

DISCOVERING THE CONNECTION: YOUR ENVIRONMENT, YOUR HEALTH

AFTERSCHOOL SCIENCE CLUB CURRICULUM FOR MIDDLE SCHOOL STUDENTS



UNIT 3: CHEMICALS IN YOUR HOME

DEVELOPED BY K-12 SPECIALIZED INFORMATION SERVICES GROUP,
NATIONAL LIBRARY OF MEDICINE, NATIONAL INSTITUTES OF HEALTH



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ABOUT DISCOVERING THE CONNECTION: YOUR ENVIRONMENT, YOUR HEALTH

PURPOSE OF THE CURRICULUM

Discovering the Connection: Your Environment, Your Health uses the Tox Town Web site (toxtown.nlm.nih.gov) developed by the National Library of Medicine (NLM) to introduce middle school students to environmental health issues in everyday life. The curriculum includes information and laboratory research and communication activities, stressing the relevance of science to informed citizenship and integrating science, society, and literacy. The curriculum is for an afterschool club, but can also be used in the science classroom. The curriculum is based on National Science Education Standards.

Teaching and Learning Approaches

The curriculum uses inquiry-based learning and problem-based learning approaches. These are student-centered approaches that promote in-depth understanding and critical thinking by fostering students' active engagement with the subject matter. Students develop content knowledge and scientific reasoning skills through collaborative work on real world problems. They explore ideas, formulate meaningful questions, collect and analyze data, and evaluate and communicate their findings.

Tox Town Web Site

Tox Town (toxtown.nlm.nih.gov) is visually engaging and is an authoritative, reliable educational Web site, dedicated to highlighting the connections among chemicals, the environment, and the public's health.

Curriculum Development Team

This effort was initiated and coordinated by the NLM K-12 Specialized Information Services group. The NLM, one of the institutes of the National Institutes of Health (NIH), has been a center of information innovation since its founding in 1836. The K-12 group develops authoritative resources for a variety of science education areas, coordinates outreach to educators and school health professionals, and conducts research into teaching and learning.

The working group for this curriculum consists of: the NLM K-12 staff; Daniel M. Levin, a professor of science education from the University of Maryland College of Education; and five teachers from Montgomery County, MD, and the District of Columbia. The teachers are Jacquelyn Geer (science), Maura Hinkle (science), Sandra Garner (language arts), Kelley Knox (social studies), and Berneatta Barnes (science).

Curriculum Overview and Suggested Use

The curriculum contains six units. Each unit introduces one environmental health topic and includes three or four 50-60 minute lessons in the following format:

- Topic introduction and information research activity using Tox Town;
- Hands-on experiment or activity reinforcing understanding, conducted with simple materials; and
- Communication and social action activity where students share their understanding of the topic with others and translate their understanding into actions.

The units can be used sequentially or individually to support the existing middle school science curriculum. They can also be used to support the science/society connection in the social science or language arts classroom. The entire curriculum was pilot-tested as an afterschool club at the Cabin John Middle School, Montgomery County, MD.

The Six Units of the Curriculum

1. **Water Quality:** Introduces students to drinking water quality issues and the water treatment process. Includes experiments where students test school drinking water, compare it with water from other sources, and communicate the findings to the school community.
2. **Air Quality:** Introduces students to air quality issues and the impact of air pollution on human health. Students test air quality in several locations in and around the school.
3. **Chemicals in Your Home:** Informs students about potentially toxic chemicals in common products and introduces safer alternatives.
4. **Food Safety:** Introduces students to biological, chemical, and physical contaminants in food. Uses an experiment to teach safe food handling.
5. **Runoff, Impervious Surfaces, and Smart Development:** Introduces students to the relationship among runoff, water pollution, and human health. Also introduces the idea of responsible development.
6. **The Great Debate: Bottled Water vs. Tap Water in Our School:** Students perform research about pros and cons of different sources of drinking water, engage in a debate, and develop persuasive arguments to advocate for bottled or tap water as a primary source of drinking water in the school.

Symbols Used in This Curriculum

-  – information research via Tox Town
-  – lab experiment
-  – hands-on activity
-  – communication and social action activity
-  – excerpt from student handouts in teacher directions

UNIT 3: CHEMICALS IN YOUR HOME

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UNIT 3:

CHEMICALS IN YOUR HOME

UNIT OVERVIEW

This unit uses the Tox Town Web site (toxtown.nlm.nih.gov) developed by the National Library of Medicine to introduce students to environmental health issues in their everyday life through *inquiry-based learning* and *problem-based learning* approaches. Inquiry-based learning is a student-centered approach that promotes in-depth understanding and critical thinking by fostering students' active engagement with the subject matter. Students explore ideas, formulate meaningful questions, collect and analyze data, and evaluate and communicate their findings. Problem-based learning is another student-centered approach, where students develop content knowledge and scientific reasoning skills through collaborative work on real world problems.

National Science Education Standards

E.F.4 Changes in Environments

b. Changes in environments can be natural or influenced by humans. Some changes are good, some are bad, and some are neither good nor bad. Pollution is a change in the environment that can influence the health, survival, or activities of organisms, including humans.

H.F.4 Environmental Quality

b. Materials from human societies affect both physical and chemical cycles of the earth.

Unit Objectives

At the end of this unit, students will be able to:

- Explain how the environment can be impacted by the use and disposal of toxic substances
- Describe the benefits and dangers of using common household products
- Explain why chemicals can be dangerous to human health
- Suggest alternative cleaners

Essential Questions

How does the use of chemicals by humans affect the environment?

What are the benefits to the environment of using safer alternatives?

Technology Education Skills

Students will use computer resources to explain how chemicals affect the environment and human health.

L 3.1 TOX TOWN BINGO: CHEMICALS IN COMMON PRODUCTS



L 3.1.1 Objectives, Materials, and Teacher Preparation

Objectives

Students will be able to:

- List common chemicals found in the home and explain their uses
- Explain health risks associated with misuse of different household products

Materials Needed for Lesson

- Commercial window cleaner
- Vinegar (for preparing a window cleaner alternative)
- Liquid soap or detergent (for preparing a window cleaner alternative)
- Water (for preparing a window cleaner alternative)
- Spray bottles (each group will need one bottle for commercial window cleaner and one bottle for alternative cleaner)
- Several small hand mirrors (two per group)
- Newspaper
- *What Chemical Products Are in Your Home? Take a Survey* (H 3.1.1)
- *Student Tox Town Bingo Boards* (H 3.1.2) for Tox Town Bingo
- *Teacher Tox Town Bingo Call Card/Answer Key* (L 3.1.4.1) for Tox Town Bingo
- A small box for placing Tox Town Bingo questions
- Computers with Internet access

Teacher Preparation

1. Divide commercial window cleaner into appropriate number of spray bottles for your class.
2. Prepare a window cleaner alternative to commercial window cleaner by mixing 1/4 cup of vinegar, 1/2 cup of liquid soap or detergent, and 2 cups of water, and pouring the mixture into appropriate number of spray bottles.
3. Prepare copies of *What Chemical Products Are in Your Home? Take a Survey* (H 3.1.1).
4. Prepare *Student Tox Town Bingo Boards* (H 3.1.2) (there are 16 different boards in the Student Handout pages) and *Teacher Tox Town Bingo Call Card/Answer Key* (L 3.1.4.1) for the Tox Town Bingo game. Cut the squares from the *Teacher Tox Town Bingo Call Card/Answer Key* (L 3.1.4.1) and place them in a box to randomly call questions during the game.
5. Ensure access to computers with Internet connection (for accessing Tox Town, toxtown.nlm.nih.gov).

L 3.1.2 Activator

Teacher Directions

1. Show students the bottle with commercial window cleaner and the bottle with the prepared alternative solution; explain what is in each bottle.
2. Ask the students, “Which bottle are you or your parents more likely to use to clean your windows or mirrors at home? Which do you think will do a better job?”

3. Divide students into groups and distribute two hand mirrors to each group. Provide each group with one commercial cleaner and alternative cleaner solution spray bottle.
4. Ask each group to clean both mirrors with crumpled newspapers, using the commercial product for one, and the alternative cleaner solution for the other. Ask students to compare and discuss the results.
5. Direct the discussion to chemicals used in cleaning products, the potential risks to human health, and alternatives.

Note: Mention to your students that although toxic chemicals can be a risk to human health, the risks are reduced when they are used properly.

L 3.1.3 Homework Assignment for L 3.3

Teacher Directions

1. Distribute *What Chemical Products Are in Your Home? Take a Survey* (H 3.1.1) to the students. Ask students to complete the surveys at home and bring them to the **L 3.3 Identifying Safer Alternatives: It's So Easy Bein' Green** meeting/class.

Note: The surveys will be used in the last lesson of this unit.

L 3.1.4 Activity

Teacher Directions

1. Introduce the Tox Town Bingo game to the students. Explain that this game will allow students to explore chemicals found in common household products.
2. Divide students into pairs or groups, or instruct them to play individually (there are 16 different *Student Tox Town Bingo Boards* (H 3.1.2) included in the Student Handout pages). Distribute a different *Student Tox Town Bingo Board* to each player or pair/group.
3. Direct pairs/groups (or individual students) to Tox Town Web site (toxtown.nlm.nih.gov) to search for answers to the bingo questions on their boards. Ask students to record their answers on the boards. Allow 15-20 minutes for the task.
4. After the time has passed for finding the answers, ask students to get ready to play bingo with their answers and boards. Use the squares you cut out from the *Teacher Tox Town Bingo Call Card/Answer Key* (L 3.1.4.1). Randomly pick a square from the box and read the question. Have one student answer the question out loud; invite other students to discuss the answer. Finally, ask all pairs/groups/students who had the correct answer to mark the corresponding square. The student or pair/group that correctly answers five questions in a row vertically, horizontally, or diagonally will be the winner of Tox Town Bingo.

L 3.1.4.1 Teacher Tox Town Bingo Call Card/Answer Key

<p>How can you be exposed to ammonia at home?</p> <p>If you use products that contain ammonia, including window cleaners, floor waxes, and smelling salts.</p>	<p>What is the number of the Poison Control Center?</p> <p>1-800-222-1222</p>	<p>Can I get chlorine poisoning from bleach?</p> <p>You can be exposed to hazardous chlorine gas at home if you mix bleach containing sodium hypochlorite with ammonia or other cleaning products.</p>	<p>What is relative risk?</p> <p>The rate of disease among the population exposed to a potentially damaging substance divided by the rate of the disease among the unexposed population.</p>	<p>Why are nail care products a health concern?</p> <p>They contain harmful chemicals like benzene, formaldehyde, and acetone.</p>
<p>How might I be exposed to toluene?</p> <p>By breathing automobile exhaust, pumping gasoline, consuming contaminated food or water, or using other products that contain toluene, such as kerosene, heating oil, paints, lacquers.</p>	<p>Name four different products that contain solvents.</p> <p>Paint, ink, coatings, household cleaners, dry cleaning fluid, spot removers, adhesives.</p>	<p>What household products contain phthalates?</p> <p>Phthalates are used in cosmetics and personal care products, flexible plastic and vinyl toys, shower curtains, wallpaper, vinyl miniblinds, food packaging, and plastic wrap.</p>	<p>Name at least five chemicals found at home.</p> <p>Ammonia, chlorine, formaldehyde, lead, PBDEs, perchloroethylene, pesticides, phthalates, polyvinyl chloride, solvents, etc.</p>	<p>What is ethylene glycol?</p> <p>Ethylene glycol is a colorless, syrupy alcohol that is highly poisonous. It is most commonly known as the key ingredient in anti-freeze products.</p>
<p>What is formaldehyde?</p> <p>It is a flammable gas or liquid that is used as a tissue preservative in medical labs or mortuaries. It is also used as an antibacterial ingredient.</p>	<p>Why is arsenic a health concern?</p> <p>Consuming or breathing in large quantities of arsenic can cause death. It is also a human carcinogen that has been shown to cause skin, lung, bladder, liver, kidney, and prostate cancer.</p>	<p>What are volatile organic compounds (VOCs)?</p> <p>VOCs are organic compounds that easily become vapors or gases.</p>	<p>How can ammonia affect your health?</p> <p>Exposure to extremely high levels can cause death, coma, blindness, lung damage, collapse, and seizures.</p>	<p>How can I be exposed to lead at home?</p> <p>Batteries, lead pipes, paint</p>
<p>List the four ways one can be exposed to pesticides.</p> <p>Inhaling, absorbing through the skin, eating, or drinking water that has been treated or exposed to pesticides.</p>	<p>What are PBDEs?</p> <p>Polybrominated diphenyl ethers, a.k.a. PBDEs, are flame retardants used in plastics, foams, fabrics and other materials that are important for safety.</p>	<p>What are pesticides?</p> <p>Substances that prevent, destroy, repel, or reduce the severity of pests.</p>	<p>Where is arsenic most commonly found?</p> <p>Arsenic compounds are used primarily in wood preservatives.</p>	<p>What is asbestos?</p> <p>Minerals that occur naturally in some rocks used for fire-retardant insulation.</p>
<p>What can asbestos do to me?</p> <p>Cause cancer</p>	<p>How might I be exposed to bisphenol A (BPA)?</p> <p>BPA products include food and drink packaging, water bottles, infant and baby bottles, infant feeding cups, reusable cups, compact discs, automobile parts, impact-resistant safety equipment, plastic dinnerware.</p>	<p>What are solvents?</p> <p>Solvents are liquids or gases that can dissolve or extract other substances.</p>	<p>What government agency regulates the use of pesticides?</p> <p>Environmental Protection Agency</p>	<p>Where can I go to learn more about chemicals and household products?</p> <p>Household Products Database</p>

L 3.2 CHEMICALS IN COMMON PRODUCTS INVESTIGATION



L 3.2.1 Objectives, Materials, and Teacher Preparation

Objectives

Students will be able to:

- Explain the dangers of common household chemical products
- Read the product labels on the back of common household chemical products
- Identify safer alternatives to common household chemical products

Materials Needed for Lesson

- Empty packaging of common household chemical products (see Teacher Preparation)
- *Chemicals in Common Products Investigation Instructions* (H 3.2.1)
- *Chemicals in Common Products Investigation Sheet* (H 3.2.2) (three copies per student or group)
- *Cleaner Alternatives* (H 3.2.3)
- Latex or latex-free gloves for all students

Teacher Preparation

1. Gather empty packages of common household chemical products (examples: commercial window cleaner, room spray, scouring powder, tile cleaners, air freshener, ant poison, detergent).
2. Remove lids, wash out the containers and let them dry. Use latex gloves.
3. Returns lids to the containers and hot glue or tape them closed for safety.
4. Prepare copies of *Chemicals in Common Products Investigation Instructions* (H 3.2.1) (one per student or group), *Chemicals in Common Products Investigation Sheet* (H 3.2.2) (three per student or group), and *Cleaner Alternatives* (H 3.2.3) (one per student of group).

L 3.2.2 Activator

Teacher Directions

1. Ask students, “What are the dangers of common household chemical products?”
2. Tell students that they will be investigating chemicals typically found in common products under the kitchen and bathroom sinks. Explain that they will focus on the effects that the chemicals may have on human health and the environment.

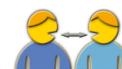
L 3.2.3 Activity

Teacher Directions

1. Arrange empty containers/packages of common household chemical products on the table. Instruct students not to try to open containers.
2. Divide students into groups, or instruct them to work individually.

3. Ask each student or group to pick three containers to use in their investigation.
4. Distribute *Chemicals in Common Products Investigation Instructions* (H 3.2.1) (1), *Cleaner Alternatives* (H 3.2.3) (1), and *Chemicals in Common Products Investigation Sheet* (H 3.2.2) (3) to each student or group. Review the instructions on *Chemicals in Common Products Investigation Instructions* (H 3.2.1) sheet with the students. Students will use Tox Town (toxtown.nlm.nih.gov) and *Cleaner Alternatives* (H 3.2.3) to complete the graphic organizer in the *Chemicals in Common Products Investigation Sheet* (H 3.2.2) for each of the three containers of their choice.
5. Invite a whole-group discussion about comparative benefits and limitations of common household chemical products and the alternatives.

L 3.3 IDENTIFYING SAFER ALTERNATIVES: IT'S SO EASY BEIN' GREEN



L 3.3.1 Objectives, Materials, and Teacher Preparation

Objectives

Students will be able to:

- Write a persuasive text explaining why alternative green cleaners are safer for human health and the environment

Materials Needed for Lesson

- Completed *What Chemical Products Are in Your Home? Take a Survey* (H 3.1.1) (distributed to students during L 3.1)
- Plain white paper
- Colored pencils and/or markers
- Optional: computer with color printer access
- It's So Easy Bein' Green* (H 3.3.1)

Teacher Preparation

- Prepare copies of *It's So Easy Bein' Green* (H 3.3.1) for students.
- Prior to the day of the lesson, remind students that they will need their completed *What Chemical Products Are in Your Home? Take a Survey* (H 3.1.1)

L 3.3.2 Activator

Teacher Directions

- Have students review the results of their *What Chemical Products Are in Your Home? Take a Survey* (H 3.1.1). Ask each student to choose five products currently used in that home that (s)he would like to replace with safer alternatives.

L 3.3.3 Activity

Teacher Directions

- Explain to students that a persuasive paragraph is a paragraph that states an opinion and tries to convince the reader to adopt it (write definition on board).
- Tell the students that they will create a persuasive pamphlet convincing the members of their household to replace common chemical cleaners with safer alternatives.
- Go over the instructions for the activity on *It's So Easy Bein' Green* (H 3.3.1), including the following list of the elements that need to be included in the pamphlet:

- Persuasive paragraph explaining why switching to safer alternatives is a good choice for human health and the environment
- Colorful visuals to support the arguments (e.g., drawings, pictures from magazines, computer printouts)
- A list of five common household cleaners and their safer alternatives
- Definitions of vocabulary terms that readers of the pamphlet should know (these may be terms learned during the **L 3.2 Chemicals in Common Products Investigation**)



4. Remind students to refer to *It's So Easy Bein' Green* (H 3.3.1) for directions and examples.
5. Divide students into groups and ask them to share their persuasive arguments with each other. If time allows, have students switch groups. Have students vote for the top three most persuasive pamphlets.

HELPFUL WEB SITES FOR TEACHERS

1. **What Is a Pesticide? (Environmental Protection Agency)** – defines pesticides and provides examples epa.gov/pesticides/kids/hometour/pest.htm
2. **Alternative Cleaning Products (eWashtenaw)** – includes a list of alternative cleaning products to make your home safer ewashtenaw.org/government/departments/environmental_health/recycling_home_toxics/hhw/hhw_nontoxic_html
3. **Household Products Database (National Library of Medicine)** – provides material safety data sheets for various products produced in the United States hpd.nlm.nih.gov
4. **Environmental Health Student Portal (National Library of Medicine)** – provides information about air pollution, chemicals, climate change, water pollution, and human health for middle school students kidsenvirohealth.nlm.nih.gov
5. **Sure, your home is clean... but is it safe for your family? (Environmental Protection Agency)** – provides information about ways to safeguard homes against hazards associated with common household products <http://www.epa.gov/osw/conserve/materials/pubs/hhw-safe.htm>



STUDENT HANDOUTS

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H 3.1.1 WHAT CHEMICAL PRODUCTS ARE IN YOUR HOME? TAKE A SURVEY



Name(s): _____

Date: _____

Directions: Talk to your parents/guardians about this survey, and tell them you want to see what common chemical products are in your home. Make sure it's OK with them for you to take the survey. If it is, have one of them sign this survey form. Then go to each room or location in your home and look for household products that contain chemicals.

Some products used in a location may be stored in a different location. For example, furniture polish used in the living room may be stored somewhere in the kitchen. During your survey, check the box next to any product you find, and add any others you find that are not on the list. **Be careful not to touch the chemicals. Wash your hands when you finish the survey.**

Parent or guardian's signature _____

Bathroom

- toilet bowl cleaner
- disinfectant cleaner
- tub/tile cleaner
- scouring powder
- other _____

Laundry

- detergent
- bleach
- stain remover
- other _____

Lawn and Garden

- fertilizer
- plant food
- weed killer
- pesticides
- fungicide
- pool chemicals
- other _____

Kitchen

- oven cleaner
- liquid dish detergent
- automatic dishwasher detergent
- floor cleaner
- all-purpose cleaner
- ammonia
- other _____

Living Room

- furniture polish
- rug cleaner
- window/glass cleaner
- air freshener
- other _____

Miscellaneous: Kitchen, Basement, or Garage

- latex paint
- paint thinner
- oil-based paint
- varnish
- silver/metal polish
- bug spray
- batteries
- other _____

Car and Vehicle

- oil
- anti-freeze
- gasoline
- car batteries
- other _____

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H 3.1.2 STUDENT TOX TOWN BINGO BOARDS



Name(s): _____

Date: _____

Student Tox Town Bingo Board 1

How can you be exposed to ammonia at home?	How might I be exposed to bisphenol A (BPA)?	Where is arsenic most commonly found?	What household products contain phthalates?	What can asbestos do to me?
What are solvents?	What are pesticides?	Where can I go to learn more about chemical and household products?	What is asbestos?	How can I be exposed to lead at home?
Can I get chlorine poisoning from bleach?	Name at least five chemicals found at home.	How can ammonia affect your health?	List four ways one can be exposed to pesticides.	Why are nail care products a health concern?
What is relative risk?	What are PBDEs?	What government agency regulates the use of pesticides?	What are volatile organic compounds?	Name four different products that contain solvents.
What is formaldehyde?	How might I be exposed to toluene?	Why is arsenic a health concern?	What is the number of the Poison Control Center?	What is ethylene glycol?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 2

What is relative risk?	What are volatile organic compounds?	How can I be exposed to lead at home?	What are solvents?	How might I be exposed to toluene?
List four ways one can be exposed to pesticides.	What is ethylene glycol?	What is asbestos?	What household products contain phthalates?	What can asbestos do to me?
Name at least five chemicals found at home.	Why are nail care products a health concern?	How can you be exposed to ammonia at home?	Where is arsenic most commonly found?	What are PBDEs?
What is the number of the Poison Control Center?	Where can I go to learn more about chemical and household products?	Can I get chlorine poisoning from bleach?	What government agency regulates the use of pesticides?	How might I be exposed to bisphenol A (BPA)?
What are pesticides?	Name four different products that contain solvents.	What is formaldehyde?	How can ammonia affect your health?	Why is arsenic a health concern?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 3

How might I be exposed to bisphenol A (BPA)?	What is ethylene glycol?	What government agency regulates the use of pesticides?	Where can I go to learn more about chemical and household products?	List four ways one can be exposed to pesticides.
What are volatile organic compounds?	Name at least five chemicals found at home.	How might I be exposed to toluene?	How can you be exposed to ammonia at home?	Where is arsenic most commonly found?
What is asbestos?	What are pesticides?	What can asbestos do to me?	Can I get chlorine poisoning from bleach?	Name four different products that contain solvents.
How can ammonia affect your health?	Why are nail care products a health concern?	How can I be exposed to lead at home?	Why is arsenic a health concern?	What are PBDEs?
What is relative risk?	What is formaldehyde?	What household products contain phthalates?	What is the number of the Poison Control Center?	What are solvents?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 4

How might I be exposed to bisphenol A (BPA)?	What is ethylene glycol?	Why are nail care products a health concern?	What is asbestos?	What is the number of the Poison Control Center?
What are solvents?	What is formaldehyde?	Where can I go to learn more about chemical and household products?	How might I be exposed to toluene?	What can asbestos do to me?
What is relative risk?	List four ways one can be exposed to pesticides.	What are volatile organic compounds?	What are PBDEs?	Where is arsenic most commonly found?
How can I be exposed to lead at home?	Name four different products that contain solvents.	How can you be exposed to ammonia at home?	Name at least five chemicals found at home.	What household products contain phthalates?
What government agency regulates the use of pesticides?	What are pesticides?	How can ammonia affect your health?	Why is arsenic a health concern?	Can I get chlorine poisoning from bleach?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 5

How can I be exposed to lead at home?	How might I be exposed to bisphenol A (BPA)?	List four ways one can be exposed to pesticides.	What is asbestos?	What government agency regulates the use of pesticides?
What can asbestos do to me?	Where is arsenic most commonly found?	What are pesticides?	How might I be exposed to toluene?	Can I get chlorine poisoning from bleach?
Where can I go to learn more about chemical and household products?	Why is arsenic a health concern?	What is formaldehyde?	What is the number of the Poison Control Center?	How can ammonia affect your health?
What is relative risk?	What household products contain phthalates?	What are volatile organic compounds?	What are solvents?	How can you be exposed to ammonia at home?
What are PBDEs?	Name at least five chemicals found at home.	Why are nail care products a health concern?	What is ethylene glycol?	Name four different products that contain solvents.

Name(s): _____

Date: _____

Student Tox Town Bingo Board 6

How can ammonia affect your health?	Where can I go to learn more about chemical and household products?	What is the number of the Poison Control Center?	How might I be exposed to bisphenol A (BPA)?	How might I be exposed to toluene?
List four ways one can be exposed to pesticides.	What government agency regulates the use of pesticides?	What can asbestos do to me?	How can I be exposed to lead at home?	Where is arsenic most commonly found?
Name at least five chemicals found at home.	What is relative risk?	What are pesticides?	How can you be exposed to ammonia at home?	What household products contain phthalates?
Why are nail care products a health concern?	What are PBDEs?	Name four different products that contain solvents.	What is asbestos?	What are volatile organic compounds?
Can I get chlorine poisoning from bleach?	Why is arsenic a health concern?	What are solvents?	What is formaldehyde?	What is ethylene glycol?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 7

How can you be exposed to ammonia at home?	How can ammonia affect your health?	Name at least five chemicals found at home.	What is formaldehyde?	Where is arsenic most commonly found?
How might I be exposed to toluene?	Why is arsenic a health concern?	How can I be exposed to lead at home?	What is the number of the Poison Control Center?	What are volatile organic compounds?
Why are nail care products a health concern?	What are pesticides?	What government agency regulates the use of pesticides?	What can asbestos do to me?	What are PBDEs?
What is asbestos?	Name four different products that contain solvents.	How might I be exposed to bisphenol A (BPA)?	Where can I go to learn more about chemical and household products?	What is relative risk?
What are solvents?	Can I get chlorine poisoning from bleach?	List four ways one can be exposed to pesticides.	What is ethylene glycol?	What household products contain phthalates?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 8

What is formaldehyde?	What is asbestos?	How can ammonia affect your health?	How might I be exposed to bisphenol A (BPA)?	What are solvents?
What is relative risk?	Can I get chlorine poisoning from bleach?	How can I be exposed to lead at home?	Name four different products that contain solvents.	What is ethylene glycol?
What are pesticides?	What government agency regulates the use of pesticides?	What are PBDEs?	Why is arsenic a health concern?	What is the number of the Poison Control Center?
What household products contain phthalates?	How can you be exposed to ammonia at home?	What can asbestos do to me?	List four ways one can be exposed to pesticides.	Where is arsenic most commonly found?
What are volatile organic compounds?	How might I be exposed to toluene?	Name at least five chemicals found at home.	Where can I go to learn more about chemical and household products?	Why are nail care products a health concern?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 9

Why is arsenic a health concern?	List four ways one can be exposed to pesticides.	What is asbestos?	What household products contain phthalates?	What is ethylene glycol?
Where can I go to learn more about chemical and household products?	What are PBDEs?	How can I be exposed to lead at home?	How can ammonia affect your health?	How can you be exposed to ammonia at home?
What government agency regulates the use of pesticides?	What is the number of the Poison Control Center?	Name at least five chemicals found at home.	Can I get chlorine poisoning from bleach?	How might I be exposed to toluene?
What are volatile organic compounds?	Where is arsenic most commonly found?	Name four different products that contain solvents.	What are solvents?	What can asbestos do to me?
What is relative risk?	What is formaldehyde?	How might I be exposed to bisphenol A (BPA)?	Why are nail care products a health concern?	What are pesticides?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 10

Name at least five chemicals found at home.	What are solvents?	Why is arsenic a health concern?	How might I be exposed to bisphenol A (BPA)?	What are pesticides?
What are PBDEs?	How might I be exposed to toluene?	What is ethylene glycol?	Name four different products that contain solvents.	What is relative risk?
What are volatile organic compounds?	What household products contain phthalates?	What government agency regulates the use of pesticides?	How can you be exposed to ammonia at home?	What is asbestos?
List four ways one can be exposed to pesticides.	Where is arsenic most commonly found?	Why are nail care products a health concern?	How can ammonia affect your health?	What is formaldehyde?
Can I get chlorine poisoning from bleach?	What is the number of the Poison Control Center?	How can I be exposed to lead at home?	Where can I go to learn more about chemical and household products?	What can asbestos do to me?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 11

Why is arsenic a health concern?	What government agency regulates the use of pesticides?	What household products contain phthalates?	What are pesticides?	What are solvents?
What is asbestos?	Name at least five chemicals found at home.	What is formaldehyde?	How might I be exposed to toluene?	What is ethylene glycol?
What are volatile organic compounds?	How can you be exposed to ammonia at home?	List four ways one can be exposed to pesticides.	How can I be exposed to lead at home?	Can I get chlorine poisoning from bleach?
Where is arsenic most commonly found?	What is relative risk?	Where can I go to learn more about chemical and household products?	How can ammonia affect your health?	Why are nail care products a health concern?
Name four different products that contain solvents.	What is the number of the Poison Control Center?	How might I be exposed to bisphenol A (BPA)?	What are PBDEs?	What can asbestos do to me?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 12

What household products contain phthalates?	What is relative risk?	Where can I go to learn more about chemical and household products?	Name at least five chemicals found at home.	What is asbestos?
Where is arsenic most commonly found?	Why are nail care products a health concern?	How can I be exposed to lead at home?	What are volatile organic compounds?	List four ways one can be exposed to pesticides.
What are solvents?	How might I be exposed to toluene?	What is ethylene glycol?	What are PBDEs?	What are pesticides?
What is formaldehyde?	How can ammonia affect your health?	What can asbestos do to me?	Why is arsenic a health concern?	Name four different products that contain solvents.
What is the number of the Poison Control Center?	How can you be exposed to ammonia at home?	Can I get chlorine poisoning from bleach?	What government agency regulates the use of pesticides?	How might I be exposed to bisphenol A (BPA)?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 13

What are PBDEs?	What is asbestos?	What are volatile organic compounds?	What is formaldehyde?	How can ammonia affect your health?
How can I be exposed to lead at home?	What government agency regulates the use of pesticides?	Name at least five chemicals found at home.	What household products contain phthalates?	What are solvents?
How might I be exposed to bisphenol A (BPA)?	List four ways one can be exposed to pesticides.	What can asbestos do to me?	What is relative risk?	What are pesticides?
Why are nail care products a health concern?	Where can I go to learn more about chemical and household products?	What is the number of the Poison Control Center?	How can you be exposed to ammonia at home?	Can I get chlorine poisoning from bleach?
What is ethylene glycol?	How might I be exposed to toluene?	Why is arsenic a health concern?	Name four different products that contain solvents.	Where is arsenic most commonly found?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 14

What are solvents?	What is formaldehyde?	What household products contain phthalates?	What is ethylene glycol?	List four ways one can be exposed to pesticides.
What are PBDEs?	How might I be exposed to bisphenol A (BPA)?	How can I be exposed to lead at home?	How can you be exposed to ammonia at home?	What is asbestos?
Name at least five chemicals found at home.	Where is arsenic most commonly found?	What is relative risk?	Why is arsenic a health concern?	Why are nail care products a health concern?
What are volatile organic compounds?	What can asbestos do to me?	Name four different products that contain solvents.	Where can I go to learn more about chemical and household products?	What are pesticides?
What government agency regulates the use of pesticides?	Can I get chlorine poisoning from bleach?	What is the number of the Poison Control Center?	How can ammonia affect your health?	How might I be exposed to toluene?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 15

Can I get chlorine poisoning from bleach?	What household products contain phthalates?	What is formaldehyde?	Why are nail care products a health concern?	What is relative risk?
What can asbestos do to me?	Why is arsenic a health concern?	What are PBDEs?	What government agency regulates the use of pesticides?	Name at least five chemicals found at home.
What is the number of the Poison Control Center?	Name four different products that contain solvents.	How can you be exposed to ammonia at home?	What are solvents?	What are volatile organic compounds?
How might I be exposed to toluene?	How might I be exposed to bisphenol A (BPA)?	What is ethylene glycol?	How can I be exposed to lead at home?	What is asbestos?
Where is arsenic most commonly found?	How can ammonia affect your health?	Where can I go to learn more about chemical and household products?	List four ways one can be exposed to pesticides.	What are pesticides?

Name(s): _____

Date: _____

Student Tox Town Bingo Board 16

How can you be exposed to ammonia at home?	How might I be exposed to bisphenol A (BPA)?	Where is arsenic most commonly found?	What household products contain phthalates?	What can asbestos do to me?
What are solvents?	What are pesticides?	Where can I go to learn more about chemical and household products?	What is asbestos?	How can I be exposed to lead at home?
Can I get chlorine poisoning from bleach?	Name at least five chemicals found at home.	How can ammonia affect your health?	List four ways one can be exposed to pesticides.	Why are nail care products a health concern?
What is relative risk?	What are PBDEs?	What government agency regulates the use of pesticides?	What are volatile organic compounds?	Name four different products that contain solvents.
What is formaldehyde?	How might I be exposed to toluene?	Why is arsenic a health concern?	What is the number of the Poison Control Center?	What is ethylene glycol?



Name(s): _____

Date: _____

Your teacher will provide empty containers of products typically found under the kitchen and bathroom sinks. Although the containers are empty, you should wear gloves in case any residue remains.

Directions

1. Put on latex or latex-free gloves.
2. Select three containers.
3. Read the information on the labels.
4. Complete one graphic organizer in *Chemicals in Common Products Investigation Sheet* (H 3.2.2) for each container. Use Tox Town (toxtown.nlm.nih.gov) to research information for the organizers. Use the table below to interpret special terms and symbols. Finally, use *Cleaner Alternatives* (H 3.2.3) to find safer alternatives to the products.
5. Compare your information with other students' information.

Word Bank

	<p>Caution: Refers to how hazardous a chemical is and indicates that this chemical can be harmful to your health if you do not follow proper directions for use.</p>
<p>CORROSIVE</p>	<p>Corrosive: A chemical reaction that can burn, kill living tissues, or severely damage material in which it comes in contact.</p>
<p>DANGER</p>	<p>Danger: Extremely flammable or corrosive or highly toxic.</p>
<p>EXPLOSIVE</p>	<p>Explosive: Material that can explode when it is exposed to heat, pressure, or other chemical substances.</p>
	<p>Flammable: Can easily be set on fire.</p>
<p>POISON</p>	<p>Poison: Highly toxic.</p>
<p>TOXIC</p>	<p>Toxic: A substance that harms living organisms, (plants, animals), or the environment.</p>



Name(s): _____

Date: _____

Product Name

Use: _____

Contents of Product: _____

Storage/Disposal: _____

Health Effects/First Aid: _____

Safer Alternative: _____

H 3.2.3 CLEANER ALTERNATIVES



Name(s): _____

Date: _____

Here are several safer alternatives to chemicals for you and your families. Alternatives should be prepared with adult supervision only.

Air Freshener:

- Boil 3 teaspoons of cinnamon and 15 cloves and let simmer on stove; or
- Put 1/2 cup of borax (you can purchase this in the supermarket) in the bottom of garbage pails; or
- Put bowls of vinegar or baking soda around the house to absorb odors.

Tub and Tile Cleaners:

- Mix baking soda with vegetable oil to make a paste. Use paste to clean surfaces; or
- Scrub with lemon slices that you have dipped in borax or baking soda. Let the slices sit overnight on tough stains; or
- Make scouring powder: 1 cup baking soda and 1/4 cup borax.

Bleach:

- Add 1/2 cup of borax to a load of laundry; or
- Add 1/4 cup of lemon juice to a load of laundry and then hang your clothes in the sun.

Dish Soap:

- Use vegetable-based soap, or castile soap made of olive oil.

Disinfectant:

- **Surface cleaners:** Use 1/2 cup of borax with 1 gallon hot water.

Drain Openers:

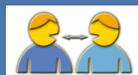
- Pour 1/2 cup of baking soda and 1/2 cup vinegar in drainpipe and give it time to work before rinsing with hot water; or
- Pour 1/4 cup hydrogen peroxide in drainpipe and give it time to work before rinsing with hot water.
- Alternate two methods if needed.

Window Cleaner:

- Mix 1/4 cup of vinegar, 1/2 cup liquid soap or detergent, and 2 cups of water.
- Put into spray bottle to use.

Stain Removers:

- **Blood:** Soak in 1/4 cup of borax and 2 cups of water. Then rub material together. Also try pouring hydrogen peroxide on the stain before soaking.
- **Juice/Wine:** Soak in cold seltzer water.



Name(s): _____

Date: _____

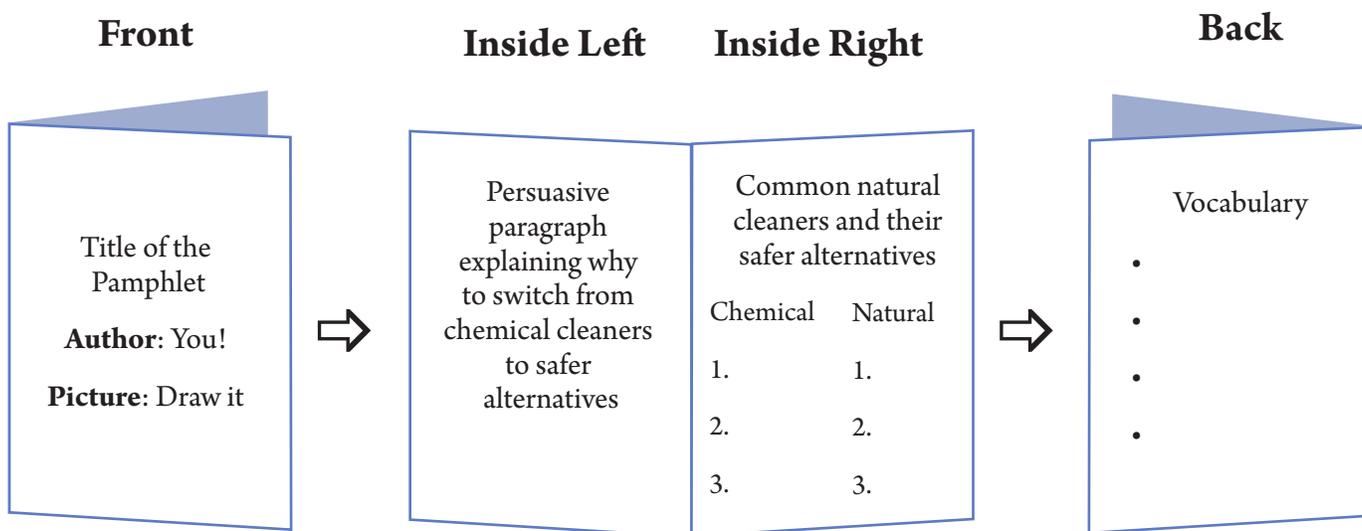
Every household has cleaners under the kitchen sink that can be considered toxic. Today, our goal is to write a persuasive pamphlet that will convince the members of our households to replace some common chemical cleaners with safer alternatives. Your pamphlet should include the following elements:

- Persuasive paragraph explaining why switching to safer alternatives is a good choice for human health and the environment
- Colorful visuals to support the arguments (e.g., your own drawings, pictures from magazines, computer printouts)
- A list of five common household cleaners and their safer alternatives
- Definitions of vocabulary words that you think the readers of your pamphlet should know (these may be terms you learned during the **L 3.2 Chemicals in Common Products Investigation**)

Instructions for creating the pamphlet:

Step 1: Fold your paper in half.

Step 2: Follow the recommended layout for the pamphlet (see below).



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UNIT 3 GLOSSARY

The following vocabulary is featured in Unit 3 of the Tox Town curriculum.

acetone—Acetone is a clear, strong-smelling liquid that is manufactured. It is found in some nail polish removers, vehicle exhaust, tobacco smoke, landfill sites, cleaning products, and other household and consumer products. Acetone can easily catch fire. Exposure to high levels of acetone can damage kidneys and skin in the mouth.

ammonia—Ammonia is a colorless gas that has a strong, irritating odor. Ammonia is naturally produced by bacteria, decaying plants and animals, and animal waste. Liquid ammonia is a cleaning agent that is a solution of ammonium hydroxide (ammonia and water). Mixing ammonia with bleach can produce hazardous chlorine gas.

arsenic—Arsenic is most commonly a brittle, gray metalloid that is highly poisonous. There are also other forms and colors. Repeated exposure can damage the liver and kidneys and cause stomach problems and skin darkening. It is used mainly in wood preservatives.

asbestos—Asbestos is a fibrous mineral form of magnesium silicate. Because it is naturally resistant to heat and flames, it has been used in fire-retardant products. Asbestos has been linked to lung cancer.

bacteria—Bacteria is the plural for bacterium, which is any one-celled organism. Bacteria are usually associated with the cause of diseases.

benzene—Benzene is a colorless, flammable liquid with a sweet odor. It can be found in glue, paint, crude oil, gasoline, and cigarette smoke. Long-term exposure to high levels of benzene can cause leukemia (cancer of the blood cells).

bisphenol A (BPA)—Bisphenol A or “BPA” is a chemical that has been used since the 1960s to make lightweight, hard plastics (also known as polycarbonate plastics) and epoxy resins. More than a billion pounds of BPA are produced in the United States every year. The National Toxicology Program (NTP) has “some concern” for hazardous BPA effects.

chemical—A chemical can be anything that is related to or produced by chemistry. It is something that is manufactured or fabricated.

chlorine—Chlorine is a naturally occurring element that can be either a gas or a liquid. As a gas, chlorine has a yellow-green color and a strong, irritating odor similar to bleach. Chlorine gas can be released if household bleach mixes with ammonia or other cleaning products. Chlorine is mainly used to bleach paper and cloth and to make pesticides, chemicals, rubber, and solvents. It is used to kill bacteria in drinking water and swimming pool water. It is also used in the sanitation process for industrial waste and sewage and as a disinfectant and fungicide.

corrosives—Corrosives are substances that can attack and chemically destroy exposed material. They can damage or destroy body tissues or even metals. Corrosives begin to burn and cause damage as soon as they make contact with skin, eyes, other body parts, or the metal. Most corrosives are either acids or bases.

disinfectant—A disinfectant is any substance that kills microorganisms. Disinfectants are used to sanitize surfaces to prevent the transmission of bacteria that cause disease. To sanitize is to make clean or more acceptable in terms of health. A sanitary environment would be one that is hygienic or free of germs.

environmental health—Environmental health is the field of science that studies how the environment influences human health and disease. “Environment,” in this context, means things in the natural environment like air, water, and soil and also all the physical, chemical, biological, and social features of our surroundings.

ethylene glycol—Ethylene glycol is a colorless, syrupy alcohol that is highly poisonous. It is most commonly known as the key ingredient in anti-freeze products.

explosive—An explosive is any material that can explode (or blow up) when it is exposed to heat, pressure, or other chemical substances.

flammable—Flammable is an adjective used to describe a material that can be easily set on fire.

formaldehyde—It is a flammable gas or liquid that is used as a tissue preservative in medical labs or mortuaries. It is also used as an antibacterial ingredient.

fungicide—A fungicide is a chemical substance that destroys or prevents the growth of fungi. See definition for fungus/fungi.

fungus/fungi—A fungus is any organism that has no green coloring and obtains its nourishment from living or dead plant or animal matter. Fungi include mushrooms, molds, yeasts, and mildews.

hypochlorite—Hypochlorite refers to chlorine-based chemicals that are usually used as bleaching or oxidizing agents. Hypochlorites are very unstable.

lead—Lead is a heavy, soft, bluish-gray metal that occurs naturally in the rocks and soil of the earth’s crust. It is also produced from burning fossil fuels, mining, and manufacturing. Lead is used to produce batteries, ammunition, pipes, tank linings, solder, casting metals, building construction materials, roofing, scientific electronic equipment, military tracking systems, medical devices, and products to shield x-rays and nuclear radiation. It is used in ceramic glazes and crystal glassware. Some cosmetics and health care products from outside the United States contain lead. The part of the body most sensitive to lead exposure is the central nervous system, especially in children, who are more vulnerable to lead poisoning than adults.

pesticide—Pesticides are substances that prevent, destroy, repel, or reduce the severity of pests. Pests are any living things that occur where they are not wanted. Pests can be any number of bugs, mammals, unwanted plants, bacteria, viruses, or fungi. Pesticides are common chemicals found in thousands of household and industrial products. Pesticides can vary in how toxic they are to humans and the environment.

phthalates—Phthalates are used to make plastics more flexible. They are used in cosmetics and personal care products, including perfume, hair spray, soap, shampoo, nail polish, and skin moisturizers. They are used in consumer products such as flexible plastic and vinyl toys, shower curtains, wallpaper, vinyl

miniblinds, food packaging, and plastic wrap. Phthalates are also used in wood finishes, detergents, adhesives, plastic plumbing pipes, lubricants, medical tubing and fluid bags, solvents, insecticides, medical devices, building materials, and vinyl flooring.

pollute/pollutants—To pollute is to make any part of an environment unfit or harmful to any living thing. A pollutant is anything that pollutes (or causes harm) to the environment.

polybrominated diphenyl ethers (PBDEs)—PBDEs are flame-retardant chemicals used in plastics, forms, fabrics, and other materials.

relative risk—Relative risk, or risk ratio, is the risk of harm among a population exposed to a potentially damaging substance compared to the risk to an unexposed population. In other words, relative risk is the rate of disease among the population exposed to a potentially damaging substance divided by the rate of the disease among the unexposed population. A relative risk of 1.0 means there is no difference among the two populations while a relative risk of 2 means that the exposed group has twice the disease risk as the unexposed group.

solvent—A solvent is a liquid that is capable of dissolving another substance.

toluene—Toluene is a clear, colorless liquid with a strong, sweet smell. It is a toxic ingredient in solvents, paints, and other household products, and it occurs naturally in crude oil. Exposure to high levels of toluene can affect the kidneys, nervous system, liver, brain, and heart.

toxic—Toxic is a term used to describe the ability of a substance to cause harm to any living organism (plants and/or animals) or the environment.

toxins—A toxin is a poison of any kind. Toxins are capable of causing poisoning when introduced into any living thing, and they can be produced by plants, animals, or any other means.

volatile organic compounds (VOCs)—Volatile organic compounds (VOCs) are natural and human-made solid or liquid chemicals that evaporate into the air. They become invisible, and many are odorless. Volatile actually means unstable and possibly dangerous. Many things in homes and businesses give off VOC gases, such as paint, glue, markers, hair spray, air fresheners, cleaning supplies, and fuels. They can affect indoor air quality. Inhaling, swallowing, or touching VOCs can make you sick. Symptoms include eye, nose, and throat problems, headaches, and damage to the liver, kidneys, and the central nervous system. Some VOCs cause cancer in humans.