



(a)



(b)



(c)

Figure 1 (a) The liquid mercury from a mercury thermometer is hazardous. If the thermometer breaks, the mercury becomes a vapour, which is easily breathed in. (b) These old car batteries contain a significant amount of lead. (c) Tuna are predators that can accumulate high levels of mercury in their bodies.

DECISION MAKING SKILLS

- | | | |
|--|---|--|
| <input type="radio"/> Defining the Issue | <input checked="" type="radio"/> Analyzing the Issue | <input checked="" type="radio"/> Communicating |
| <input checked="" type="radio"/> Researching | <input checked="" type="radio"/> Defending a Decision | <input type="radio"/> Evaluating |
| <input type="radio"/> Identifying Alternatives | | |

Heavy Metals in the Environment

Heavy metals, which are found in the middle of the Periodic Table, have a relatively high density and can be toxic or poisonous at low concentrations (Figure 1). There is a growing concern about our increasing exposure to heavy metals in the environment. The concentration of a heavy metal in animals or people can reach a level that will affect their short-term and long-term health. Heavy metals are important, however, in the design and manufacture of consumer and commercial goods, and the production of energy.

The Issue: Health and Environmental Risks Due to Heavy Metals

The federal government is conducting a review of its environmental regulations for heavy metals. The government is holding a meeting at which stakeholders can present their opinions and positions on the use of heavy metals in Canada. The review panel contains federal, provincial, and local government representatives, research scientists, and local citizens. The review panel must make a recommendation to the government on whether specific heavy metals should be banned from commercial use.

Background to the Issue

Animals that are higher in the food web (including humans) accumulate higher concentrations of heavy metals. These levels build up in the body systems, and have cumulative effects, both short-term and long-term. For example, mercury as a vapour is easily absorbed by organisms. Mercury is converted to methylmercury, its most damaging form, by bacteria in soil and water. The methylmercury works its way through the food web, accumulating in higher and higher concentrations at each step. This is called bioaccumulation. Fish such as tuna and salmon, and the whales that feed on them, have been shown to have significantly high levels of methylmercury, which can cause serious damage to the brain and nervous system.

Some heavy metals are micronutrients, which are necessary in trace amounts for maintaining good health—copper is needed by the body to help form red blood cells. As well, heavy metals are extremely important to the resource and manufacturing industries. Mercury, for example, is an essential component of energy-efficient fluorescent light bulbs. The amount of mercury is small, however—less than 5 mg. A household thermometer contains up to 500 times more mercury.

Many of our modern technological conveniences or necessities rely on heavy metals. Table 1 provides examples of heavy metals used in industry and consumer goods.

Take a Position

You will assume the role of one of the presenters at the meeting (see the list below), and you will choose one of the following heavy metals to discuss: lead, mercury, cadmium, cobalt, silver, copper, selenium, or chromium. Choose a position for or against the use of the heavy metal. Prepare for your role by considering the health and environmental risks, as well as the benefits to industry, the economy, and society, from the use of the heavy metal. Conduct research to support your position and help you prepare your presentation.

• www.science.nelson.com 

The Roles

- a representative of one of the primary resource industries that provides significant employment in your community
- an engineer with a manufacturing firm that produces consumer goods at a local factory
- a marketing executive with a chain of large retail stores
- a representative of the local tourism industry
- a member of a local environmental protection group
- a research scientist who is studying the effects of exposure to heavy metals on children
- a member of the provincial medical association
- a representative of the regional health authority

Communicate Your Position

Prepare a presentation that represents the role you assumed and addresses the heavy metal you chose. Consider:

- What arguments support your position?
- Is your position appropriate for the short term, long term, or both?
- Do the risks outweigh the benefits, or vice versa?
- How can you justify your position to the government and the community?

Make your presentation to the panel and be prepared to answer questions.

Table 1

Examples of Uses of Heavy Metals

- lead (batteries, fuel additives, radiation shielding, old paint pigments, solder, old plumbing, roof flashing)



- selenium (dandruff shampoo, electronics, photographic films and papers)



- cadmium (rechargeable batteries, metal coatings, pigments, plastics)



- chromium (alloys, metal coatings, pigments)



- copper (wood preservatives, plumbing and wiring, roof flashing, electronics)

