chemistry stores, or by collecting the gases yourself, using a Hoffman's apparatus.
Try This! (page 35) (TR page 40)	• 1 week before – Book the computer lab (optional). • Collect pamphlets and posters about the use of oxygen in medicine, sports, and emergency services (optional).	• 45–60 min	• Have pamphlets and posters about the use of oxygen in medicine, sports, and emergency services available in the classroom.

Materials Needed for Chapter 1

Activity/Investigation	Apparatus	Materials	Blackline Masters
Find Out: What Chemicals Are in the Bottles? (page 22) (TR page 27)	• magnifying glass (optional)	• empty medicine packaging • empty chemical bottles	**Recommended** Assessment Master 2 Co-operative Group Work Rubric
Find Out: How Do Acids React with Shells? (page 28) (TR page 35)	• 4 beakers • masking tape or grease pencil	• 60 mL acetic acid (white vinegar) • 60 mL tap water • 2 marble chips (or alternative) • 2 eggs, in their shells	**Recommended** BLM 1–2 How Do Acids React With Shells?
What's Going On? Invisible Ink (page 30) (TR page 36)	• paint brushes or cotton swabs • 500 mL spray bottle • beakers	• 500 mL 0.5 Mol/L sodium hydroxide solution • 10 mL phenolphthalein • white paper	
Try This! (page 30) (TR page 37)		• materials to create flyers (optional)	**Recommended** BLM 1–3 Make a Flyer for a Common Chemical Assessment Master 15 Visual Presentation Checklist Assessment Master 16 Visual Presentation Rubric
What's Going On? How Does an Oxidizer Work? (page 32) (TR page 38)	• 9 V battery • 400 mL beaker • 2 graphite pencil leads for electrodes • stirring rod • 2 – 50 mL test tubes • 2 wire leads with alligator clips • lighter or matches	• 3 mL sodium sulfate solution • 300 mL water • 2 wooden splints	**Recommended** Assessment Master 7 Safety Checklist Assessment Master 8 Safety Rubric
Try This! (page 35) (TR page 40)		• pamphlets and posters about the use of oxygen in medicine, sports, and emergency services (optional)	

CHAPTER 1 Everyday Chemistry

(page 20)

SUGGESTED TIMING	**BLACKLINE MASTERS**
20 min	OHT A–3 WHMIS Labels

Overall Expectations

SIMV.01 – explain how science-related information is presented in print and electronic media for different purposes and audiences

SIMV.02 – investigate science-related information presented in print and electronic media using appropriate research and reporting skills

SIMV.03 – evaluate claims and presentations of science-related information in media

CIMV.01 – understand how chemicals in common household and workplace materials interact

Activity Planning Notes

The language of chemistry consists of the terms and standards used worldwide to communicate about chemistry. In this chapter, the naming of elements and compounds and the writing of symbols and formulas are emphasized.

To introduce this chapter, consider using **OHT A–3 WHMIS Labels** and show the DHMO label so that students can follow along as you identify the parts. As you work through the information on the label, remind students of the different parts of a WHMIS label:

- identifier: hatched line border
- risk phrases: describe the biggest risks
- health hazard data: identify ways the chemical can harm a user's health
- personal protective equipment: list what should be worn to keep safe
- first aid measures: provide steps to take in the case of an accident
- reference to MSDS: the Material Safety Data Sheet provides more detailed information about the product

Read through the properties of DHMO with students. Work through the questions as a class. Have students work to decode the puzzle individually. Then have them work in pairs and, finally, share their work with the class.

Most students think that all chemicals are bad because that is what they hear in the news. This activity will help students understand that everything is a chemical and that chemicals are not simply bad. This activity also introduces the idea that there are common and chemical names for many everyday substances. Wrap up by asking "What is DHMO?"

Consider using the following overhead transparency:

- **OHT A–3 WHMIS Labels**

Check Your Understanding Answers (page 20)

1. a) Gas may cause severe burns.
   b) Solid may cause severe tissue damage.
   c) Ingesting large quantities may cause excessive sweating, urination, bloating, nausea, or vomiting.
2. Most students will say no, because so many dangers are stated.
3. H_2O (that is, water)

Technology Links

- For more links to resources and creative media to do with DHMO, go to **www.mcgrawhill.ca/books/Se10** and follow the links to DHMO.

Alternative Activity

- Have students produce a creative work from the WHMIS information for DHMO. They might design a fact sheet, collage, T-shirt, song, or storyboard for a TV ad. Discuss whether they would have understood what DHMO was if pictures had been used to describe the chemical instead.

1.1 Using the Language of Chemistry (page 21)

SUGGESTED TIMING	MATERIALS
30 min 30–45 min for Find Out	• cola can

Specific Expectations

CIM1.01 – recognize the relationships among chemical formulae, composition, and common names
CIM2.05 – communicate the results of investigations using a variety of oral, written, and graphic formats
SIM1.01 – identify the ways in which scientific information is conveyed
SIM1.02 – discuss, using examples, how the method of presenting scientific information connects to the purpose
SIM1.03 – explain how different formats used in the media to present science information target specific audiences
SIM2.04 – organize and communicate information collected from lab investigations and information research using graphic organizers

Science Background

After describing the principles of naming compounds, students may question why propane and graphite are classified as chemical names rather than common names. Propane is the accepted IUPAC (International Union of Pure and Applied Chemistry) name, although it is not based on the names of the elements that make it up. Propane is an organic compound and has different rules for naming than the inorganic compounds talked about in this section. (Sucrose is also an organic compound, which is why its name does not appear to follow the rules given.) Graphite is also the accepted chemical name as it is composed of the graphite isotope of carbon.

Key Terms Teaching Strategies

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

- Write definitions for these terms in their Science Log. You may wish to have students keep a glossary at the back of their Science Log.
- Describe situations when each term is used.

Begin a science word wall in the classroom. Have students add key terms to the wall as they are introduced.

Reading Icon Answer (page 21)

4. Students should circle: scientific names, common names, and brand names.

Reading Icon Answer (page 23)

1. Students should underline: calcium carbonate, sodium chloride, graphite, sodium bicarbonate, sucrose, propane, ethylene glycol, and magnesium sulfate.

Activity Planning Notes

Read the first paragraph aloud. Brainstorm chemicals the class is familiar with. Note these on a chalkboard or overhead. After reading the next paragraph aloud, review the brainstormed list. What names did students give: chemical or common? Circle all the chemical names and underline the common names. A different colour of chalk or overhead marker will help emphasize this. Continue reading the text and have students note any brand names that were part of the brainstormed list.

Have students complete and then discuss questions 5 to 7.

Mention that modern chemical names are the same all over the world because scientists follow an agreed-upon naming system described by IUPAC, an organization that develops standards for chemistry. Standard naming helps scientists communicate accurately between languages and cultures. This also helps non-scientists recognize similarities between substances. For example, once you know properties of a certain chemical, you can guess that names containing similar chemicals may have similar safety concerns. For example, all nitrates are an explosion hazard, so recognizing "nitrate" in a chemical name could tip you off about potential dangers.

Complete the Find Out activity before introducing the Science and Literacy Link.

To wrap up, consider creating a bingo-like game with common names listed on students' cards and chemical names on the list of names that you call out. Use the examples in the student resource or check the Technology Links for more examples. Repetition will help students remember the link between common and chemical names.

Accommodations

- Encourage reluctant readers to follow along by having them use coloured pencils to highlight the text.

Check Your Understanding Answers (page 21)

5. a) to **c)** Look for three of,
- salt acid
- spirit of salt
- acidum salis
- muriatic acid

Making Connections Answers (page 21)

6. Answers will vary but may include that the number of chemical names is related to the number of settings in which they are used (e.g., industry, home, historical, science). Therefore, less commonly used chemicals have fewer names.

7. Answers will vary but may include that chemical names are standard worldwide, so knowing one will help you stay safe or communicate in any language. It also helps you identify the elements and types of dangerous chemicals in a product.

Check Your Understanding Answer (page 23)

2. Once students replace chemical words with common names, the text should read as follows:

Charles and Jemika ran up the *limestone* steps to the school cafeteria. For lunch, they had fries with *table salt*.

While they ate, they picked up their *pencils* to finish their science homework. In cooking class, they mixed flour, *baking soda*, *sugar*, blueberries, milk, and eggs to make pancakes, and cooked them over a *heating gas* burner on the stove.

After school, Charles went to his part-time job at the auto shop and worked on a radiator with *antifreeze*. Jemika went to ballet practice and then soaked her feet in an *epsom salt* bath.

Making Connections Answer (page 23)

3. Answers depend on the cola can used. Sample answer:

- Water, high fructose corn syrup and/or sucrose, caramel color, phosphoric acid, natural flavors, potassium benzoate, potassium citrate, caffeine, aspartame, acesulfame potassium, sucralose

Find Out Activity (page 22)

What Chemicals Are in the Bottles?

Purpose

- Students evaluate different bottles of medicine or chemicals. They see commonalities in chemical ingredients amongst the brand names.

Science Background

Many students will be surprised to find nearly identical ingredients on similar products. There are two main differences: each brand uses slightly different amounts of the ingredients; and different "strengths" of the same brand use more of the active ingredient. For example, extra strength Aspirin™ contains more ASA than regular strength.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
2 days before	• Collect *empty* over-the-counter medicine containers showing ingredient lists, at least one per student; for example, pain killers, cough syrups, allergy pills, muscle rubs, or cold remedies. You may also decide to provide the box or insert, as they often list more ingredients than are on the container itself. • From the chemical stores, select some pure chemicals listed on the medicines; for example, ASA. • Photocopy Assessment Master 2 Co-operative Group Work Rubric.
Day of	• Set out materials.

APPARATUS	MATERIALS
• magnifying glass (optional)	• empty medicine packaging • empty chemical bottles

Suggested Timing

30–45 min

Safety Precautions

- Ensure that all containers are empty and that any residual dust, fragments, and odours have been cleaned out.
- Have students wash their hands thoroughly at the end of this activity.

Activity Planning Notes

From the chemical stores, select examples of pure chemical ingredients found in some of the medicines—for example, ASA (acetylsalicylic acid), which will be found in some pain killers.

Display the empty medicine containers and pure chemical containers as students enter the classroom. This should promote discussion. Examine one list of ingredients in an overhead or large-print handout that you have prepared in advance. Go through the activity using this sample. Students may be surprised by the very long chemical names on the containers. Read out the chemical names on the sample pure chemical containers. Some alien-looking words will be familiar when students hear them.

Provide containers to the students and have them work singly or in small groups to complete the remaining questions on their own. Remind students that this section of text is focusing on the difference between brand names and chemical names. They may contrast the length of words as well as their size or prominence on the packaging.

Find Out Activity Answers (page 22)

3. **a)** to **d)** Answers will vary depending on samples. In many cases, the largest name is the brand name; other names include chemicals and manufacturer.
4. Answers will vary depending on the samples chosen. Sample answer:
   - acid
   - acetaminophen
   - sodium
5. **a)** The brand name.
   b) Most students will identify the brand name, but some may have heard the generic or chemical names before.
6. Senior citizens may feel the very small writing is not readable because their eyesight has deteriorated.

Accommodations

- Enlarge labels so small type is easier to read.
- Pair a weaker reader with a strong reader.
- Examine some of the longer chemical names orally. Demonstrate how to break the words down into shorter, more manageable syllables.

Activity Wrap-up

- Lead students through a comparison of one “regular” and one “extra strength” medicine. Identify the active ingredient and point out the sample container of that pure chemical. Identify the difference that makes one version “stronger” (i.e., more of the active ingredient).

Ongoing Assessment

- Use **Assessment Master 2 Co-operative Group Work Rubric** to assess how well students worked together during the Find Out activity.
- Use Check Your Understanding question 2 on page 23 to assess students’ comprehension and understanding of the difference between chemical and common names.

Technology Links

- For activities related to chemical names, go to **www.mcgrawhill.ca/books/Se10** and follow the links to Chemical Names.

Alternative Activities

- Have students design a label for an imaginary medicine. They could create a name for the medicine and include some of the chemical names in a list of ingredients.
- Have students write a story like that on page 23, or create a TV ad for a common substance. They can draft it using common language and then substitute the chemical names after a little research. Alternatively, they could pick substances from a list you provide.

1.2 The Secrets of Chemical Names and Formulas (page 24)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
45 min	• "The Elements Song" by Tom Lehrer (optional) • coloured pencils	OHT A–4 Periodic Table

Specific Expectations

CIM1.01 – recognize the relationships among chemical formulae, composition, and common names
SIM1.01 – identify the ways in which scientific information is conveyed

Science Background

Chemical naming and formula writing can get complicated. For ease of understanding, the process has been simplified in the student resource. For example, the formulas used contain only two elements. Also, a simple formula for iron oxide (FeO) has been used to support the nomenclature; it is described as rust to relate it to everyday life. The formula for rust is actually Fe_2O_3.

Compounds which have three or more elements follow a more complex naming system, which falls outside of the scope of this course. However, students may note that some chemical names end in -ate, -ite, etc.

Several examples have subscript numbers in them, just as the formula for water does. Students commonly question this, although it is beyond the scope of this course. You might explain that these numbers represent the proportion of elements within the substance.

The symbols for some elements come from their historic name in another language, usually Latin. For example: Na, natrium; K, kalium; Sb, stibium; Fe, ferrum; Ag, argentum; Au, aurum; Pb, plumbum; Hg, hydrargyrum; Sn, stannum, and Cu, cuprum. Tungsten's symbol (W) comes from its German name, wolfram.

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 mind map or concept map to show the connections between the key terms.
- Write definitions for these terms in their Science Log. You may wish to have students keep a glossary at the back of their Science Log.

Help students remember the key terms by posting them on a science word wall.

Activity Planning Notes

As students enter the classroom, consider playing "The Elements" by Tom Lehrer. Ask if students recognize this song; it has been used in some popular sitcoms. Does the song make sense? What do the words mean?

Have students refer to the periodic table which is on the page facing the inside back cover of their student resource. Ask them to call out elements they recognize in the periodic table. Try to write everything they call on the chalkboard. Act frustrated and tell students to slow down as you can't write that fast. After a minute or less, stop and ask students what would make recording faster. Lead them to the answer of using the symbols instead of the whole name.

Repeat the activity using only symbols. Students will have a very good idea now of why symbols were invented for each element and the importance of knowing these symbols. Tell them they will not have to memorize the symbols but that the more they know the easier it will be to use them.

You may wish to hand out photocopies of **OHT A–4 Periodic Table** and have students shade the elements they recognize. They will likely observe that they shaded only a few of the 100+ elements used in daily life.

Begin the Chemical Formulas section on page 25 by displaying formulas with only two elements. Ask students what they mean. Answers will likely include just the names of the two elements, but this is the starting point for naming chemicals.

Have students complete and then discuss questions 6 and 7 on page 25.

Consider using the following overhead transparency:
- **OHT A–4 Periodic Table**

Technology Links

- For an animated version of the Tom Lehrer song, "The Elements," go to **www.mcgrawhill.ca/books/Se10** and follow the links to The Elements.

Accommodations

- Pair weaker readers with stronger readers so they can help them find the symbols on the periodic table more quickly.
- Coach students through a few examples of replacing the ending on a chemical with the suffix -ide. For example, slash the word chlorine after the first syllable (e.g., chlor/ine). Then replace the end of the word with –ide (e.g., chlor-ide). Repeat for other examples such as sulf-ide and fluor-ide.

Check Your Understanding Answers (page 24)

1. A chemical name gives information about what elements are in the chemical and what chemical group it belongs to.
2. Chemicals are made of elements.
3. The names and symbols of the elements are found in the periodic table.
4. There are one or two letters in an element symbol.

Making Connections Answers (page 24)

5. **a)** to **c)** Answers should include any three of: Na, sodium; K, potassium; W, tungsten; Fe, iron; Ag, silver; Au, gold; Hg, mercury; Sn, tin; Pb, lead; Sb, antimony.

Check Your Understanding Answers (page 25)

6. **a)** KCl: potassium chloride
   b) CO: carbon monoxide
   c) NaCl: sodium chloride
   d) FeO: iron oxide
   e) $CaCl_2$: calcium chloride
7. **a)** $NaHCO_3$: Na, sodium; H, hydrogen; C, carbon; O, oxygen
   b) $CaCO_3$: Ca, calcium; C, carbon; O, oxygen
   c) $MgSO_4$: Mg, magnesium; S, sulfur; O, oxygen

Alternative Activities

- Play a "Who Wants to be a Millionaire" quiz game using chemical names in the question and formulas in the answers. Include the help options such as phone a friend, ask the audience, and 50/50.
- Play a concentration card game where one set of cards has symbols and the other has names. Have teams of students race to be the first to match all of the cards.
- Use some or all of the activities in the following Chemistry *ActiveFolders*: The Periodic Table of Elements.

Ongoing Assessment

- Use question 2 on page 24 as a formative assessment of how well students understand the relationship between chemicals and elements.
- Use the Check Your Understanding questions on page 25 to assess students' understanding of the relationship between chemical formulas and elements.
- You may wish to provide a pencil and paper quiz for students to have them complete the names of some simple compounds as review. Give them feedback on their quiz results and a second chance to improve their mark.

Technology Links

- For information and examples of elements and common chemical names, go to **www.mcgrawhill.ca/books/Se10** and follow the links to Secrets of Chemicals.
- For an interactive site about elements mentioned in comics, go to **www.mcgrawhill.ca/books/Se10** and follow the links to Periodic Table of Comic Books.

1.3 Classifying Chemicals (page 26)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
160 min 30 min for Find Out: How Do Acids React with Shells? 45–60 min for What's Going On? 105 min for Try This! on page 30 60 min for Find Out: How Does an Oxidizer Work? 45–60 min for Try This! on page 35	• sample MSDS (optional)	BLM 1–1 Predict, Explain, Observe, Explain BLM 1–2 How Do Acids React with Shells? BLM 1–3 Make a Flyer for a Common Chemical BLM 1–4 Compare Flammable and Combustible OHT A–3 WHMIS Labels OHT A–5 WHMIS Symbols OHT A–6 Compare Flammable and Combustible Assessment Master 7 Safety Checklist Assessment Master 8 Safety Rubric Assessment Master 15 Visual Presentation Checklist Assessment Master 16 Visual Presentation Rubric

Specific Expectations

CIM1.02 – classify chemicals into groups according to their behaviour, using appropriate scientific terminology
CIM2.01 – select and use appropriate lab equipment and apply WHMIS safety procedures for the handling, storage, disposal, and recycling of laboratory materials
CIM2.02 – conduct experiments to investigate how materials can interact chemically
CIM2.05 – communicate the results of investigations using a variety of oral, written, and graphic formats
CIM3.01 – research the interactions of materials that are used in daily life
SIM1.01 – identify the ways in which scientific information is conveyed
SIM1.02 – discuss, using examples, how the method of presenting scientific information connects to the purpose
SIM2.02 – research science-related information from a variety of electronic and other sources
SIM2.04 – organize and communicate information collected from lab investigations and information research using graphic organizers

Key Terms Teaching Strategies

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

- Write definitions for these terms in their Science Log. You may wish to have students keep a glossary at the back of their Science Log.
- Write a paragraph that contains the key terms in this section.

Help students remember the key terms by posting them on a science word wall.

Reading Icon Answer (page 36)

1. Combustible substances must be heated before they catch fire. Flammable materials burn or catch fire at lower temperatures.

Activity Planning Notes

Engage students' interest with one or more of the demonstrations described in the alternative activities section. You may wish to use **BLM 1–1 Predict, Explain, Observe, Explain** to help students identify misconceptions and to give you an idea of students' prior knowledge.

As a class, read and discuss the information about classifying chemicals on page 26. Note that the table is simplified for reasons of space and that the description of bases also applies to acids. When concentrated, acids react with bases to cause heat, and when diluted, acids can be used to help clean up base spills. The neutralizing effects are useful safety knowledge. You may wish to emphasize the safety note that acid will react with metal to make explosive hydrogen gas. If there is a spark, this hydrogen gas will cause a very big explosion.

Introduce the material about WHMIS on page 27 by noting some of the WHMIS symbols found in the classroom, such as the compressed gas symbol on the fire extinguisher. You may wish to use **OHT A–3 WHMIS Labels** and **OHT A–5 WHMIS Symbols**.

When reviewing parts of the label, you might refer to the notes for the Chapter Opener and remind students of the DHMO label.

Recap the neutralizing effects of acids and bases. If the sample WHMIS label on page 27 is an acid, what might the substances be that are listed under the Ingestion portion of the WHMIS label? Ask what safety equipment should be used. Point out that the MSDS (Material Safety Data Sheet) provides additional and more detailed information. Show an example of an MSDS or show students where they are kept.

Introduce corrosive chemicals by having students carry out the Find Out activity on page 28.

Have students complete the What's Going On? activity on page 30 to show them a more playful application of acids and bases followed by the What's Going On activity on page 32. You may wish to have them complete the Try This! on page 35 to make sure they understand the importance of handling oxygen with caution.

Introduce flammable and combustible fuels on page 36 by reading the information as a class. Have students complete and then discuss question 2. Consider using **OHT A–6 Compare Flammable and Combustible** to model completing a double bubble organizer.

As a class, read and discuss alternative fuels on page 37. Alternative fuels are a subject of ongoing debate and are often in the news. Help students understand fuels that are not derived from fossil sources by showing them examples, such as wood, candle wax, biodiesel, or ethanol.

Accommodations

- Pair weaker readers with stronger readers.
- Have note buddies who can monitor each other's note-taking skills.
- Provide students who need more space to complete question 2 on page 36 with **BLM 1–4 Compare Flammable and Combustible**.

Consider using the following blackline masters and overhead transparencies:

- **BLM 1–1 Predict, Explain, Observe, Explain**
- **BLM 1–4 Compare Flammable and Combustible**
- **OHT A–3 WHMIS Labels**
- **OHT A–5 WHMIS Symbols**
- **OHT A–6 Compare Flammable and Combustible**

Check Your Understanding Answers (page 26)

1. a) acids

b) bases

2. a) oxidizers

b) fuels

Check Your Understanding Answers (page 27)

3. a) concentrated hydrochloric acid

b) highly irritating to skin, eyes, and nose; strong acid vapours highly toxic; burns skin on contact

Check Your Understanding Answers (page 31)

1. Besides being an awkward position to paint in, students might say that it is hard to paint a ceiling because it's hard to tell if any spots have been missed until the paint dries.

2. Professionals touch up areas they missed.

3. a) The new brand of ceiling paint is pink before it dries. Note: Although the student resource says pink, different brands use other colours and indicators (e.g., blue, purple).

b) The dye lets you see where you have painted but does not leave a coloured ceiling.

Making Connections Answer (page 31)

4. Students may infer an answer such as:

- The paint is a base with phenolphthalein in it since it starts out pink and dries colourless.

Check Your Understanding Answer (page 36)

2. Flammable Differences: burn or catch fire easily, burn or catch fire below 38°C

Flammable examples: gasoline or another fuel, turpentine

Similarities: burn, produce heat, catch on fire, burn by themselves

Combustible Differences: catch fire when heat applied, catch fire above 38°C

Combustible examples: wood, candle wax

Check Your Understanding Answers (page 37)

1. a) They cause pollution.

b) They will eventually run out.

2. Biofuels are fuels made from plants or animal products.

3. Look for two examples of biofuels.

a) wood

b) ethanol

4. New fuels do not always work with the old machines.

Find Out Activity (page 28)

How Do Acids React with Shells?

Purpose

- Students test the effect of acetic acid on the rate of erosion/corrosion.

Science Background

Vinegar contains about 3% acetic acid. This reacts with the calcium carbonate in eggshells (and marble) to form calcium, water, and carbon dioxide bubbles.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
2 days before	• Buy eggs, vinegar, and marble chips (available at garden supply stores). • Boil eggs (optional). • Collect other materials. • Photocopy **BLM 1–2 How Do Acids React with Shells?** (optional).
Day of	• Distribute materials.

APPARATUS	MATERIALS
• 4 beakers • masking tape or grease pencil	• 60 mL acetic acid (white vinegar) • 60 mL tap water • 2 marble chips (or alternative) • 2 eggs, in their shells

Suggested Timing

30 min; plus 5 minutes to observe over 4 days

Safety Precautions

- Remind students not to eat anything in the science lab.
- Have students clean up their work area and wash their hands thoroughly at the end of the activity.

Activity Planning Notes

Read over the procedure with students before they begin. Have students work in small groups.

Have students record their observations on **BLM 1–2 How Do Acids React with Shells?** Bubbles will form on the eggshell, rising periodically, and a layer of bubbles will skim the surface of the vinegar.

The next day, have students record observations of the four samples. You may choose to remove an egg from the vinegar and have students feel that its shell is rubbery, not brittle. Have students continue to make observations over four days. By then, the shell should be nearly worn away, leaving behind either a raw egg held together by its membrane or a boiled egg.

You may substitute chalk pieces or seashells for the marble chips. Or you may wish to divide all material options among student groups so that they are each testing a different material. Boiled eggs eliminate the potential for mess.

As students will not study signs of change until Chapter 2, have them focus on the “disappearance” of the material as a sign of corrosion. They may instinctively recognize bubbles as a sign that something is happening. Alternatively, have students weigh the marble chips before and after the activity to show that there is a change in mass as a result of this reaction.

To clean up, have students wearing gloves pour the liquids down the sink. The rinsed marble chips should be returned and the eggs disposed of appropriately.

Find Out Activity Answers (pages 28–29)

1. Sample answer; they will dissolve.

7. No. There were no signs of change.

8. Yes. There were bubbles in both combinations and the eggshell softened in a few days.
9. **a)** vinegar and eggshell

   b) The eggshell softened and seemed to disappear, but the marble chips only bubbled and got less shiny.
10. No. It did not corrode either the eggshell or marble chips.
11. Yes. It corroded both the eggshell and the marble chips.
12. **a)** Students should circle the common names: limestone, chalk, and shell. Students should underline the chemical name: calcium carbonate.

    b) calcium, carbon, oxygen
13. Sample answer: Acid corrodes limestone. This could include the limestone in buildings and statues.

Accommodations

- Eliminate the potential for a raw egg mess by having students work with boiled eggs or pieces of eggshell.
- Set up a time-lapse observation by preparing samples one day apart, for four days. Students can then compare the effect of four different time frames all at once.
- Assign the observations as homework.

Activity Wrap-up

- Have students complete and then discuss the questions on page 29. Survey their observations and conclusions.
- Ask students how they might improve the activity. What other materials might they test with the vinegar? What other acids might they test (e.g., soda pop, citrus juice)?
- Discuss how this reaction might be similar to other bone and acid combinations. For example, teeth are bone. How might acidic drinks affect teeth?
- Vinegar is commonly used as an "environmentally friendly" household cleaner. Ask students whether they think vinegar would harm (e.g., etch and dull) a marble countertop or tiles.
- Have students repeat question 12 on page 29 for acetic acid ($C2H_4O_2$). The opening paragraph on page 28 provides the information needed. Students may be interested to know that organic chemists write this formula as CH_3COOH (which might be pronounced chu-cooh). Have them add up the elements to show that these formulas are the same.

What's Going On? Activity (page 30)

Invisible Ink

Purpose

- Students model a practical use of an indicator and a base.

Science Background

An indicator is a substance that changes colour in the presence of an acid or base. A colourless indicator (phenolphthalein) may be used to write on paper, leaving an invisible message. When a base is sprayed on the message, the "invisible ink" turns bright pink. The indicator changes colour when the base is applied.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
2 days before	• Collect materials and apparatus. • Prepare a 0.5 Mol/L solution of sodium hydroxide and put it into a spray bottle labelled "Teacher Message Detector."
Day of	• Set out materials.

APPARATUS	MATERIALS
• paint brushes or cotton swabs • 500 mL spray bottle • beakers	• 500 mL of 0.5 Mol/L sodium hydroxide solution • 10 mL phenolphthalein • white paper

Suggested Timing

45–60 min

Safety Precautions

- Remind students to wear gloves and eye protection.
- If phenolphthalein gets on clothing or skin, wash the area with water (no soap).
- Do not let students spray the sodium hydroxide (Teacher Message Detector).
- Keep students away from the spray. If sodium hydroxide gets on skin, thoroughly wash the area with plenty of cool water (no soap).
- Let the paper dry before returning it to students.
- Have students clean up the work area and wash their hands thoroughly at the end of the activity.

Activity Planning Notes

Review safety precautions and procedures with students before starting. Provide each student or group with a small amount of phenolphthalein in a beaker, a piece of white paper, protective gloves, and a paintbrush or cotton swab. Remind students to write only messages that are appropriate for the classroom. You may wish to provide more direction, such as "write the name of the last movie or concert you saw."

The messages should take about 5 minutes to dry, depending on how much liquid is used. Spray the dried messages with Teacher Message Detector (dilute sodium hydroxide) and let it dry before returning it to students.

Accommodations

- Allow students to draw a picture if they so desire. The point is not the message but how the indicator changes colour when the base is added.

What Did You Learn? Answers (page 30)

3. The message was revealed in pink.

4. **a)** base

b) The message turned pink just like the base in the beaker did when phenolphthalein indicator was added.

Activity Wrap-up

- Have students think about some limitations to the "invisible ink" method of message creation.

Try This! Activity (page 30)

Purpose

- Students research the names, uses, and possible dangers of a chemical and make a flyer.

Science Background

Many common names for chemicals originated before there was a worldwide standard for naming chemicals. Today, the IUPAC system of naming is accepted around the world.

Refresh students' memories about brand names. They are easier to say and are seen more often than the tougher IUPAC chemical names, so more people are likely to remember and use them.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 week before	• Book computers with Internet access or the library. • Collect print resources.

Day before	• Photocopy **BLM 1–3 Make a Flyer for a Common Chemical**, **Assessment Master 15 Visual Presentation Checklist**, and **Assessment Master 16 Visual Presentation Rubric** (optional).

APPARATUS	MATERIALS
	• materials to create flyers (optional)

Suggested Timing

105 min, including time for research, design, and creation

Activity Planning Notes

Allow students class time to research and create a flyer. Provide old catalogues or magazines for students to use for cutting pictures. Students can use **BLM 1–3 Make a Flyer for a Common Chemical** to keep their research focused and help with their design.

Consider reviewing **Assessment Master 15 Visual Presentation Checklist** to help students plan their flyer.

Accommodations

- Have pre-printed information about several chemicals ready for students to use in the classroom.

Activity Wrap-up

- Have students share their flyers with the class in an informal way.
- You may wish to put the students into groups, as there may be two students completing the same chemical. They could work together to come up with a short presentation for the class about their compound.

What's Going On? Activity (page 32)

How Does an Oxidizer Work?

Purpose

- Students test the effect of an oxidizer on the rate of burning.

Science Background

Electrolysis is a method used to separate a compound into simpler substances using an electric current. The electric current provides the energy necessary to break the chemical bonds within the compound.

The sodium sulfate in this investigation acts as a salt "bridge," a catalyst that allows the electric current to pass through the water. When the electricity flows, the water separates into its component elements, hydrogen and oxygen gases.

The glowing splint test is a classic test for hydrogen. Though the reaction is actually an explosion, students may observe that the burning stopped. When compared to the flare-up of a burning splint in oxygen, students will recognize that an oxidizer makes a flame burn hotter and faster.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
2 days before	• Collect necessary materials and apparatus. • Photocopy **Assessment Master 7 Safety Checklist** and **Assessment Master 8 Safety Rubric** (optional).
Day of	• Set up one apparatus as a model for students.

APPARATUS	MATERIALS
• 9 V battery • 400 mL beaker • 2 graphite pencil leads for electrodes • stirring rod • 2 – 50 mL test tubes • 2 wire leads with alligator clips • lighter or matches	• 3 mL sodium sulfate solution • 300 mL water • 2 wooden splints

Suggested Timing

60 min

Safety Precautions

- Do not use salt water in this investigation; it will produce toxic chlorine gas.
- Make sure students do not touch exposed wires once the battery is connected.
- The solution containing sodium sulfate should be collected in an empty beaker. It can then be disposed of by pouring it down the drain. Students should not be encouraged to pour chemicals down a drain.
- When setting up the electrodes and test tubes, stress that the leads should not touch. This would cause a short circuit or drain the power supply.
- Have students clean up their work area and wash their hands thoroughly at the end of the activity.

Activity Planning Notes

Set up the apparatus as a model for students to copy.

As a class, review the procedure with students and make sure everyone understands what to do before allowing them to proceed. Consider reviewing **Assessment Master 7 Safety Checklist** to reinforce the importance of following safety precautions. Have students work in pairs or groups of three so that one student can be assigned to record observations.

In advance, you may wish to make an overhead copy of the electrolysis diagram on page 32, and use it to help students label their diagrams.

Direct students to avoid touching the splint to the wet sides of the test tube.

Encourage students to consider various scenarios when they predict what will happen. Remind them that no prediction is wrong. Scientists are frequently surprised by the outcome of an investigation—it is often something quite different than what was predicted.

Students are not expected to understand decomposition reactions. The reaction is used simply as a method to collect oxygen and hydrogen. Use this opportunity to reinforce the relationship between elements and formulas.

Depending on students' abilities, you may choose to demonstrate the electrolysis instead and provide students with gas samples to test. If so, you may wish to use a Hoffman's apparatus in place of the set-up in this activity. You may also replace the battery and electrodes with a 120 V, variable power pack and carbon electrodes.

Find Out Activity Answers (pages 34–35)

5. The liquid bubbled and the test tubes filled up with gas (and emptied of liquid).

6. Diagrams should show one test tube full of gas and the other half full.

7. **a)** The splint went out and there was a "pop."

b) The splint flared up into flame.

8. **a)** hydrogen, oxygen

b) half-full test tube; because water contains twice as much hydrogen as oxygen

c) The full test tube contains hydrogen. The half-full test tube contains oxygen.

9. oxidizer, compressed gas

10. Answers will vary but should reflect the safety precautions.
11. Answers will vary. Look for evidence that students have identified challenges in the procedure.

Accommodations

- Use a measuring spoon to measure 3 mL of sodium sulfate or provide pre-measured samples.
- Provide students with a sample of oxygen rather than having them collect the gas.

Activity Wrap-up

- Have students complete and then discuss questions 5 to 11 on pages 34 and 35. Survey students' observations and emphasize that the oxygen made the splint burn hotter and faster.

Try This! Activity (page 35)

Purpose

- Students use research skills to discover how oxygen is used, and what precautions are taken when using oxygen.

Science Background

As students demonstrated in What's Going On? How Does an Oxidizer Work?, oxygen can be dangerous when used improperly. On the other hand, we depend on this gas, which is used to assist people with breathing disorders, and allows people to survive both when working underwater and when rescuing people from burning buildings. Encourage students to visit or call medical, sports, and safety supply houses, or medical facilities or diving shops where oxygen is routinely used, to get information on the importance of keeping open flames away from oxygen.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 week before	• Book the computer lab. (optional) • Collect pamphlets and posters about the use of oxygen in medicine, sports, and emergency services (optional).

APPARATUS	MATERIALS
	• pamphlets and posters about the use of oxygen in medicine, sports, and emergency services (optional)

Suggested Timing

45–60 min

Activity Planning Notes

Pamphlets and poster are available at some medicine, sports, and emergency service suppliers and/or facilities; however, it may be more productive to arrange for Internet access so students can research the use of oxygen in these fields. Alternatively, you may wish to have students interview medical, emergency, or sports personnel who use oxygen. This can be done individually or as a group.

Accommodations

- Have some web sites ready. Sit Internet-savvy students beside those who struggle so they may help each other.
- Brainstorm with the class a list of possible general internet search terms such as "oxygen" and "medicine," "oxygen" and "scuba diving," or "oxygen" and "fire rescue".

Activity Wrap-up

- Bring in a guest speaker who can talk about or demonstrate the use of oxygen in medicine, sports, and emergency services, plus discuss how oxygen can be handled safely.
- Have students share their findings.

Alternative Activities

- Demonstrate flammability using a bill and homemade fire retardant. Prepare retardant before class: put 3–4 cm of rubbing alcohol (isopropyl alcohol) into a 250 mL beaker then add water to raise the level another 2 cm. Add 5 g of table salt (sodium chloride) for a colourful effect. In class, borrow a $5 bill from a student, telling them you have been working on a homemade flame retardant. Submerge the bill in the mixture flat for about 30 seconds. Remove it with a pair of tongs and light it. When the bill catches fire, say "I guess it needs more work." The big yellow flame will extinguish after 15 seconds and the bill will not be burned. Note: Practice this demo ahead of time.
- Demonstrate the corrosive effect of acids and bases. Crack a raw egg into a petri dish so that it mimics the shape of an eye. Place five drops of concentrated acid (6 Mol/L or greater) on one side of the raw egg and five drops of concentrated base (6 Mol/L or greater) on the other side. Both of these solutions will make the egg look like it is cooking. This also reinforces the need to wear safety glasses, as this could happen to eyes as easily as to the egg.
- Have students create a display about alternative fuels. Have each student add one fact about a fuel. For example, the raw material needed to produce the fuel, the properties of each fuel, or the associated costs and benefits. Alternative fuels include ethanol, biodiesel, natural gas, propane, hydrogen, electricity, methanol, and p-series fuels.
- Have students research the 1967 *Apollo 1* disaster in which three astronauts died as a result of a fire during a pre-launch test. The severity of the disaster was attributed to the cockpit's pure oxygen atmosphere which causes the explosive burning materials, including a lot of Velcro™. Velcro™ is used to hold items (and people) in place in zero gravity. It is resilient, non-toxic, and does not burn in ordinary air. As a result of this accident, NASA reports that all tests taking place in 100% pure oxygen are now defined as hazardous.
- Use some or all of the activities in the following Chemistry *ActiveFolders*: Acids and Bases.

Ongoing Assessment

- Use **Assessment Master 16 Visual Presentation Rubric** to assess the flyers that students made for the Try This! activity.
- Use **Assessment Master 8 Safety Rubric** to assess students' safety practices during the What's Going On? How Does an Oxidizer Work? activity.

Technology Links

- For activities related to alternative fuels, go to **www.mcgrawhill.ca/books/Se10** and follow the links to Alternative Fuels.
- For information about oxidizers, go to **www.mcgrawhill.ca/books/Se10** and follow the links to Oxidizing Materials.
- For information about biomass, go to **www.mcgrawhill.ca/books/Se10** and follow the links to Biomass.

Chapter 1 Review (page 38)

SUGGESTED TIMING

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

BLACKLINE MASTERS

Master 5 Certificate
Master 6 List of Skills
BLM 1–5 Chapter 1 Practice Test
BLM 1–6 Chapter 1 Test
BLM 1–7 BLM Answers

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 1–5 Chapter 1 Practice Test** can be customized to produce extra reinforcement questions.

Summative Assessment

- Have students complete **BLM 1–6 Chapter 1 Test** to assess individual skills.
- You may wish to develop **Master 5 Certificate** to show students what they have learned during this chapter. Cut and paste the related skills from **Master 6 List of Skills**.

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.

To provide additional reinforcement of key terms, have students complete a concept map of all the key terms. Once the review is completed and taken up, assign **BLM 1–5 Chapter 1 Practice Test** for students to answer individually. They may wish to use their completed review to help them.

Review Guide

Question	Section(s)	Refer to
1	1.3	Flammable and Combustible Chemicals: Fuels (page 36)
2	1.1	Using the Language of Chemistry (page 21)
3	1.3	Flammable and Combustible Chemicals: Fuels (page 36)
4	1.3	Corrosive Chemicals (page 28)
5	1.1	Using the Language of Chemistry (page 21)
6	1.1	Using the Language of Chemistry (page 21)
7	1.2	Chemical Formulas (page 25)
8	1.2	Chemical Formulas (page 25)
9	1.3	Classifying Chemicals (pages 26–37)
10	1.1	Using the Language of Chemistry (page 21) Everyday Chemicals (page 23)
11	1.3	WHMIS and Safety (page 27)
12	a) 1.1 b) 1.3 c) 1.3 d) 1.3	a) Using the Language of Chemistry (page 21) b) Classifying Chemicals (page 26) c) Classifying Chemicals (page 26); Oxidizing Chemicals (page 32) d) Alternative Fuels (page 37)

Chapter 1 Review Answers (pages 38–39)

1. **e)** flammable
2. **b)** brand name
3. **a)** combustible
4. **c)** corrosive
5. Sample answer: A brand name identifies a substance made by a specific company. A common name describes the substance no matter who makes it.
6. Sample answer: A chemical name describes the elements contained in a substance. A common name does not describe elements but is easier to say.
7. **a)** MgF_2: magnesium fluoride

   b) AuP: gold phosphide

   c) Cs_2O: cesium oxide

   d) $AlBr_3$: aluminum bromide

   e) $CoCl_2$: cobalt chloride
8. **a)** to **d)**
   - beryllium
   - aluminum
   - silicone
   - oxygen
9. Likely examples include:

   a) gas, sawdust, isopropyl alcohol

   b) acid rain, acid, base, hydrochloric acid, sulfuric acid, sodium hydroxide, potassium hydroxide

   c) potassium chlorate, potassium nitrate, oxygen

   d) wood, oil, gas, coal, tar, sucrose, steel wool, biofuel
10. **a)** pencil lead

    b) baking soda

    c) sugar

    d) table salt

    e) bleach

    f) limestone
11. **a)** 

    b) 
12. **a)** F. The brand name of a substance is usually less complicated than its chemical name.

    b) T

    c) F. An oxidizing chemical cannot be used to stop a substance from burning; *or*, an oxidizing chemical can be used to make a substance burn hotter and faster.

    d) F. Fuels release useful energy and other things when they burn.