

### Heavy Metal Ions WebQuest

1. What is your favorite heavy metal band?

Go to the websites listed and answer the questions for each section. We will spend very little time discussing heavy metal contamination in class. You are responsible for understanding the material through this WebQuest. Please ask questions if you need clarification or assistance.

<http://ga.water.usgs.gov/edu/earthgwquality.html>

2. Why does groundwater often contain more dissolved substances in it than water on the surface?
3. Where do water contaminants come from? List *at least* 4 examples.

There are many contaminants that are found in surface and groundwater. Three that are regularly sampled and tested for are Mercury, Arsenic and Lead. Scroll down the page and look at the table of contaminants, the sources of these contaminants and their potential health risks. Summarize the info on these three toxins and fill in the chart below.

Toxin	Chemical Symbol	Possible Sources, Potential Health Hazards and Other Risks
Mercury		
Arsenic		
Lead		

Use your periodic table or go to [http://en.wikipedia.org/wiki/List\\_of\\_elements\\_by\\_name](http://en.wikipedia.org/wiki/List_of_elements_by_name) to find the chemical symbols of these common toxins. Fill in the column in the chart above.

#### Mercury

<http://pubs.usgs.gov/fs/1995/fs216-95/>

4. Why is it a concern that fish and wildlife contain high, even toxic, levels of mercury?
5. How many states regulate how much fish you should consume because of mercury? Does California?
6. What is the main cause of mercury pollution?

7. What does "bioaccumulation" mean?
8. Click on Figure 4 and explain how this diagram shows "biomagnification."
9. Click on Figure 5. If there are additional health effects listed here that you did not include in the table above, list them here.
10. How mercury enters the food chain is still a bit of a mystery in some cases, but what do scientists believe may have had an early role in this?
11. If humans decreased their mercury emissions today, approximately how long would it take to see mercury levels in the fish we eat decrease?

<http://www.gotmercury.org>

12. What is your favorite type of seafood (fish, shellfish, shark, etc.) to eat?
13. Use the Mercury Calculator to see how much of your favorite fish you could eat in a week without exceeding the Environmental Protection Agency's (EPA) recommended limit. (A typical serving of seafood is 8 ounces).

**Arsenic:**

<http://www.epa.gov/safewater/arsenic/index.html>

14. Arsenic is a semi-metal that is odorless and tasteless. How does it enter our drinking water supplies?
15. What is the maximum amount of arsenic allowed in drinking water in ppm?
16. The amount of arsenic found in the front lawn of BHS is between 17-693 ppm. How does this compare to the amount allowed in drinking water?

Click on "Basic Information" to learn more about Arsenic poisoning.

17. List 4 natural ways arsenic can be released into the environment.
18. One theory about the presence of arsenic at BHS is that it is from rodent bait that was used over 30 years ago. List 3 more example of how human activity can lead to arsenic contamination in the environment.
19. What are the health risks associated with arsenic poisoning.

**Lead:**

<http://www.epa.gov/safewater/lead/index.html>

20. What is lead?
21. How are people most commonly exposed to lead?

22. How does too much lead in drinking water affect children and babies?
23. What would long-term exposure to Pb in water do to adults?
24. Lead is rarely found naturally in water sources, so where does it come from?
25. What should people who live in homes older than 1968 occasionally check?
26. Are new homes totally safe from the possibility of lead exposure? Explain.

Click on "Basic Information" to learn more.

27. What is the maximum contaminant level allowed in water?
28. How can you prevent or reduce the amount of lead in drinking water in your home? Give two examples.

**Reflection (using what you have learned throughout the webquest):**

Fish can usually consume large quantities of heavy metals without becoming ill or dying from it. A fish kill, or the sudden death of more than 200 fish at once, is rarely due to heavy metal contamination unless an extremely high amount is released into a water source very quickly.

29. Brainstorm, or google, some ideas as to how a lethal dosage of a heavy metal, such as arsenic, might suddenly be released into a river.

Even if there is not enough heavy metal contamination in a source of water to cause a fish kill, high levels of these toxins in fish are dangerous to humans and also to other land mammals and birds.

30. Why do larger fish contain higher levels of mercury and other heavy metals than smaller fish? (This is a review question - you've already learned about this earlier in the WebQuest!)
31. When some species of birds eat a fish that contains high levels of mercury or arsenic, it can die. How could this affect a marine bird population?
32. If a marine bird population becomes endangered, how will this affect the ecosystem it is a part of? Please use the words "producers" and "consumers" in your answers.