

Module 5 — Human Toxicity, PPE, Exposure & First Aid

CORE exam · 10 practice questions · Signal words and LD50, the four routes of exposure, choosing and caring for PPE, recognising poisoning, and what to do in the first five minutes.

Key numbers & facts to memorise

LD50	LOWER number = MORE toxic
Most common route	Dermal, during mixing and loading
Gloves	Unlined nitrile/butyl/barrier laminate — never leather or fabric-lined
Eye flush	15–20 minutes of clean running water
Poison Help	1-800-222-1222 · CHEMTREC 1-800-424-9300

Toxicity, LD50 and what the signal word really tells you

Toxicity is the inherent capacity of a substance to cause injury; **hazard** is toxicity combined with your actual exposure. That distinction is the whole point of applicator safety: you cannot change a product's toxicity, but you control exposure almost completely. A highly toxic product handled with correct PPE and closed transfer can present less real-world hazard than a mildly toxic product splashed on bare skin.

Toxicity is quantified as **LD50** (lethal dose for 50% of a test population, in mg of chemical per kg of body weight) and **LC50** for inhaled concentrations. The relationship is inverse and it trips people up: a **lower LD50 means a more toxic product**. A product with an oral LD50 of 5 mg/kg is far more dangerous than one at 5,000 mg/kg. Exams love this reversal, so anchor it once: small number, big danger.

The **signal word** on the front panel translates toxicity into a legal category. **DANGER — POISON** with the skull and crossbones marks the highest acute toxicity; **DANGER** alone (without POISON) usually indicates severe eye or skin corrosivity rather than acute lethality; **WARNING** is moderately toxic; **CAUTION** is slightly toxic or relatively non-toxic. Signal words also carry a rough dose scale you should recognise: a few drops to a teaspoon can be lethal for DANGER-POISON, roughly a teaspoon to a tablespoon for WARNING, and an ounce to more than a pint for CAUTION.

The four routes of exposure — and where applicators actually get dosed

Pesticides enter the body four ways: **dermal** (through the skin), **inhalation** (breathed in), **oral** (swallowed) and **ocular** (through the eyes). For working applicators, **dermal exposure is by far the most common route**, and the highest-risk moment of the entire day is **mixing and loading concentrate**, when the product is at its strongest and you are handling it by hand.

Absorption is not uniform across the body. Skin permeability varies dramatically by site: the forearm is the low baseline, while the **genital area absorbs many times more**, and the scalp, ear canal, forehead and armpit are also high-absorption regions. This is why a splash on the forearm and a splash on the head are

not equivalent events, and why gloves plus a hat plus long sleeves is the routine minimum rather than an abundance of caution.

Exposures are also classified by timing. **Acute** effects appear soon after a single exposure — headache, nausea, dizziness, skin or eye irritation, sweating, salivation, pinpoint pupils, muscle twitching. **Chronic** effects follow repeated low-level exposure over months or years and may include organ damage or reproductive and developmental effects. Chronic risk is exactly what good habits on ordinary days buy you protection from, and it is the reason the label's PPE section is mandatory rather than advisory.

PPE: choosing it, wearing it, and keeping it working

The label's PPE statement is the **legal minimum**, not a recommendation and not a ceiling — you may always wear more. Typical requirements include long-sleeved shirt and long pants, **chemical-resistant gloves**, shoes plus socks, protective eyewear, and sometimes a chemical-resistant apron for mixing, a respirator, or a chemical-resistant suit. Read the PPE section twice: mixing/loading requirements are often stricter than application requirements on the same label.

Glove selection matters more than most people assume. **Unlined nitrile, butyl or barrier-laminate** gloves are the workhorses; **never use leather, cotton or fabric-lined gloves**, which absorb concentrate and hold it against your skin. Wear sleeves over gloves when your hands are below shoulder height so runoff sheds outward, and cuff the gloves outside your sleeves when reaching overhead. Wash gloves before removing them, and replace them at the first sign of a tear, swelling or stickiness.

Respirators require more than purchase. The label specifies a type — often an **N95** for dust and mist, or an organic-vapour cartridge respirator — and correct use means **fit testing**, a user seal check every time, and cartridge replacement on a schedule (typically at the end of the day or after eight hours of use, or sooner if you smell or taste anything or breathing becomes difficult). Facial hair that crosses the seal breaks the protection entirely.

Cleaning closes the loop. Launder contaminated clothing **separately from family laundry**, in hot water with heavy-duty detergent, and run an empty rinse cycle afterwards; heavily contaminated clothing should be discarded. Wash PPE after every day of use, store it away from pesticides so it does not absorb vapours, and keep a **full change of clean clothes and clean water for washing in the vehicle** — the value of that habit becomes obvious exactly once.

First aid, poisoning recognition and emergency numbers

The label's **Statement of Practical Treatment / First Aid** section is the authority in an emergency, and it is written per route of exposure. General practice: for **skin** contact, remove contaminated clothing immediately and wash the skin with soap and plenty of water for 15–20 minutes. For **eyes**, hold the eyelid open and rinse gently with clean running water for **15–20 minutes**, removing contact lenses after the first five minutes if present. For **inhalation**, move the person to fresh air; give artificial respiration if breathing has stopped. For **swallowing**, call poison control or a physician immediately and **do not induce vomiting unless the label specifically directs it** — vomiting a corrosive or petroleum-based product causes a second injury on the way back up.

Recognition is a skill worth rehearsing because early organophosphate and carbamate poisoning masquerades as heat stress or the flu: headache, nausea, sweating, blurred vision, pinpoint pupils, excessive salivation, muscle twitching, weakness. If a crew member shows those signs during application,

stop, decontaminate, and get medical evaluation — the failure mode is assuming it is the heat and continuing to work.

Have the numbers before you need them. **Poison Help: 1-800-222-1222** connects to your regional poison control centre; **CHEMTREC: 1-800-424-9300** handles chemical transport emergencies; **911** for immediate medical emergencies; and **ODA Pesticide & Fertilizer Regulation: 614-728-6987** for Ohio regulatory reporting. Always take the label (or a photo of it) with you to the medical provider — treatment decisions depend on the active ingredient, and a physician who can read the label treats faster and better.

Spills follow the **three Cs: Control, Contain, Clean up**. Control the source (upright the container, stop the leak), contain the spread with absorbent material or a soil berm, then clean up — sweep or absorb, place in a sealable labelled container, and dispose as directed. Never wash a spill into a drain, ditch or waterway. Keep people and animals away, and stay with the spill until it is secured.

Practice questions

Answer these closed-book, then check against the answer key that follows. Ohio requires 70% to pass.

1. Which signal word indicates the highest acute toxicity?

- A) CAUTION
- B) WARNING
- C) DANGER — POISON
- D) No signal word

2. A lower LD50 value means the product is:

- A) Less toxic
- B) More toxic
- C) Equally toxic
- D) Non-toxic

3. For pesticide applicators, the most common route of exposure is:

- A) Oral
- B) Dermal (skin)
- C) Ocular
- D) Injection

4. Which glove material is NOT acceptable for handling pesticides?

- A) Unlined nitrile
- B) Butyl rubber
- C) Barrier laminate
- D) Fabric-lined leather

5. The PPE listed on the label is:

- A) A suggestion
- B) The legal minimum required
- C) The maximum allowed
- D) Only for commercial applicators

6. Pesticide splashed in the eye should be flushed with clean water for:

- A) 1 minute
- B) 5 minutes
- C) 15–20 minutes
- D) 1 hour

7. You should induce vomiting after a pesticide is swallowed:

- A) Always
- B) Never — only if the label specifically directs it
- C) Only with water
- D) Only for herbicides

8. The national Poison Help line is:

- A) 1-800-424-9300
- B) 1-800-222-1222
- C) 614-728-6987
- D) 1-888-CROPS-11

9. Contaminated work clothing should be laundered:

- A) With the family laundry
- B) Separately, in hot water with heavy-duty detergent
- C) In cold water only
- D) Not at all — just air it out

10. The three steps of spill response are:

- A) Report, rinse, resume
- B) Control, contain, clean up
- C) Cover, ignore, continue
- D) Dilute, drain, dry

Answer key & explanations

1. C) DANGER — POISON — DANGER — POISON with the skull and crossbones marks the highest acute toxicity category.

2. B) More toxic — LD50 is the dose that kills 50% of a test population — a smaller dose needed means greater toxicity.

3. B) Dermal (skin) — Dermal exposure dominates, and mixing/loading concentrate is the highest-risk task of the day.

4. D) Fabric-lined leather — Leather and fabric linings absorb and hold concentrate against the skin. Use unlined chemical-resistant gloves.

5. B) The legal minimum required — Label PPE is enforceable as a minimum. You may always wear more protection.

6. C) 15–20 minutes — Gently flush the eye with clean running water for 15–20 minutes, then seek medical attention.

7. B) Never — only if the label specifically directs it — Vomiting a corrosive or petroleum-based product causes further injury. Follow the label first-aid statement and call poison control.

8. B) 1-800-222-1222 — Poison Help is 1-800-222-1222. CHEMTREC (1-800-424-9300) handles transport chemical emergencies.

9. B) Separately, in hot water with heavy-duty detergent — Wash separately in hot water with heavy-duty detergent and run an empty rinse cycle afterwards.

10. B) Control, contain, clean up — Control the source, contain the spread, clean up and dispose properly. Never flush a spill to a drain or waterway.