

Study Guide — BI Problem 4: Environmental Health (Pretest)

Biomedical Innovations · Problem 4 — Environmental Health · Modeled on the PLTW Guided Review format

Vocabulary to know cold

Term	Definition
Environmental toxicology	The study of how chemical, physical, and biological agents in the environment harm living organisms and e
Toxicant	A harmful substance, often human-made, introduced into the environment.
Dose	The amount of a substance an organism is exposed to; the independent variable in dose-response studies
Dose-response relationship	The pattern in which the size of a biological effect changes as the dose changes.
LD50	The dose that is lethal to 50% of a test population; a standard measure of acute toxicity.
Negative control	A group receiving no treatment, used to establish the baseline response.
Standard curve	A graph of known concentrations vs. measured signal used to find unknown concentrations.
Representative sample	A sample collected so it accurately reflects the larger population or area being studied.
Biohazard	Biological material that poses a risk to health, marked with the three-crescent symbol.
Sharps container	A rigid, puncture-resistant, labeled container for needles, blades, and broken glass.
Chemical segregation	Storing incompatible chemicals apart so they cannot react dangerously.
Replication	Repeating measurements or samples to estimate variability and improve reliability.

Worked examples (follow the reasoning)

Example 1. A class tests how a weed-killer affects radish seed germination. They use 0, 1, 2, and 4 mL/L of weed-killer, 20 seeds per dose. Identify the independent variable, dependent variable, and the control.

- The variable the students change on purpose is the weed-killer concentration → independent variable.
- The variable they measure is the number (or %) of seeds that germinate → dependent variable.
- The 0 mL/L group gets no weed-killer and shows normal germination → negative control.
- Using 20 seeds per dose provides replication.

Answer: IV = weed-killer concentration; DV = % germination; control = the 0 mL/L group; 20 seeds/dose = replication.

Example 2. After lab, students have used pipette tips contaminated with bacterial culture, an empty acid bottle, and a used scalpel blade. State the correct disposal for each.

- Bacteria-contaminated tips are a biohazard → autoclave/biohazard waste bag.
- The acid bottle is chemical hazardous waste → labeled chemical-waste container, not the sink or trash.
- The scalpel blade is a sharp → red puncture-resistant sharps container.
- Each container must be labeled with contents and hazard.

Answer: Tips → biohazard bag; acid bottle → labeled chemical waste; blade → sharps container.

Practice questions (with reasoning)

1. Which graph type best shows how a measured effect changes across increasing doses of a single toxin?

- A. Pie chart
- B. Line / standard curve
- C. Map
- D. Karyotype

Answer: B. A line or standard curve plots a continuous response against an ordered range of doses.

2. A used Petri plate grew E. coli during a sampling experiment. Before discarding it should be:

- A. Rinsed and put in recycling
- B. Autoclaved or sealed in biohazard waste
- C. Left open on the bench
- D. Mailed home

Answer: B. Live-culture plates are biohazardous and must be decontaminated or biohazard-bagged.

3. A toxin with an LD50 of 5 mg/kg compared to one with an LD50 of 500 mg/kg is:

- A. Less toxic
- B. More toxic (lethal at a much smaller dose)
- C. Equally toxic
- D. Not a toxin

Answer: B. A lower LD50 means a smaller dose is lethal, so the substance is more toxic.