

Overview of Lesson Plan B (Grades 6–8)

This lesson introduces students to the properties of mercury and the possible health hazards of exposure to mercury. In addition, it introduces students to a scientific career—being a health educator. It is based on Next Generation Science Standard (MS-PS1-3) and Common Core Language Arts Standards (RST.6-8.1, WHST.6-8.8, RST.6-8.9, RST.6-8.10, SL.6-8.4, and SL.6-8.5) for grades 6–8. Following a brief warm up, students begin individually with Part 1, in which they learn about the hazards of mercury exposure by engaging in fun and interactive web-based activities from the [Don't Mess With Mercury—For Students](#) webpage. Then, individually or in pairs, they proceed to Part 2, in which they create a health-promoting presentation using online (and available print) resources, demonstrating what they have learned. This lesson is designed for two to four class periods.

We recommend that teachers familiarize their students with the following concepts prior to using this lesson plan:

- Periodic Table of Elements, including classes of elements (e.g., metals, nonmetals, etc.)
- Physical properties of matter

Familiarity with Microsoft PowerPoint or some other presentation software program would be helpful.

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Teachers, ATSDR's Don't Mess With Mercury website is 508 compliant and available in English & Spanish.

Teachers, your feedback is very important for improving these materials. This lesson plan will prompt you to take a quick survey and provide the data for each class here:

https://www.surveymonkey.com/s/DMWM_Quiz

Tip: In addition to a computer, this survey link can be easily accessed on a smartphone!

Learning Objectives

Students will be able to

1. Describe characteristics (physical properties) of elemental mercury.
2. Explain health effects of exposure to elemental mercury.
3. Identify objects that may contain elemental mercury.
4. Explain what to do if they find mercury.
5. Use evidence from various resources to communicate about mercury exposure.



Materials

1. One computer and set of headphones per student
2. Internet access, including access to www.youtube.com
3. Double-sided copies of Student Handouts ([pages 7–10](#)), one set per student
4. Access to computer program: Microsoft PowerPoint
5. **Recommended:** Books about mercury ([See page 12 for suggestions](#))

Preparation

1. Reserve computer lab and/or library.
2. Print double sided copies of Student Handout packet ([pages 7–10](#)) (one packet per student). Be sure to modify the grading rubric to your preferences prior to printing.
3. Print one copy of lesson plan for yourself.
4. Assign partners (2 to a group) for Part 2 if necessary.
5. Write/project warm-up questions on chalkboard or screen.
6. To save time, open [Don't Mess With Mercury—For Students](http://www.atsdr.cdc.gov/dontmesswithmercury/students.html) webpage on each computer prior to students' arrival. (<http://www.atsdr.cdc.gov/dontmesswithmercury/students.html>)

Optional

1. Reserve library books about mercury as supplementary resources.
2. Print one copy of Teacher's Supplementary Sheet ([pages 11–12](#)) to have handy.
3. Consider inviting guests who may encounter mercury to attend students' presentations (e.g., school janitors, science department safety specialist, other teachers and students).

As students enter, inform them that they will be working in pairs so they should find a seat next to their partner or they can choose to work alone. Be sure that assigned partners are seated next to each other. There should be one student per computer.

Lesson Components

1. Warm Up—15 minutes
2. Part 1—Online Activities—35 minutes
3. Part 2—Students Develop Presentations—
Time is set by teacher
4. Part 3—Exit Poll—5 minutes
5. Part 4—Presentations (time may vary)

Warm Up (15 minutes)

Display the warm-up questions for all to see.

Read the warm-up questions aloud and ask students to discuss answers with their neighbors and write them down.

When students are done with the three questions, let volunteers share answers for each question and provide the correct answers.

Part 1—Introduction to PSAs

(35 minutes; use website and student handout, part 1)

Distribute Student handout packet ([pages 7–10](#)).

Note: Answer key to Student Handout, Part 1 can be found on [page 6](#) of this lesson plan.

Tell students:

We are going to learn about a very interesting element, mercury. Mercury is a very toxic metal that is liquid at room temperature. Toxic means that it is harmful to our health.

You might be wondering:

- *What does it look like?*
- *Where can we find it?*
- *How is it toxic?*
- *What should I do if I ever find it?*

You'll find out all the answers to these questions after completing the online activities in Part 1. Use your handout as a guide and raise your hand if you need my assistance. Let me know when you are finished and I will assist you in moving on to Part 2.

Warm Up Questions

1) What is an element?

(Answer: A chemical substance made of only one kind of atom; a chemical in its purest form)

2) What are the three main classes of elements on the Periodic Table?

(Answer: Metals, metalloids, and non-metals)

3) List five physical properties you could use to describe an element:

(Answer: color, ability to conduct electricity, state of matter at room temperature, density, luster, malleability, hardness, boiling point, melting point, etc.)

Part 2—Students develop PSAs (Time may vary; use Microsoft PowerPoint and Student Handout. Students should work alone or in pairs to create a PowerPoint presentation.)

Tell students:

You are going to become a health educator and create a slide show (PowerPoint) presentation to inform your peers about the dangers of mercury exposure.

When we say someone was “exposed” or “had an exposure” to a hazardous chemical, we mean that their body came into contact with it by touching, swallowing, or inhaling it. As you know, exposure to mercury can be very dangerous.

For this part, you may work with a partner or alone. We will have _____ class period(s) to work on Part 2. That gives you about _____ minutes total. Page 4 of the Student Handout package includes a rubric to show you how you will be graded.



Teacher should:

- Assist students with saving their PowerPoint presentation files.
- Remind students to save their work frequently.

Part 3—Exit Poll (5 minutes)

Read these questions aloud. Students should raise their hands to vote for what they think is the correct answer. If you suspect that students may not answer honestly, consider asking them to put their heads down while voting. After voting, provide students with correct answers (in **bold** text). Record the number of students who answer correctly.*

Tell students:

Let's take a quick poll to see what you have learned about mercury. On your own, answer the following questions, which I will read aloud. After you listen to all the answers, write the letter corresponding to your answer in the Exit Poll section of your Grading Rubric. Once everyone answers all the questions, raise your hand when I say the letter that corresponds with your answer. The Exit Poll is not graded, so please answer honestly.

1. At room temperature, mercury is not a
 - a. **solid**
 - b. liquid
 - c. gas
2. Inhaling mercury can lead to
 - a. trembling
 - b. mood changes
 - c. memory loss
 - d. **all of these**

3. Which of the following objects could contain mercury?
 - a. thermostat
 - b. certain light bulbs
 - c. a thermometer
 - d. all of them**
4. If you find mercury, you should
 - a. play with it and show it to your friends. This could be fun!
 - b. pour it down the drain if it gets messy. Better clean it up before somebody else finds it!
 - c. leave the room and tell an adult right away. This could be bad!**
 - d. smell it to see if it has an interesting odor.

*ATSDR would like your feedback about this lesson plan. Please help us improve this Lesson Plan By completing a short electronic survey (https://www.surveymonkey.com/s/DMWM_Quiz).

Please note that your participation in this survey is voluntary and your responses will be confidential. Use of the data obtained from this survey will be in aggregate form and not contain any personal identifiers. Your responses will be used to help improve this lesson plan and better tailor the lesson plans. Your participation is greatly appreciated.

Part 4—Presentations *(time will vary)*

Allow students to share their presentations with the class (and invited guests).

Complete this worksheet by doing the online activities in order.

Begin with the following website: <http://www.atsdr.cdc.gov/dontmesswithmercury/students.html>

- 1. Watch the video.** Wear headphones if available. Fill in the blanks:
If a student finds mercury, he/she shouldn't **play** with it and should find an **adult**.
 - 2. Get the facts.** What are some physical properties of Mercury?
 - Color and appearance: **shiny silver colored liquid at room temperature**
 - How would you describe mercury's density? **Very heavy; two tablespoons weigh about one pound**
 - 3. How does mercury affect the human body?** Write down examples of what could happen.
Brain & nervous system: **Several responses are possible including: changes in mood, difficulty sleeping, trembling, difficulty with muscle coordination**
Eyes: **red eyes**
Head: **headache**
Mouth: **tasting metal, swollen gums, drooling**
Throat: **sore throat**
Heart: **high blood pressure, fast heart rate**
Lungs: **cough, pain when breathing, feeling out of breath, damage to the lungs**
Stomach/intestines: **feeling sick to your stomach, nausea, diarrhea, not feeling hungry**
Skin: **red, itchy rashes, peeling hands and feet**
Body: **fever, feeling tired, muscle aches**
 - 4. Learn the history.** How has mercury been used in the past? Give three examples of uses of mercury and the time period when it was used that way. **Several responses are possible including:**
 - 1500 B.C.E. Ancient Egyptians used mercury in cosmetics**
 - 1600s scientists tried to use mercury to turn it into gold**
 - 1800s mercury was used by hat makers to soften the wool in the hats**
 - 5. Play the game.** Wear headphones if available.
- Now go to the following website to learn more about Mercury's physical properties:
<http://www.youtube.com/watch?v=tpqP3ReC1cQ>.
- Mercury's state at room temperature: **L i Q U i D** and a **G A S**

Name: _____ Class period: _____ Date: _____

Complete this worksheet by doing the online activities in order.

Begin with the following website: <http://www.atsdr.cdc.gov/dontmesswithmercury/students.html>

1. **Watch the video.** Wear headphones if available. Fill in the blanks:

If a student finds mercury, he/she shouldn't _____ with it and should find an _____

2. **Get the facts.** What are some physical properties of Mercury?

a. Color and appearance: _____

b. How would you describe mercury's density? _____

3. **How does mercury affect the human body?** Write down examples of what could happen.

Brain & nervous system: _____

Eyes: _____

Head: _____

Mouth: _____

Throat: _____

Heart: _____

Lungs: _____

Stomach/intestines: _____

Skin: _____

Body: _____

4. **Learn the history.** How has mercury been used in the past? Give three examples of uses of mercury and the time period when it was used that way.

a. _____

b. _____

c. _____

5. **Play the game.** Wear headphones if available.

Now go to the following website to learn more about Mercury's physical properties:

<http://www.youtube.com/watch?v=tpqP3ReC1cQ>.

6. Mercury's state at room temperature: ___ i ___ i ___ and a ___ ___ ___

Throughout history, advances in science and technology have revealed different uses for mercury. Scientific research has also discovered the dangers of exposure to mercury. Not everyone knows about health hazards, so health educators must teach the public how to be safe and healthy.

Instructions

You will create a six-slide PowerPoint presentation about the dangers of mercury exposure. Use available Internet and print resources (like books!). Make your presentation interesting and use pictures!

Your presentation should teach your audience answers to the following four questions:

1. What are the characteristics (physical properties) of elemental mercury?
2. How can exposure to mercury affect the human body?
3. Which objects might contain mercury?
4. What should a student do if s/he finds mercury?

As you find useful information about mercury for your project, keep track of the sources of information. Be sure to give credit to the sources you used by listing them on a slide at the end of your presentation—Slide 6. Use this format for your works cited or sources slide (slide 6):

For books or other printed resources:

Author(s). "Title of Article or Chapter". Publication Title. Date published. pages #-#

For websites:

Author(s). "Website Title". Date published or updated. www.websitelink.com

For photos:

Photographer's Name. www.websitelink.com

Authors or photographers name should be listed as last name, first initial. If there are multiple authors, separate each individual by a comma, e.g., Doe A., Ray B., and Mei C.

If no author is listed, you can use an organization's name instead, e.g., National Institutes of Health.

If you cannot find one of the components mentioned in the format above, just skip that part and provide the information that is available.

Where can you find reliable information about mercury for your presentation?

- Agency for Toxic Substances and Disease Registry's Don't Mess with Mercury Website—For Students: <http://www.atsdr.cdc.gov/dontmesswithmercury/students.html>
- "Mercury Containing Devices/Products" by North Dakota Department of Health—Waste Management: <http://www.ndhealth.gov/wm/Mercury/MercuryContainingDevicesProducts.htm>
- Public Service Announcement from EPA Region 9: <http://www.epa.gov/region9/psa/mercury/>
- "Mercury" by National Institutes of Health: <http://kids.niehs.nih.gov/explore/pollute/mercury.htm>
- US EPA's Mercury Page: <http://www.epa.gov/mercury/index.html>
- Mercury in Schools Case Studies: <http://www.epa.gov/mercury/casestudies.htm#3>

Project partner's name: _____

Brainstorm: What are you going to put in each slide? Use these guidelines and the rubric on the next page (Side D) to plan your slides below. Feel free to draw pictures or use more paper.

Slide 1 (Title & presenters)

Slide 2 (4 Physical properties of mercury)

Slide 3 (3 Objects containing elemental mercury and their picture)

Slide 4 (Health effects of mercury exposure and at least 1 picture)

Bonus: What are alternatives to using mercury?

Slide 5 (What should students do if they find mercury?)

Slide 6 (Conclusion and sources)

Now, get started on your slide presentation. Ask your teacher for help when necessary.

Remember to save your work often.

When you are finished,

- Rehearse your presentation. Do you know your part?
- Check your presentation against the Grading Rubric. Has your group earned all the points possible?
- Send an e-card to someone you care about to keep them safe by going here:
<http://tools.cdc.gov/ecards/message.aspx?cardid=720&category=206>

don't mess with MERCURY

Name: _____ Class period: _____ Date: _____

	Points Possible	What I think learned	Points Earned
Slide 2: What are the characteristics (physical properties) of elemental mercury? <ul style="list-style-type: none"> • Provided 4 physical properties of mercury (1 point each) 	4		
Slide 3: How can exposure to mercury affect the human body? <ul style="list-style-type: none"> • Provided 5 health effects of exposure to mercury (1 point each) 	5		
Slide 4: Which objects might contain mercury? <ul style="list-style-type: none"> • Listed 3 objects that contain elemental mercury (1 point each) 	3		
Slide 5: What should a student do if s/he finds mercury? <ul style="list-style-type: none"> • Correctly explained what students do if they find mercury (2 points) 	2		
Slide 6/Works cited <ul style="list-style-type: none"> • Listed at least 4 sources (1 point each) • Used the correct format (1 point) 	5		
Quality of work <ul style="list-style-type: none"> • Neat in appearance (3 point) • Clearly written & used helpful pictures (if newspaper article or poster) (3 points) 	6		
Classroom Presentation <ul style="list-style-type: none"> • Spoke audibly and clearly (3 points) • Spoke with enthusiasm (2 points) 	5		
	Final Grade		

Exit Poll

My answers:

1. _____ 2. _____ 3. _____ 4. _____



What is mercury?

Mercury is a naturally occurring element that is found in oceans, rocks, and soils. It can be found as a pure element—elemental (metallic) mercury—or as a compound—organic and inorganic mercury.

Note: ATSDR's Don't Mess with Mercury Lesson Plans are about elemental mercury and do not discuss the other forms of mercury.

Quick facts about elemental mercury

1. Mercury's symbol on the Periodic Table of Elements is "Hg," which is an abbreviation for the Greek word hydragyrum (liquid silver). Its atomic number is 80.
2. Physical properties of elemental mercury:
 - Mercury is the only metal that is liquid at room temperature.
 - Even at room temperature, mercury evaporates into an odorless vapor that is invisible to the unaided eye.
 - Mercury is very dense. Two tablespoons of mercury weighs about 1 pound.
 - Mercury has a high surface tension, which makes it very slippery. When it is spilled, it breaks into many small drops, known as beads.
 - Mercury is a good conductor of heat and electricity.
3. Some people call elemental mercury quicksilver.
4. Breathing in mercury vapors is the most common way to get mercury poisoning—and also the most dangerous.
5. Spilled mercury beads easily spread and hide in small spaces (like cracks in the floor). They can release vapors that can be inhaled by students and staff even years after a spill.
6. Mercury has been used to make many different kinds of products, including devices used in schools. These include glass thermometers, thermostats, electrical switches, gauges, and science laboratory equipment, among others.
7. Because mercury is a hazardous chemical, many manufacturers have removed it from consumer products.
8. Mercury is not a banned substance and some products still contain it. For example, compact fluorescent light (CFL) bulbs contain a small amount of mercury. Note, that if a bulb breaks, the amount of mercury in the CFL is so small that it will not produce enough vapor to make people sick. However, it is still important to clean up safely and properly.



Instructions for students who find mercury

- **DON'T** mess with it.
- **DON'T** touch it.
- **DON'T** walk through it or get it on your clothes, backpack or other things.
- **DO** find an adult and ask for help.

Health effects of mercury

- Mercury poisoning can affect the nervous system, lungs, and kidneys.
- Inhaling mercury vapors can cause different symptoms depending on how long and how much of the vapor people inhale.

Inhaling high levels of vapors for a short period of time	Inhaling low levels of vapors for a long period of time
• Nausea, vomiting, diarrhea	• Feeling anxious or tired
• Headaches	• Lack of appetite
• Shortness of breath	• Trembling (shaking)
• Eye irritation and vision problems	• Memory problems
• Chest pain	• Hearing problems

Differences between elemental mercury and other forms of mercury

- Unlike organic and inorganic mercury, which are compounds, elemental mercury is pure, i.e., it is not chemically bonded to other elements.
- Organic mercury is mainly methylmercury. Due to environmental pollution, fish may contain mercury that they have accumulated through the food chain.
- Ethylmercury is another form of organic mercury. It is found in some vaccine preservatives and some antiseptics.
- Inorganic mercury compounds are found in batteries, some disinfectants, and some health remedies and creams.
- All three forms of mercury are harmful to human health.

Elemental mercury resources

- Websites:
 - » Agency for Toxic Substances and Disease Registry's Don't Mess with Mercury—For Students website: <http://www.atsdr.cdc.gov/dontmesswithmercury/students.html>
 - » Ohio EPA public service announcement highlighting mercury vapors: <http://www.youtube.com/watch?v=tpqP3ReC1cQ>
 - » North Dakota Department of Health. Mercury Containing Devices/Products: <http://www.ndhealth.gov/wm/Mercury/MercuryContainingDevicesProducts.htm>
 - » US EPA Region 9. Public Service Announcement: Mercury Is Toxic: <http://www.epa.gov/region9/psa/mercury/>
 - » US EPA's Mercury Page: <http://www.epa.gov/mercury/index.html>
 - » Mercury in Schools Case Studies: <http://www.epa.gov/hg/casestudies.htm>
- Books:
 - » Lew, Kristi. Mercury (Understanding the Elements of the Periodic Table). New York, NY: Rosen Publishing Group, 2009.
 - » Watt, Susan. The Elements: Mercury. Tarrytown, New York: Benchmark Books, 2005.

Contact ATSDR for more information about elemental mercury

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