

SECTION 2.3 ASSESSMENT, p. 103

Check Your Understanding Answers

Checking Concepts

- The disappearance of amphibians has been caused by prolonged drought, increased ultra-violet radiation, habitat loss, pollution, over-hunting, parasites, and diseases.
- Synthetic chemicals become biomagnified in organisms when they become stored in plant tissue and the fat tissue of animals.
- A chemical bioaccumulates when the chemical is taken up faster than it is broken down and excreted.
- PCBs are synthetic chemicals called polybiphenyls.
- Sources of PCBs include paints, plastics, and lubricants for electrical transformers made between 1930 and 1970.
- An example of a persistent organic pollutant (POP) is DDT.
- DDT bioaccumulates because it has a long half-life. It enters plants and then the fatty tissue of fish, birds, and animals that eat the plants.
- Two ppm means two particles (such as of a pollutant) mixed with 999 998 other particles.
- A chemical with a toxic level of 0.03 ppm is more toxic, as a smaller amount has a greater negative effect on the organism.
- DDT affects the nervous system and immune system and causes reproductive disorders.
- The effect of biomagnification is so great in killer whales (orcas) because the toxins such as PCBs are stored in blubber and, when blubber is burned for energy the chemical is released into the whale's bloodstream, reducing immune system activity.
- Methyl mercury affects nerve cells, damages the heart, kidneys, and lungs, and suppresses the immune system.
- (a) Cadmium poisoning is caused by smoking.  
(b) Cadmium can harm the human body when it accumulates in lung tissue, causing cancer. Cadmium can also be taken into the body in certain foods, where it accumulates and leads to infertility and damage to the central nervous system, immune system, and DNA.
- Bioremediation is the use of living organisms to clean up the environment. Scientists have extracted the enzymes from chemical-eating bacteria and have used them to clean up the environment.

Understanding Key Ideas

- Scientists use frogs to evaluate the health of an ecosystem since amphibians live in both land and aquatic environments. Their egg casings are permeable and sensitive to harmful chemicals in the water. Their skin, which is partly used for breathing, is sensitive to air and water pollutants.
- Sample answer:

Heavy Metal	Natural Sources	Human-made Sources	Effects on Plants and Animals	Effects on Humans
Lead	Soil	Insecticide, paints, gasoline ingredient	Very toxic at 0.0012 ppm	Anemia, nervous system damage, sterility in men, low fertility rates in women, brain damage and kidney failure
Cadmium	Earth's crust, trees burning	Plastics, batteries, mining	Toxic to earth-worms and soil organisms at very low levels, high death rates in fish	Accumulates in lung tissue and causes cancer, stores in liver and kidney, infertility, damage to central nervous system, immune system
Mercury	Released from volcanoes, geothermal springs, rock	Burning fossil fuels, mining, battery manufacture,	Bioaccumulates in brain, heart, kidneys of vertebrates	Affects nerve cells, heart, kidneys, and lungs and suppresses the immune system

- A chemical with a long half-life stays for decades in the environment where it may bioaccumulate and biomagnify.
- The amount of chemical left from 3 tonnes after 120 years would be  $\frac{3}{16}$  of a tonne. This is calculated by  $3 \text{ tonnes} \times \frac{1}{2^4}$  (since  $\frac{120}{30} = 4$ ).
- The chemical could be picked up in the atmosphere and be carried by wind currents 1000 km away and deposited back down with precipitation.