

Ohio Pesticide Applicator Licence

Complete free study packet — CORE + Category 1 Aerial Pest Control (drone spraying)

What this packet is

This is the printable version of the free Ohio pesticide applicator exam-prep course at factordrones.com/learn/ohio-pesticide-applicator-license-course. It contains all 14 modules, 126 practice questions with worked explanations, and the key numbers pulled out of each module so you can revise from the boxes alone the night before.

It is study material, not legal advice, and it is not a substitute for Ohio's official study guides (sold through OSU Extension publications). Everything time-sensitive — fees, exam schedules, recertification hours, category structure — should be confirmed with the Ohio Department of Agriculture before you rely on it.

The exam at a glance

Passing score	70%
Format	Multiple choice, closed book. Roughly 25–150 questions depending on the category
Label block	Most exams include questions about a pesticide label supplied with the exam
CORE topics	Laws and regulations · label reading · handling and storage · calculations · human toxicity · applicator safety · environmental protection
Category 1 aerial	Agricultural pests and crops, plus aerial equipment, droplet size, swath, drift, buffers and weather limits
Window to pass	One year from an accepted ODA application
Results	About 2–4 weeks; minimum 5 business days before a retest
Fees	\$35 application and \$35 annual renewal for commercial applicators (OSU Extension ANR-0140)
Licence term	Expires September 30 annually; late renewal to March 31 if recertification hours were completed by Sept 30
Recertification	Every 3rd year: retake exams, or 5 credit hours minimum (1 CORE + 0.5 per category). Credits do not carry over
ODA	614-728-6987 · pesticides@agri.ohio.gov · agri.ohio.gov
OSU PSEP	614-292-4070 · pested@osu.edu · pested.osu.edu

Contents

Module 1 — Ohio Pesticide Law, FIFRA & Your Legal Duties

Who regulates what, the licence classes, direct supervision, penalties, and the legal duties the CORE exam tests hardest.

Module 2 — Reading the Label (the most-tested skill on the exam)

Ohio exams hand you an actual label and ask questions about it. Here is how to read one under time pressure and find every answer.

Module 3 — Formulations, Handling, Storage & Disposal

What the letters after a product name mean, how to mix without ruining a tank, and the storage and disposal rules ODA enforces.

Module 4 — Pesticide Calculations (worked, step by step)

Area, rate, tank loads, percent solutions, active ingredient and calibration math — with fully worked examples and unit tricks.

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

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.

Module 6 — Applicator Safety, Transport, Spills & Emergency Response

Safe transport, mix-and-load discipline, backflow prevention, the three Cs of spill response, heat illness, and drone-specific battery and site hazards.

Module 7 — Environmental Protection, Water, Pollinators & Endangered Species

Drift and runoff, leaching and groundwater, the pollinator protection box, endangered species bulletins, and Ohio-specific nutrient and water rules.

Module 8 — Pest Identification, IPM & Resistance Management

Why identification comes first, how thresholds and scouting work, the IPM tactic hierarchy, modes of action, and how resistance actually develops.

Module 9 — Category 1 Aerial: Drone Spray Technique, Droplet Size & Drift

What Category 1 (Aerial) actually tests, how rotor downwash changes deposition, droplet-size classes, swath and overlap, and the aerial-specific label language.

Module 10 — The Aviation Half: Part 107, Part 137, 44807 & Airspace

The six federal steps to legally spray from a drone, why Part 137 is separate from Part 107, exemptions and waivers, and airspace/LAANC in plain language.

Module 11 — Worker Protection Standard, REI & Notification Duties

What the WPS requires of you when you spray someone else's farm: REIs, posting and oral notification, decontamination supplies, the application exclusion zone, and the paperwork.

Module 12 — Ohio Records, Renewal, Recertification & Reciprocity

The exact record fields ODA requires, the same-day and ten-day rules, the September 30 renewal, the third-year recertification maths, and which states Ohio reciprocates with.

Module 13 — Ohio Pesticide Business Licence, Insurance Limits & Supervision

The second licence a spray-for-hire operation needs, the exact OAC 901:5-11-07 insurance minimums for aerial work, direct supervision rules, and the trained-serviceperson pathway.

Module 14 — Exam Blueprint, Exam Day Strategy & Free Official Resources

What is actually on the test, how the label question block works, a timing and elimination strategy, and every free government and university resource worth using.

Module 1 — Ohio Pesticide Law, FIFRA & Your Legal Duties

CORE exam · 8 practice questions · Who regulates what, the licence classes, direct supervision, penalties, and the legal duties the CORE exam tests hardest.

Key numbers & facts to memorise

Federal law	FIFRA — using a pesticide inconsistent with its labelling is unlawful
Ohio agency	Ohio Department of Agriculture (ODA), 614-728-6987
Conflicting rules	Follow the MORE restrictive requirement
Category 1 aerial	Application by aircraft — includes uncrewed aircraft
Supervision	Trained serviceperson: supervisor within 25 miles or available within 2 hours

The two-layer system: FIFRA on top, Ohio underneath

Pesticide regulation in the United States is a partnership. The **Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)**, administered by the U.S. EPA, is the foundation: it requires every pesticide sold in the country to be registered with EPA, assigns each product an **EPA registration number**, classifies products as **general use** or **restricted use**, and makes the approved labelling legally binding on the person who applies it. FIFRA is where the phrase "the label is the law" actually comes from — section 12 makes it unlawful to use a registered pesticide in a manner inconsistent with its labelling.

Ohio then layers its own programme on top through the **Ohio Revised Code Chapter 921** and the rules in **Ohio Administrative Code 901:5-11**. The **Ohio Department of Agriculture (ODA)** is the state lead agency: it registers products for sale in Ohio, licenses applicators and pesticide businesses, sets recordkeeping requirements, investigates complaints, and holds enforcement authority. A product legal under FIFRA still may not be applied in Ohio unless it also carries current **Ohio registration** — ODA maintains a searchable product database for exactly this check.

The practical rule the exam wants you to internalise: **when federal and state requirements differ, comply with the more restrictive one**. A federal label that permits something Ohio restricts does not give you permission. Likewise, nothing in state law can authorise a use the label prohibits. Applicators who get in trouble almost never do so from ignorance of an obscure statute; they do it by treating the label as advisory and assuming state rules are looser than federal ones.

Which licence you need, and why drone work is always commercial

Ohio distinguishes **private** applicators from **commercial** applicators. A private applicator applies restricted-use pesticides to land they own or rent, to produce an agricultural commodity. A **commercial applicator** licence is required if you apply pesticides to the property of another for hire, apply pesticides for any government agency (federal, state, county, township, city, village, or school district), apply to sites like schools, parks, golf courses, restaurants, food-processing plants, medical facilities and apartment complexes of more than four units, or conduct wood-destroying-insect inspections for real-estate transactions.

Two details catch people out. First, the licence requirement is not limited to restricted-use products — **general-use and even minimum-risk products** (cedar oil, garlic oil, corn gluten meal) trigger the commercial licence when applied in those situations. Second, ODA also requires the commercial licence if you apply a restricted-use pesticide on your **employer's** property, or apply any pesticide to public property. The trigger is the situation, not the toxicity of the jug in your hand.

For drone operators the conclusion is simple and non-negotiable: application by aircraft falls under **Category 1, Aerial Pest Control**, which ODA defines as "the application of pesticides by aircraft (includes both crewed and uncrewed aircraft)." Category 1 lives on the commercial side of the house. If you fly a spray drone over someone else's field — or over public ground — you need a commercial applicator licence carrying Category 1, and a copy of your pilot licence or **remote pilot certificate** must accompany the application.

Direct supervision and the trained serviceperson

Ohio law lets an unlicensed person — a **trained serviceperson** — make applications under the **direct supervision** of a licensed commercial applicator. This is a real, defined legal relationship, not a loophole. New employees must be trained **before their first occupational exposure** to pesticides, training is delivered by reading the "Safety Training Guide for Trained Servicepersons" (or equivalent), and verification of that training must be kept in personnel records during employment and for **three years after termination**.

The supervising applicator carries specific, testable obligations. They must demonstrate **instruction and control** over the trained serviceperson, must be **within 25 miles or available within two hours** while the serviceperson is applying, and must be **employed by the same company or public agency**. Note what this does not say: it does not require physical presence in the field. It does require reachability and genuine control — and the licensed applicator remains legally responsible for the application.

For aerial work, treat supervision narrowly regardless of what the general rule allows. The person at the controls of a spray drone is making dozens of application judgements a minute — droplet size, height, buffer distances, wind calls. The defensible arrangement, and the one insurers and ODA investigators expect to see, is that **the person flying holds the applicator licence**, with any helper confined to mixing, loading and ground support under supervision.

Enforcement, penalties and what an investigation looks like

ODA enforcement is complaint-driven far more often than it is random. A neighbour whose grapes cupped, a beekeeper who lost hives, a homeowner who smelled spray — any of these can open a file. Investigators typically request your application records, ask what product and rate you used, pull the label, ask about wind speed and direction at the time, and may sample foliage or soil. This is why a complete record written in the field on the day of application is worth more than any explanation offered weeks later.

Consequences escalate with severity and intent. ODA can issue civil penalties, and it can **suspend or revoke** an applicator or business licence — which, in a custom-application business, is an existential event mid-season. Knowing or repeated violations can carry criminal exposure under FIFRA. The most common triggers are entirely preventable: applying off-label (wrong site, above the maximum rate), allowing drift onto a neighbouring property, incomplete or missing records, and applying without the correct category on your licence.

Your obligations as a licensed applicator, stated plainly by OSU Extension, are worth memorising because they map directly to exam questions: read and follow the label; do not allow pesticides to contaminate or damage adjacent areas (prevent drift, clean up off-target dry product); apply only products registered both federally and in Ohio; hold the required business, location or solicitation licences; train and directly supervise any trained serviceperson; and keep records of every application.

Practice questions

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

1. Which statement best describes the relationship between FIFRA and Ohio pesticide law?

- A) Ohio law replaces FIFRA within Ohio
- B) FIFRA sets the federal baseline; Ohio adds its own requirements and you follow the more restrictive
- C) Federal law only applies to restricted-use pesticides
- D) Ohio law only applies to private applicators

2. A neighbour pays you to spray his soybeans with a general-use fungicide. In Ohio you need:

- A) No licence, because the product is general use
- B) A private applicator licence
- C) A commercial applicator licence
- D) Only a federal permit

3. How does ODA define Category 1, Aerial Pest Control?

- A) Application by crewed aircraft only
- B) Application of pesticides by aircraft, including both crewed and uncrewed aircraft
- C) Any application above 10 feet
- D) Application by helicopter only

4. A licensed commercial applicator supervising a trained serviceperson must be:

- A) Physically present at all times
- B) Within 25 miles or available within two hours, and employed by the same company
- C) Available by phone within 24 hours
- D) On the same county road

5. Verification of trained serviceperson training must be kept:

- A) For 30 days
- B) During employment only
- C) During employment and for three years after termination
- D) Permanently in a state database

6. Before applying a product in Ohio you must confirm it is:

- A) Registered federally only
- B) Registered in Ohio only
- C) Registered both federally (EPA) and in Ohio
- D) Approved by your county

7. "Using a pesticide in a manner inconsistent with its labeling" is:

- A) A recommendation to avoid
- B) A federal violation under FIFRA
- C) Allowed if you reduce the rate
- D) Only a problem for restricted-use products

8. Which is NOT one of the listed responsibilities of an Ohio licensed applicator?

- A) Keeping records of each application
- B) Preventing drift and cleaning up off-target dry product
- C) Guaranteeing pest control results in writing
- D) Training and directly supervising trained servicepersons

Answer key & explanations

1. B) FIFRA sets the federal baseline; Ohio adds its own requirements and you follow the more restrictive — FIFRA (administered by U.S. EPA) is the federal foundation; Ohio adds ORC 921 / OAC 901:5-11 administered by ODA. Where they differ, comply with the more restrictive requirement.

2. C) A commercial applicator licence — Applying pesticides to the property of another for hire requires a commercial applicator licence — the requirement is triggered by the situation, not by whether the product is restricted-use.

3. B) Application of pesticides by aircraft, including both crewed and uncrewed aircraft — ODA explicitly includes uncrewed (drone) aircraft in Category 1, and requires a copy of the pilot licence or remote pilot certificate with the application.

4. B) Within 25 miles or available within two hours, and employed by the same company — Ohio requires the supervisor to demonstrate instruction and control, be within 25 miles or available within two hours, and be employed by the same company or public agency.

5. C) During employment and for three years after termination — Training verification stays in personnel records during employment and for three years after the employee leaves.

6. C) Registered both federally (EPA) and in Ohio — Products must carry both federal EPA registration and current Ohio registration; ODA maintains a searchable Ohio product database.

7. B) A federal violation under FIFRA — It is unlawful under FIFRA. The whole label — sites, rates, restrictions, droplet and buffer statements — is enforceable.

8. C) Guaranteeing pest control results in writing — Efficacy guarantees are not a legal duty. Records, drift prevention, registered products, licensing, and supervision are.

Module 2 — Reading the Label (the most-tested skill on the exam)

CORE exam · 9 practice questions · Ohio exams hand you an actual label and ask questions about it. Here is how to read one under time pressure and find every answer.

Key numbers & facts to memorise

Signal words	CAUTION < WARNING < DANGER < DANGER–POISON
REI	Restricted-entry interval — how long people stay OUT
PHI	Pre-harvest interval — last application to harvest
If the site is not listed	The application is illegal, full stop
Aerial section	Droplet size, release height, wind limits, buffers — enforceable

Why this module matters more than any other

OSU Extension states it plainly: **most Ohio commercial exams include questions about a pesticide label that is included with the exam.** You are handed a real label and asked to extract facts from it. That single sentence should reorganise how you study — label interpretation is not one topic among seven, it is the delivery mechanism for a large share of the questions, spanning law, rates, calculations, PPE, environmental restrictions and intervals.

This is good news, because it means you are not being asked to memorise thousands of products. You are being asked to demonstrate a **repeatable reading procedure** that finds any fact on any label quickly. Applicators who fail this section usually do so by skimming for keywords and answering from prior experience with a similar product, rather than reading the actual document in front of them.

Build the habit now, on real labels, with a timer. Download two or three labels for products you actually use — a corn fungicide, a post herbicide, an insecticide — and practise locating twelve specific facts in under two minutes each. By exam day, the label section should feel like looking up a phone number, not solving a puzzle.

The anatomy of a label, in the order you should read it

Start at the top block: **brand/product name**, the **"RESTRICTED USE PESTICIDE"** box if present, the **ingredient statement** (active ingredient and percentage), the **EPA registration number** and **EPA establishment number**, net contents, and the name and address of the registrant. The signal word — **CAUTION**, **WARNING**, or **DANGER** (with **POISON** and the skull-and-crossbones for the most acutely toxic products) — tells you the acute toxicity category and drives your PPE and handling care.

Next comes the **precautionary statements**: hazards to humans and domestic animals (including the required PPE and any user-safety requirements), environmental hazards (drift, water, pollinators, endangered species), and physical/chemical hazards (flammability, corrosivity). Then **first aid** (formerly

"statement of practical treatment"), **directions for use**, and finally **storage and disposal**. The directions section is the biggest and most-tested: it lists approved sites and crops, target pests, application rates, timing and growth-stage limits, maximum amount per application and per season, re-treatment intervals, spray volume, droplet-size requirements, buffer zones, and the **REI** and **PHI**.

Two habits separate confident readers from anxious ones. First, **check the site list before anything else** — if your crop or site is not on the label, no rate matters, because the application would be illegal. Second, always look for an **aerial application** section; when it exists it governs your drone work with its own minimum carrier volume, droplet class, release height and wind limits, and if a label prohibits aerial application, a drone cannot legally apply it.

Rates, maximums and the intervals people confuse

A label rate is expressed per unit area — pints or fluid ounces per acre, pounds per acre — and there is almost always more than one number. There is the **rate per application** (often a range, tied to pest pressure or weed size) and a **maximum per season** or per crop cycle. If a product allows 2.5 pt/A per application and 5 pt/A per season, two full-rate passes exhaust your season allowance; a third pass is a violation even at a token rate. Exams love this because it requires reading two numbers instead of one.

The **REI (restricted-entry interval)** is a worker-protection interval: how long people must stay out of the treated area after application, enforced under the Worker Protection Standard. The **PHI (pre-harvest interval)** is a residue interval: the minimum time between the last application and harvest, which keeps residues within legal tolerances. Confusing the two is one of the most common wrong answers on the CORE exam, so anchor them: REI protects people, PHI protects the crop/consumer.

Also read the re-treatment interval (minimum days between applications), any rotational-crop restrictions (what you may plant afterwards, and when), and grazing or feeding restrictions for forage. For drone applicators, pay special attention to any **minimum spray volume**: ultra-low-volume aerial application can fall below a label's stated minimum gallons per acre, and no amount of good flying makes that legal.

A twelve-point label drill you can practise today

Work this list in order on any label until it becomes automatic. (1) Is it Restricted Use? (2) Signal word. (3) Active ingredient and percentage. (4) EPA registration number. (5) Is my crop/site listed? (6) Is my target pest listed? (7) Rate per application and per season. (8) Growth-stage or plant-height cutoffs. (9) Minimum carrier volume and droplet-size requirement. (10) Wind/inversion and buffer statements. (11) REI and PHI. (12) Required PPE for the task I am doing.

Then add the three questions that only matter to aerial applicators: does an aerial section exist, does it change any of the above, and does anything prohibit aerial use entirely? Write the answers down. On exam day you will be doing exactly this against an unfamiliar label, and the discipline of writing before answering prevents the single biggest error — answering from what you expect the label to say.

Finally, practise the arithmetic embedded in labels: converting between pints, quarts, fluid ounces and gallons; scaling a per-acre rate to a field; and computing how much product goes into one tank. Module 4 covers the mathematics, but the numbers you will be handed come from a label, so practise them together rather than separately.

Practice questions

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

1. According to OSU Extension, what should you expect on most Ohio commercial pesticide exams?

- A) Questions about a pesticide label included with the exam
- B) An oral interview
- C) A practical spray demonstration
- D) Only mathematics problems

2. Rank the signal words from least to most acutely toxic:

- A) DANGER, WARNING, CAUTION
- B) CAUTION, WARNING, DANGER
- C) WARNING, CAUTION, DANGER
- D) CAUTION, DANGER, WARNING

3. The REI on a label tells you:

- A) How long before harvest
- B) How long workers must stay out of the treated area
- C) How long the product controls the pest
- D) How long you may store the product

4. A label allows 2.0 pt/A per application with a 4.0 pt/A seasonal maximum. You have already made two full-rate applications. A third application at 1.0 pt/A is:

- A) Legal, because it is below the per-application rate
- B) Legal if pest pressure is high
- C) A violation — the seasonal maximum is already reached
- D) Legal if you wait 30 days

5. Your crop is not listed anywhere on the label. You should:

- A) Use the rate for the most similar listed crop
- B) Apply at the lowest labelled rate
- C) Not apply the product — the application would be illegal
- D) Apply and record it as experimental

6. Which label section lists required personal protective equipment?

- A) Storage and disposal
- B) Precautionary statements — hazards to humans and domestic animals
- C) Ingredient statement
- D) First aid

7. A label states "Do not apply by air." As a drone operator you may:

- A) Apply by drone because drones are not aircraft
- B) Apply by drone at reduced height
- C) Not apply this product by drone
- D) Apply by drone with a waiver

8. The EPA registration number on a label identifies:

- A) The manufacturing plant
- B) The specific registered product
- C) The applicator
- D) The state approval

9. For a drone applicator, the most important number to check before calibrating is:

- A) Net contents
- B) The minimum carrier volume (GPA) and droplet-size requirement
- C) The registrant address
- D) The container material

Answer key & explanations

1. **A)** Questions about a pesticide label included with the exam — OSU Extension states most exams include questions about a pesticide label that is provided with the exam — label interpretation is the core testable skill.
2. **B)** CAUTION, WARNING, DANGER — CAUTION (slightly toxic) → WARNING (moderately toxic) → DANGER (highly toxic; DANGER-POISON with skull and crossbones for the highest acute toxicity).
3. **B)** How long workers must stay out of the treated area — The restricted-entry interval is a worker-protection interval. The pre-harvest interval (PHI) is the harvest one.
4. **C)** A violation — the seasonal maximum is already reached — Two applications at 2.0 pt/A total 4.0 pt/A, which exhausts the seasonal maximum. Any further application violates the label.
5. **C)** Not apply the product — the application would be illegal — If the site or crop is not on the label, applying the product is inconsistent with its labelling and therefore unlawful.
6. **B)** Precautionary statements — hazards to humans and domestic animals — PPE requirements appear in the precautionary statements addressing hazards to humans and domestic animals.
7. **C)** Not apply this product by drone — Ohio Category 1 treats uncrewed aircraft as aircraft. A label prohibiting aerial application prohibits drone application.
8. **B)** The specific registered product — The EPA registration number identifies the specific registered product (the establishment number identifies the plant where it was produced). It is a required field in Ohio application records.
9. **B)** The minimum carrier volume (GPA) and droplet-size requirement — Low-volume aerial application can fall below a label-specified minimum spray volume, and droplet-size class is often a legal requirement.

Module 3 — Formulations, Handling, Storage & Disposal

CORE exam · 8 practice questions · What the letters after a product name mean, how to mix without ruining a tank, and the storage and disposal rules ODA enforces.

Key numbers & facts to memorise

Mixing order	W-A-L-E: Wettable/dry → Agitate → Liquids/flowables → Emulsifiables; adjuvants last
Jar test	Small-scale compatibility check in the same order, stand 15 min
Storage	Original labelled containers, locked, ventilated; dry ABOVE liquids
Containers	Triple/pressure rinse → rinsate to tank → puncture → recycle
Highest dust hazard	Wettable powders (WP) while measuring

Formulations and what they mean for you

A pesticide **formulation** is the active ingredient plus carriers, solvents, surfactants and other inert ingredients that make it possible to handle and apply. The abbreviations on the label are not decoration: **EC** (emulsifiable concentrate) mixes into a milky emulsion and can be hard on rubber and plastic; **SC/F** (suspension concentrate/flowable) is a fine solid suspended in liquid and needs agitation; **WP** (wettable powder) is a dusty solid that must be kept suspended and is abrasive to pumps; **WDG/DF** (water-dispersible granule/dry flowable) is a low-dust improvement on WP; **SL** (soluble liquid) truly dissolves; and **RTU** products are ready to use.

Formulation drives four practical decisions: how much agitation you need, how much your equipment will wear, how likely you are to plug a screen or nozzle, and how much dust or splash exposure you face while measuring. It also affects drift and efficacy — the same active ingredient in two formulations can behave differently on a waxy leaf. Exams commonly ask which formulation poses the greatest inhalation hazard while mixing (wettable powders, because of dust) or which requires continuous agitation (suspensions and wettable powders).

For drone applicators there is an extra filter: small tanks, small lines, small screens. Fine **WDG** and true **SL/SC** products generally run well; coarse wettable powders can settle and plug a 10-gallon system far faster than they would trouble a 1,000-gallon rig. Always run a new product/tank combination on clean water first, watch your flow meter for drift, and flush thoroughly the same day.

Compatibility, mixing order and the jar test

When two or more products go in the same tank you are performing chemistry. Incompatible mixes curdle, gel, form flakes, or separate into layers — at best you plug the system, at worst you ruin an expensive tank of mix and lose a spray window. The label of every product in the mix must be checked; if any label prohibits the combination or specifies an order, that instruction controls.

A widely taught mixing sequence is **W-A-L-E**: fill the tank half to three-quarters with clean water and start agitation, add **W**ettable and dry products (WP, WDG, DF), **A**gitate until fully dispersed, add **L**iquids and flowables (SC, SL), then **E**mulsifiable concentrates, with adjuvants and surfactants generally last. Ammonium sulphate or water conditioners are often added first per label. Rinse each container three times and add the rinsate to the tank; top off with water and keep agitating until the tank is empty.

When you are unsure, run a **jar test** before you commit. Scale everything down: put water in a clear quart jar in proportion to your tank rate, add each product in the same order you would use in the tank, shaking gently between additions, then let it stand for about fifteen minutes. Watch for clumping, curdling, gel, oily layers or heavy sediment. A uniform mix is a good sign; a separated mix means do not tank-mix those products. Thirty minutes here regularly saves a full tank and a day of the season.

Storage that keeps you legal and safe

Store pesticides in their **original, labelled containers** — never in a food or beverage container, never in an unlabelled jug. The storage area should be cool, dry, well ventilated, and **secure (locked)**, sited away from food, feed, seed and water sources, and posted with warning signage. Temperature matters: freezing can break emulsions and crack containers, while extreme heat degrades some actives and can pressurise containers.

Organise deliberately. Keep **dry formulations above liquids** so a liquid leak cannot drip into and activate a powder. Separate herbicides from insecticides and fungicides where practical to prevent cross-contamination and mistakes under time pressure. Maintain a current inventory list — it speeds ordering, prevents buying what you already own, and is exactly what a fire department or emergency responder needs if there is an incident at your facility.

Keep the storage area equipped, not just tidy: absorbent material, a scoop and sealable container for spills, clean water, soap, an eyewash source, a fire extinguisher, and copies of labels and safety data sheets accessible outside the room. Practise a fifteen-second mental drill: if a container failed right now, could you contain it without leaving to fetch supplies? If the answer is no, the kit is in the wrong place.

Disposal, container rinsing and unusable product

Empty containers are not empty. **Triple-rinse** or pressure-rinse immediately after emptying — waiting lets residue dry on and become far harder to remove. Pour each rinse into the spray tank so the product goes onto the labelled target rather than into a waste stream. Once properly rinsed, puncture the container so it cannot be reused, and recycle through an agricultural container programme or dispose of it as the label directs.

Rinsate is part of your mix, not waste: adding rinse water back into the tank is both the legal expectation and the practical way to avoid creating a disposal problem. Never pour excess mix on the ground, down a drain, into a ditch, or into a waterway. If you consistently end up with leftover mix, your calibration or your acreage math needs attention — mix what the field needs, which is exactly the arithmetic in Module 4.

For products that have become unusable — banned, expired, degraded, or unlabelled — do not stockpile them indefinitely and never burn or bury them. Ohio periodically offers **pesticide collection ("clean sweep") events** through ODA that accept unwanted agricultural pesticides at no charge; contact ODA's Pesticide & Fertilizer Section for current opportunities. Planning around a collection event is dramatically cheaper and safer than any improvised solution.

Practice questions

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

1. Which formulation generally poses the greatest inhalation hazard while measuring and mixing?

- A) Soluble liquid (SL)
- B) Wettable powder (WP)
- C) Ready-to-use (RTU)
- D) Emulsifiable concentrate (EC)

2. In the W-A-L-E mixing sequence, emulsifiable concentrates are added:

- A) First, before water
- B) After wettable/dry products and liquids/flowables
- C) Before agitation begins
- D) Only after adjuvants

3. The purpose of a jar test is to:

- A) Measure droplet size
- B) Check physical compatibility of a tank mix before mixing a full tank
- C) Determine soil pH
- D) Calibrate the pump

4. Pesticides must be stored:

- A) In any sealed container
- B) In original labelled containers in a cool, dry, ventilated, secure area
- C) Beside livestock feed for convenience
- D) In a sunny area to prevent freezing

5. In a storage area, dry formulations should be stored:

- A) Below liquid formulations
- B) Above liquid formulations
- C) Mixed with liquids
- D) Outside the building

6. After triple-rinsing an empty container, the rinsate should be:

- A) Poured on the driveway
- B) Added to the spray tank and applied to the labelled site
- C) Poured down a floor drain
- D) Stored indefinitely

7. A rinsed container should then be:

- A) Reused for water storage
- B) Punctured so it cannot be reused, then recycled or disposed per label
- C) Given to a neighbour
- D) Burned on site

8. Which formulations most require continuous agitation in the tank?

- A) Soluble liquids
- B) Suspensions and wettable powders
- C) Ready-to-use products
- D) Granules applied dry

Answer key & explanations

1. B) Wettable powder (WP) — Dry, dusty wettable powders create airborne dust during measuring and mixing — hence the dust/mist respirator requirements on many WP labels.

2. B) After wettable/dry products and liquids/flowables — W-A-L-E: Wettable/dry → Agitate → Liquids/flowables → Emulsifiabiles, with adjuvants generally last. Labels override the general order.

3. B) Check physical compatibility of a tank mix before mixing a full tank — A small-scale jar test in the same mixing order reveals curdling, gelling, layering or sediment before you ruin a full tank.

4. B) In original labelled containers in a cool, dry, ventilated, secure area — Original labelled containers only, in a locked, ventilated, temperature-appropriate area away from food, feed, seed and water.

5. B) Above liquid formulations — Storing dry products above liquids prevents a liquid leak from dripping into and activating or contaminating dry material.

6. B) Added to the spray tank and applied to the labelled site — Rinsate goes into the spray tank so it is applied to the labelled target, avoiding creation of a waste stream.

7. B) Punctured so it cannot be reused, then recycled or disposed per label — Puncture to prevent reuse, then recycle through an ag container programme or dispose as the label directs. Never burn or reuse pesticide containers.

8. B) Suspensions and wettable powders — Suspended solids (SC/F) and wettable powders settle out without agitation, causing uneven application and plugging.

Module 4 — Pesticide Calculations (worked, step by step)

CORE exam · 10 practice questions · Area, rate, tank loads, percent solutions, active ingredient and calibration math — with fully worked examples and unit tricks.

Key numbers & facts to memorise

Acre	43,560 sq ft = 0.4047 ha
Gallon	4 qt = 8 pt = 128 fl oz = 3.785 L
Pound	16 oz = 0.4536 kg
Aerial rate	$GPA = (GPM \times 495) \div (\text{mph} \times \text{swath ft})$
Percent solution	Tank gallons $\times$ percent = gallons of product

The conversions and constants you must know cold

Calculation questions are guaranteed on the CORE exam, and every one is solvable with a handful of facts. Area: **1 acre = 43,560 square feet**; 1 square mile = 640 acres; 1 acre $\approx$ 0.4047 hectare. Liquid volume: **1 gallon = 4 quarts = 8 pints = 128 fluid ounces**; 1 gallon $\approx$ 3.785 litres; 1 fluid ounce $\approx$ 29.6 mL. Weight: **1 pound = 16 ounces** $\approx$ 0.4536 kg. Distance: 1 mile = 5,280 feet; 1 rod = 16.5 feet.

The single most valuable habit is **writing the units at every step and cancelling them**. If your units cancel to "gallons," your arithmetic path is right; if they cancel to "gallons per acre squared," you multiplied where you should have divided. This one discipline converts calculation questions from memory tests into bookkeeping, and it works even when the question is phrased in a way you have never seen.

Practise reading numbers off a label rather than out of a textbook, because that is how the exam presents them. A rate might be given as "1.5 pints per acre," "24 fluid ounces per acre," or "0.75 pound active ingredient per acre" — three different arithmetic paths to the same kind of answer, and you should be fluent in all three.

Area, total product and tank loads — a full worked example

Start with a rectangular field 1,320 feet by 660 feet. Area = $1,320 \times 660 = 871,200$ square feet. Divide by 43,560 $\rightarrow$ **20 acres**. (Recognise 1,320 ft as a quarter mile and 660 ft as an eighth — these round numbers appear constantly on exams.) For irregular fields, break the shape into rectangles and triangles (triangle = $\frac{1}{2} \times \text{base} \times \text{height}$) and total the pieces.

Now scale a rate. Suppose the label rate is **1.5 pints per acre** and your field is **120 acres**. Total product = $1.5 \times 120 =$ **180 pints**. Convert: $180 \div 8 =$ **22.5 gallons** of product for the job. Next, spray volume: at **2 gallons per acre** carrier, total mix = $2 \times 120 =$ **240 gallons**.

Finally, tank loads for a drone with a **10.5-gallon** tank. $\text{Loads} = 240 \div 10.5 = 22.9$, so **23 loads**. Acres per tank = $10.5 \div 2 = \mathbf{5.25 \text{ acres}}$. Product per full tank = $5.25 \times 1.5 = \mathbf{7.9 \text{ pints}}$ (about 126 fl oz). Every tank-mix question on the exam is a rearrangement of these four steps: area, total product, total mix, and per-tank quantities.

Percent solutions, active ingredient and dilutions

A **percent solution** means parts of product per hundred parts of finished mix. To mix a 2% solution in a 25-gallon tank: $25 \times 0.02 = \mathbf{0.5 \text{ gallon}}$ (64 fluid ounces) of product, topped to 25 gallons. The same logic in reverse tells you the concentration of a mix you have already made — product volume divided by total volume.

For **pounds of active ingredient**, read the label's a.i. content. If a product contains **4 pounds a.i. per gallon** and you apply 1 quart per acre, that is $0.25 \text{ gallon} \times 4 = \mathbf{1.0 \text{ pound a.i. per acre}}$. Going the other way: to apply 0.5 lb a.i./A with a 4 lb/gal product you need 0.125 gallon (16 fl oz) per acre. Dry formulations work the same way using the percentage: 2 pounds of a 75% WP supplies 1.5 pounds a.i.

Exams also test dilution scaling: if a rate is given per 1,000 square feet and you need it per acre, multiply by 43.56 (because an acre is 43,560 sq ft). This is a common trap in turf and ornamental questions, and the arithmetic is trivial — but only if you notice the units changed.

Calibration math and the drone-specific formula

Calibration is the procedure that proves your equipment actually delivers the label rate. The general approach is the same for any sprayer: measure output over a known area or time, compare to your target, then adjust flow, speed or swath until measured equals labelled. Recalibrate after any change to nozzles, atomiser settings, height, speed or payload — and record the result, because a calibration log is powerful evidence that you applied correctly.

For aerial and drone application the working formula is **GPA = (gallons per minute × 495) ÷ (mph × swath in feet)**. The 495 constant converts units so the answer lands in gallons per acre. Example: 1.6 gal/min at 15 mph with a 20-foot effective swath gives $(1.6 \times 495) \div (15 \times 20) = 792 \div 300 = \mathbf{2.64 \text{ GPA}}$. Rearrange the same equation to solve for the flow rate you need at a target GPA, which is how you set up before a job rather than discovering the error afterwards.

Two cautions the exam rewards. First, use **effective** swath, not the physical boom width — the edges of the pattern receive less deposit, so effective swath is narrower and your planned overlap depends on it. Second, verify with water-sensitive paper laid across the swath at canopy height at least once per season; it shows droplet density and pattern uniformity, which no arithmetic can confirm on its own.

Practice questions

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

1. How many square feet are in one acre?

- A) 10,000
- B) 43,560
- C) 5,280
- D) 640

2. A field measures 1,320 ft by 660 ft. How many acres is it?

- A) 10 acres
- B) 20 acres
- C) 30 acres
- D) 40 acres

3. The label rate is 1.5 pt/A. How much product does a 120-acre field require?

- A) 90 pints
- B) 180 pints (22.5 gallons)
- C) 240 pints
- D) 120 pints

4. You are applying 2 GPA to 120 acres with a 10.5-gallon tank. How many tank loads?

- A) 12
- B) 18
- C) 23
- D) 30

5. How much product makes a 2% solution in a 25-gallon tank?

- A) 0.25 gallon
- B) 0.5 gallon (64 fl oz)
- C) 1 gallon
- D) 2 gallons

6. A product contains 4 lb active ingredient per gallon. Applying 1 quart per acre delivers:

- A) 0.5 lb a.i./A
- B) 1.0 lb a.i./A
- C) 2.0 lb a.i./A
- D) 4.0 lb a.i./A

7. Using $GPA = (GPM \times 495) \div (mph \times \text{swath ft})$, what is the rate at 1.6 GPM, 15 mph, 20-ft swath?

- A) 1.32 GPA
- B) 2.64 GPA
- C) 5.28 GPA
- D) 0.66 GPA

8. How many fluid ounces are in a gallon?

- A) 64
- B) 96
- C) 128
- D) 160

9. Calibration should be repeated:

- A) Only when you buy the sprayer
- B) After any change to nozzles, speed, height or payload
- C) Once a decade
- D) Only if the tank leaks

10. 2 pounds of a 75% wettable powder supplies how much active ingredient?

- A) 0.75 lb
- B) 1.5 lb
- C) 2.0 lb
- D) 2.75 lb

Answer key & explanations

- 1. **B)** 43,560 — One acre = 43,560 square feet. (5,280 is feet per mile; 640 is acres per square mile.)
- 2. **B)** 20 acres — $1,320 \times 660 = 871,200$ sq ft; $871,200 \div 43,560 = 20$ acres.
- 3. **B)** 180 pints (22.5 gallons) — $1.5 \times 120 = 180$ pints; $180 \div 8$ pt/gal = 22.5 gallons.
- 4. **C)** 23 — Total mix = $2 \times 120 = 240$ gal; $240 \div 10.5 = 22.9$, so 23 loads.
- 5. **B)** 0.5 gallon (64 fl oz) — $25 \times 0.02 = 0.5$ gallon of product, topped off to 25 gallons of finished mix.
- 6. **B)** 1.0 lb a.i./A — 1 quart = 0.25 gallon; 0.25×4 lb/gal = 1.0 lb a.i. per acre.
- 7. **B)** 2.64 GPA — $(1.6 \times 495) \div (15 \times 20) = 792 \div 300 = 2.64$ gallons per acre.
- 8. **C)** 128 — 1 gallon = 128 fluid ounces = 8 pints = 4 quarts.
- 9. **B)** After any change to nozzles, speed, height or payload — Any change that affects flow, speed or swath changes the delivered rate — recalibrate and log it.
- 10. **B)** 1.5 lb — 2 lb $\times 0.75 = 1.5$ pounds of active ingredient.

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.

Module 6 — Applicator Safety, Transport, Spills & Emergency Response

CORE exam · 8 practice questions · Safe transport, mix-and-load discipline, backflow prevention, the three Cs of spill response, heat illness, and drone-specific battery and site hazards.

Key numbers & facts to memorise

Transport	Cargo area, upright, secured, original labelled containers — never the cab
Backflow	Keep fill hose above the tank water line, or use a check valve
Spill response	Control → Contain → Clean up. Never flush to drain or water
ODA incidents	614-728-6987
Batteries	Never charge unattended; retire swollen or damaged packs

Transporting pesticides legally and safely

Most pesticide incidents that make the local news happen on the road, not in the field. Transport product in **original, labelled containers**, secured upright so containers cannot tip, slide or be punctured, and carried in the **cargo area — never in the passenger cab**, where a leak fills the space you are breathing. Separate pesticides from food, feed, seed, fertiliser and PPE, and never transport them with passengers or animals in the same compartment.

Inspect before you drive. Check caps, seams and bungs; look for weeping or crusted residue around closures; make sure the load is blocked so it cannot shift under braking. Carry a basic spill kit in the vehicle — absorbent, a scoop, a sealable labelled container, gloves, eye protection, clean water and soap — because a spill twenty miles from the shop is the exact scenario the kit exists for. Never leave a loaded vehicle unattended and unlocked where the public can reach the product.

Larger quantities may trigger **Department of Transportation hazardous-materials** requirements including shipping papers, placarding and driver training. Thresholds depend on the product's hazard class and the quantity carried; if you routinely move drums or totes, confirm your obligations rather than assuming farm use exempts you. The relevant exam point is simpler: know that transport rules exist, that original containers and secure upright loading are required, and that the cab is not a storage area.

Mixing, loading and protecting the water source

Mixing and loading is the highest-exposure task of the day because you are handling undiluted concentrate. Do it **outdoors or in a well-ventilated area**, standing upwind, wearing the label's mixing PPE (which is often stricter than the application PPE), at a height that keeps splashes below your face. Use dedicated measuring equipment that never goes back to household use, and pour at a controlled rate rather than glugging from a full jug.

Site selection matters as much as technique. Mix and load **away from wells, sinkholes, tile inlets, ditches and surface water**, and preferably on a surface where a spill can be recovered rather than soaking straight into a gravel drive next to a wellhead. Rotating your mix/load location across a field prevents the concentration of residues that comes from using the same spot every time.

Prevent **back-siphoning** — the most under-appreciated contamination pathway on any farm. Keep the fill hose end **above the water line in the tank (an air gap)**, or use an approved anti-backflow device or check valve. Never submerge the fill hose in the mix. If the pump loses pressure while the hose is submerged, tank contents can be drawn back into the well or hydrant system, which turns a routine fill into a drinking-water contamination event.

The three Cs: control, contain, clean up

Spill response is a rehearsed sequence, not an improvisation. **Control**: protect yourself first with PPE, stop the source — upright the container, close the valve, plug the leak — and keep people, children and animals well back. **Contain**: prevent spread using absorbent material, a soil or sand berm, or a shovelled dike, working to keep the spill away from any drain, ditch, tile inlet or water body. **Clean up**: sweep or absorb the material, place it in a sealable, labelled container, and dispose of it as the label directs; decontaminate the surface and your equipment.

Never rinse a spill into a storm drain, ditch, waterway or field tile — that converts a contained problem into a reportable water-contamination event. Do not walk away from a spill to fetch supplies if you can avoid it, which is the practical argument for a kit in every vehicle. Document what happened: product, quantity, location, time, what you did, and photographs. That record protects you later far more than it exposes you.

Know when to escalate. Significant spills, spills that reach or threaten water, and any spill involving injury require notification. In Ohio, contact **ODA Pesticide & Fertilizer Regulation at 614-728-6987**; use **CHEMTREC 1-800-424-9300** for transport emergencies, **Poison Help 1-800-222-1222** for exposure, and **911** for anything with immediate injury or fire. Post these numbers in the shop and save them in the phone you actually carry.

Heat, fatigue and drone-specific hazards

PPE and August do not cooperate. Wearing chemical-resistant clothing suppresses evaporative cooling and sharply raises the risk of **heat exhaustion and heat stroke**, whose early symptoms — headache, nausea, dizziness, weakness — are nearly identical to early pesticide poisoning. Because you cannot reliably tell them apart in the field, treat the symptoms seriously either way: stop, get to shade, decontaminate, hydrate, and get medical evaluation if symptoms do not resolve quickly. Schedule spraying for cooler hours, drink before you are thirsty, and rotate crew.

Fatigue is the quiet risk in drone operations, because the work rewards long days during narrow weather windows. Sustained attention degrades measurably after hours of repetitive flight lines, and the errors it produces — a missed buffer, a wrong tank, a forgotten flow shut-off at a turn — are exactly the errors with regulatory consequences. Build in breaks and a hard stop, and use checklists precisely because checklists work when attention does not.

Drone-specific hazards deserve their own habits. **Lithium polymer batteries** should be charged per manufacturer guidance, never unattended, never near flammables, with a suitable extinguisher available; swollen, punctured or damaged packs must be retired from service rather than nursed through one more

field. Spinning propellers on agricultural-scale aircraft cause serious lacerations — establish and enforce a takeoff/landing exclusion zone. Add power lines, guy wires, grain legs, irrigation pivots and overhead cables to your site survey, and treat the mixing station, the landing pad and the tank as three separate contamination-control zones so you are not carrying concentrate onto the controller you hold all day.

Practice questions

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

1. Pesticides being transported should be carried:

- A) In the passenger cab within reach
- B) Secured upright in the cargo area in original labelled containers
- C) Loose in the truck bed
- D) Mixed with feed to save space

2. To prevent back-siphoning while filling a spray tank you should:

- A) Submerge the fill hose fully
- B) Keep the hose end above the tank water line, or use an anti-backflow device
- C) Fill as fast as possible
- D) Remove all screens and valves

3. The correct order of spill response is:

- A) Clean up, contain, control
- B) Control, contain, clean up
- C) Contain, clean up, control
- D) Report, rinse, resume

4. A spill should never be:

- A) Contained with absorbent
- B) Photographed and documented
- C) Washed into a storm drain, ditch, tile inlet or waterway
- D) Reported when significant

5. Mixing and loading should be done:

- A) Next to the wellhead for convenience
- B) Away from wells, sinkholes, tile inlets and surface water
- C) Inside the closed cab
- D) Downwind of yourself

6. Early heat illness and early pesticide poisoning are difficult to distinguish because:

- A) Both cause frostbite
- B) Both can cause headache, nausea, dizziness and weakness
- C) Neither has symptoms
- D) Both cause fever only

7. A swollen lithium polymer drone battery should be:

- A) Charged more slowly
- B) Retired from service and disposed of properly
- C) Punctured to relieve pressure
- D) Used until it fails

8. The Ohio number for pesticide regulatory questions and incidents is:

- A) 614-728-6987 (ODA Pesticide & Fertilizer Regulation)
- B) 1-800-222-1222
- C) 1-800-424-9300
- D) 614-292-4070

Answer key & explanations

- 1. B)** Secured upright in the cargo area in original labelled containers — Cargo area only, secured upright, original labelled containers, separated from food, feed and seed.
- 2. B)** Keep the hose end above the tank water line, or use an anti-backflow device — An air gap or approved check valve prevents tank contents being drawn back into the water source if pressure drops.
- 3. B)** Control, contain, clean up — Control the source, contain the spread away from water, then clean up into a sealable labelled container.
- 4. C)** Washed into a storm drain, ditch, tile inlet or waterway — Flushing a spill to water turns a contained incident into a reportable contamination event.
- 5. B)** Away from wells, sinkholes, tile inlets and surface water — Keep mix/load sites away from water access points, and rotate locations to avoid concentrating residues.
- 6. B)** Both can cause headache, nausea, dizziness and weakness — Because the presentations overlap, treat symptoms seriously: stop work, cool, decontaminate and seek evaluation.
- 7. B)** Retired from service and disposed of properly — Swollen or damaged packs are a fire risk and must be removed from service, never nursed along.
- 8. A)** 614-728-6987 (ODA Pesticide & Fertilizer Regulation) — ODA Pesticide & Fertilizer Regulation: 614-728-6987. Poison Help is 1-800-222-1222; CHEMTREC 1-800-424-9300; OSU PSEP 614-292-4070.

Module 7 — Environmental Protection, Water, Pollinators & Endangered Species

CORE exam · 9 practice questions · Drift and runoff, leaching and groundwater, the pollinator protection box, endangered species bulletins, and Ohio-specific nutrient and water rules.

Key numbers & facts to memorise

Four pathways	Drift · Runoff · Leaching · Volatilisation
Leaching risk	Sandy, low-OM soil, shallow water table, soluble persistent product
Inversion	Calm stable air traps fine droplets — do not spray
Pollinators	Avoid blooming plants when bees forage; spray evening/night/early morning
Endangered species	Bulletins Live! Two — obtain within 6 months of application

How pesticides move off target — the four pathways

Everything that goes wrong environmentally is one of four movements. **Drift** is airborne movement of droplets or vapour during or shortly after application. **Runoff** is surface movement in water across the soil, typically after rain on saturated or compacted ground. **Leaching** is downward movement through the soil profile toward groundwater. **Volatilisation** is conversion to vapour after application, which can carry a product off target hours later on a warm, still afternoon.

Each pathway has predictable drivers. Drift is worst with fine droplets, high release height, high wind — or, counterintuitively, **near-zero wind under a temperature inversion**, where fine droplets hang in a stable layer and then move as a concentrated cloud when the inversion breaks. Runoff rises with slope, rainfall intensity, bare soil and low infiltration. Leaching rises with **sandy, coarse soils, low organic matter, shallow water tables, high rainfall or irrigation, and products that are highly water-soluble and persistent**.

The management levers are equally predictable, which is what makes this examinable. Increase droplet size, lower the release height, respect the label's wind range, avoid inversions, use downwind buffers, avoid application before heavy rain, maintain vegetative filter strips near water, and choose products with lower solubility and shorter persistence where groundwater is vulnerable. Sensitive-area awareness — wells, sinkholes, tile inlets, ponds, streams, wetlands, schools, apiaries, organic and specialty-crop neighbours — belongs on your pre-application checklist, not in your memory.

Pollinator protection is now explicit on labels

Many insecticide labels carry a **Protection of Pollinators** box marked with a bee icon, and its restrictions are enforceable label language. Typical directives prohibit application to blooming crops or weeds when bees are foraging, restrict application to specific hours, or require notification of beekeepers within a set distance. Read the box before you plan the timing, because it frequently changes what "legal" looks like for a field that is already flowering.

Practical bee stewardship goes beyond the box. Apply in the **late evening, at night, or in early morning** when foraging is minimal; mow or control blooming weeds in the target area before spraying; use larger droplets and avoid dusts and micro-encapsulated formulations, which bees can carry back to the hive as if they were pollen; and choose products and formulations with lower bee toxicity where an equally effective option exists.

Communication prevents most incidents. Learn where the hives are within a couple of miles, exchange phone numbers with beekeepers, and give notice before you spray a bloom-adjacent field so hives can be closed or moved. Ohio maintains an **apiary registration** programme through ODA, and honey bee colonies must be registered annually with the department — a courtesy call is both good neighbouring and good liability management.

Endangered species, Bulletins Live! Two, and buffers

Federal law requires EPA to ensure registered pesticide use does not jeopardise **federally listed threatened and endangered species** or their critical habitat. EPA implements this partly through **Endangered Species Protection Bulletins** delivered by the **Bulletins Live! Two** system at epa.gov/endangered-species/bulletins. When a label references a bulletin, that bulletin becomes enforceable label language for the county and month in which you apply.

The mechanics matter for compliance. Bulletins are county-specific and month-specific, and you must obtain the bulletin **no more than six months before** the application. Keep the bulletin (or a screenshot) with your application record — it is the only way to prove you checked the version in force on the day. Bulletins may impose buffers around habitat, timing windows, or outright prohibitions on specific active ingredients.

Newer labels increasingly add **runoff and erosion mitigation menus** and **downwind spray-drift buffer distances** tied to droplet size, application height and boom width. For drone applicators this cuts both ways: your low release height and ability to fly precisely means you can respect a narrow buffer accurately, but a coarse droplet requirement may force an atomiser setting you were not planning to use. Read those sections before you quote the job, not after you have loaded the tank.

Ohio-specific water and nutrient context

Ohio applicators operate inside an unusually active water-quality policy environment because of harmful algal blooms in Lake Erie and Grand Lake St. Marys. While those rules primarily target **fertiliser** rather than pesticides, the two regulatory systems intersect for many custom applicators, and exam questions in Ohio commonly test whether you know the difference between a pesticide licence and a **fertiliser applicator certification**.

Ohio requires **fertiliser applicator certification** for those applying fertiliser to more than 50 acres of agricultural production grown primarily for sale — a separate credential from a pesticide licence, administered by ODA. In the Western Lake Erie Basin, Ohio Revised Code 905.326 additionally restricts

surface application of nutrients on snow-covered or frozen ground, on saturated soil, or when the forecast calls for a defined amount of precipitation within a set window. If you offer both services, you need both credentials and both sets of timing rules.

Beyond statute, several habits reduce real risk and read well to a regulator: keep application setbacks from wells and surface water even where the label does not require them, avoid mixing and loading near a wellhead or a tile inlet, use nurse tanks with anti-backflow protection, and document weather at the time of application. In the event of a complaint, contemporaneous weather and setback notes in your record are the difference between a conversation and an enforcement action.

Practice questions

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

1. Which soil condition most increases the risk of pesticide leaching to groundwater?

- A) Heavy clay with high organic matter
- B) Sandy soil with low organic matter and a shallow water table
- C) Compacted subsoil
- D) Frozen ground

2. A temperature inversion increases drift risk because:

- A) Wind speeds are high
- B) Fine droplets remain suspended in a stable layer and can move off target as a concentrated cloud
- C) It raises soil temperature
- D) It increases droplet size

3. To protect pollinators, the best time to apply an insecticide to a blooming field is:

- A) Midday when bees are most active
- B) Late evening, night, or early morning when bees are not foraging
- C) Any time — bees avoid sprayers
- D) Only during rain

4. Endangered species protection bulletins are obtained from:

- A) The product manufacturer
- B) EPA's Bulletins Live! Two system
- C) Your county auditor
- D) The FAA

5. An endangered species bulletin must be obtained no more than:

- A) One week before application
- B) Six months before application
- C) Two years before application
- D) After the application

6. Runoff risk is highest when:

- A) Soil is dry and freshly tilled with no rain forecast
- B) Soil is saturated or compacted and heavy rain is expected
- C) Wind is calm
- D) Humidity is low

7. In Ohio, applying fertiliser to more than 50 acres of agricultural production for sale requires:

- A) No credential
- B) A fertiliser applicator certification from ODA
- C) Only a pesticide licence
- D) A CDL

8. Volatilisation refers to:

- A) Downward movement through soil
- B) Conversion of pesticide to vapour that can move off target after application
- C) Runoff in surface water
- D) Breakdown by sunlight

9. Which practice best reduces pesticide movement into surface water?

- A) Applying just before heavy rain
- B) Maintaining vegetative filter strips and setbacks near water
- C) Increasing spray pressure
- D) Reducing droplet size

Answer key & explanations

1. B) Sandy soil with low organic matter and a shallow water table — Coarse, sandy soils with little organic matter and shallow groundwater allow water-soluble, persistent products to move downward.

2. B) Fine droplets remain suspended in a stable layer and can move off target as a concentrated cloud — Under an inversion, cool air is trapped near the ground and fine droplets do not disperse — they drift as a concentrated mass.

3. B) Late evening, night, or early morning when bees are not foraging — Apply outside foraging hours, and control blooming weeds in the area beforehand.

4. B) EPA's Bulletins Live! Two system — Bulletins Live! Two provides county- and month-specific bulletins that become enforceable label language.

5. B) Six months before application — Bulletins must be obtained within six months before the application and retained with your records.

6. B) Soil is saturated or compacted and heavy rain is expected — Saturated or compacted soil cannot infiltrate, so rainfall moves product across the surface.

7. B) A fertiliser applicator certification from ODA — Fertiliser applicator certification is a separate ODA credential from a pesticide applicator licence.

8. B) Conversion of pesticide to vapour that can move off target after application — Volatilisation is vapour movement, which can occur hours after application on warm days.

9. B) Maintaining vegetative filter strips and setbacks near water — Vegetative buffers and setbacks intercept runoff before it reaches surface water.

Module 8 — Pest Identification, IPM & Resistance Management

CORE exam · 9 practice questions · Why identification comes first, how thresholds and scouting work, the IPM tactic hierarchy, modes of action, and how resistance actually develops.

Key numbers & facts to memorise

Step one	Correct pest identification
Economic threshold	LOWER than the economic injury level
Tactics	Cultural · Mechanical/physical · Biological · Chemical
Resistance	Rotate MODES OF ACTION (HRAC/WSSA, IRAC, FRAC) — not brand names
Rate cutting	Sub-lethal rates ACCELERATE resistance

Identification first — everything else depends on it

Correct **pest identification** is the first step of every pest management decision, and the most common cause of a failed application is not a bad product but a misidentified target. A grass herbicide will not control a sedge. A fungicide will not fix a nutrient deficiency that looks like disease. An insecticide timed to a larval stage does nothing to eggs. Before you choose chemistry, name the organism and know its life stage.

Practical identification means using resources rather than guessing: extension diagnostic guides, the OSU Extension plant and pest diagnostic clinic, regional pest alerts, and photographs of damage patterns. Distinguish the **pest** from the **damage symptom** — chewed leaves narrow the field but do not name the insect — and remember that most organisms in a field are neutral or beneficial. Predators, parasitoids and pollinators are the reason broad-spectrum insecticides sometimes make a pest problem worse in the following weeks.

Also identify the **site**, not just the pest. The crop, growth stage, soil type, neighbouring sensitive crops and the interval to harvest all constrain your options before the product label is even open. This is exactly the reasoning path exam questions follow: identify the pest, identify the site, check the label, then decide.

Economic thresholds, scouting and the decision to spray

Integrated Pest Management (IPM) is a decision system, not an ideology: use monitoring and multiple tactics to hold pests below economically damaging levels while minimising cost, resistance and non-target harm. Two definitions carry most of the exam weight. The **economic injury level (EIL)** is the pest density at which the cost of damage equals the cost of control. The **economic threshold (ET)**, or action threshold, is the density at which you must act to prevent reaching the EIL — necessarily **lower** than the EIL, because control takes time to work.

Scouting is what makes thresholds usable. Walk a defined pattern, sample enough locations to represent the field, count rather than impress yourself, and record what you find with the date and growth stage. Sweep nets, sticky cards, pheromone traps, soil sampling and simple plant counts all have their place. Over a season, records turn into a map of where problems recur, which is worth more than any single scouting trip.

The decision to spray then becomes arithmetic rather than reflex: expected yield loss × crop value versus product plus application cost, adjusted for the probability that conditions favour the pest. Sometimes the answer is a targeted spot treatment of ten acres rather than a blanket pass over 300. Drone application is unusually well suited to that answer, and it is a legitimate selling point — precision where a threshold has actually been crossed.

The IPM tactic hierarchy

Cultural controls change the environment so the pest does less well: crop rotation, resistant varieties, planting date adjustment, sanitation, tillage decisions, row spacing, irrigation timing and fertility management. These are cheap, durable and cumulative, and they are the answer to a surprising number of exam questions that appear to be about chemicals.

Mechanical and physical controls remove or exclude the pest directly — cultivation, mowing, hand-removal, barriers, traps, screens, mulches. **Biological** controls use natural enemies: conserving resident predators and parasitoids, releasing commercially reared beneficials, or applying microbial products such as *Bacillus thuringiensis*. Conservation of what is already present is usually more cost-effective than releases.

Chemical control is one tool inside the system, used when monitoring shows a threshold has been crossed and non-chemical tactics are insufficient. Deployed that way, chemistry stays effective for years. Deployed as the only tactic on a calendar schedule, it selects hard for resistance and often for secondary pest outbreaks when natural enemies are removed.

Modes of action and resistance management

Resistance is the inherited ability of a pest population to survive an application that previously controlled it. The mechanism is straightforward natural selection: a few individuals carry genes that let them survive, they reproduce, and repeated use of the same chemistry raises their share of the population until the product appears to stop working. The product did not weaken; the population changed.

The single most important management principle is to **rotate modes of action, not just product names**. Two differently branded products can share one mode of action, and rotating between them provides no resistance benefit whatsoever. Use the classification codes: **HRAC/WSSA groups** for herbicides, **IRAC** for insecticides, **FRAC** for fungicides. These group numbers are printed on modern labels precisely so you can rotate meaningfully.

Layer the other tactics. Apply **full labelled rates** — cutting rates leaves survivors and accelerates selection. Use **tank mixes or premixes with two effective modes of action** against the same pest where appropriate. Include non-chemical tactics so chemistry is not carrying the whole load. Control escapes and weed seed before they set seed. Preserve refuges of untreated susceptible individuals where the crop system allows. And scout after application: an unexplained control failure is worth investigating rather than repeating, because the response to real resistance is a different mode of action, not a higher rate of the

same one.

Practice questions

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

1. The first step in any pest management decision is:

- A) Choosing a pesticide
- B) Correctly identifying the pest
- C) Calibrating the sprayer
- D) Filing a record

2. The economic threshold is:

- A) Higher than the economic injury level
- B) Lower than the economic injury level
- C) The same as the economic injury level
- D) Unrelated to pest density

3. The economic injury level is the pest density at which:

- A) Any pest is present
- B) The cost of damage equals the cost of control
- C) The crop dies
- D) Scouting begins

4. Which is a cultural control?

- A) Applying an insecticide
- B) Crop rotation and resistant varieties
- C) Releasing lady beetles
- D) Hand-pulling weeds

5. Releasing or conserving natural enemies of a pest is:

- A) Cultural control
- B) Biological control
- C) Mechanical control
- D) Chemical control

6. The most effective way to delay pesticide resistance is to:

- A) Use the same product every application
- B) Rotate modes of action, not just product brands
- C) Reduce the rate below the label
- D) Spray on a fixed calendar

7. Applying less than the labelled rate to save money:

- A) Reduces resistance risk
- B) Increases resistance risk by leaving survivors
- C) Has no effect on resistance
- D) Is required by IPM

8. HRAC/WSSA, IRAC and FRAC codes on a label indicate:

- A) Signal word category
- B) Mode-of-action group for resistance management
- C) Re-entry interval
- D) Storage temperature

9. In IPM, chemical control is best described as:

- A) The first tactic to try
- B) One tool used when monitoring shows a threshold has been crossed
- C) Never acceptable
- D) Required annually

Answer key & explanations

1. B) Correctly identifying the pest — Identification drives every subsequent choice — product, timing, rate and whether treatment is needed at all.

2. B) Lower than the economic injury level — The threshold is set below the EIL so control can be applied before economic damage occurs.

3. B) The cost of damage equals the cost of control — At the EIL, damage cost equals control cost — above it, treatment pays for itself.

4. B) Crop rotation and resistant varieties — Cultural controls modify the growing environment: rotation, variety selection, planting date, sanitation and fertility.

5. B) Biological control — Biological control uses predators, parasitoids and pathogens, including microbial products like Bt.

6. B) Rotate modes of action, not just product brands — Different brands can share a mode of action. Rotate using HRAC/WSSA, IRAC or FRAC group numbers.

7. B) Increases resistance risk by leaving survivors — Sub-lethal doses let partially resistant individuals survive and reproduce, accelerating selection.

8. B) Mode-of-action group for resistance management — These group codes let you rotate genuinely different modes of action rather than different brand names.

9. B) One tool used when monitoring shows a threshold has been crossed — IPM integrates cultural, mechanical, biological and chemical tactics, with chemistry applied on the basis of monitoring.

Module 9 — Category 1 Aerial: Drone Spray Technique, Droplet Size & Drift

Category 1 (Aerial) exam · 10 practice questions · What Category 1 (Aerial) actually tests, how rotor downwash changes deposition, droplet-size classes, swath and overlap, and the aerial-specific label language.

Key numbers & facts to memorise

Droplet classes	Fine 106–235 µm · Medium 236–340 · Coarse 341–403 · Very Coarse 404–502 µm
Rule of thumb	Coarsest droplet that still achieves efficacy, within label limits
Downwash	Drives droplets into the canopy — enables low carrier volumes
Effective swath	Narrower than the boom; determine it empirically, plan overlap on it
Verify with	Water-sensitive paper across the swath at canopy height

What Category 1 (Aerial) covers, and where uncrewed aircraft fit

Ohio's **Category 1** is agricultural pest control, and it is subdivided — **1a** is field crops, **1b** fruit and vegetable crops, **1c** ornamentals and turf grown for sale, and so on, with **Category 1 Aerial** covering pesticide application from aircraft. ODA has treated uncrewed aerial spray application as falling within the aerial category, which means a drone spray business needs the aerial credential alongside CORE, not merely a ground-application category. Confirm your exact category set with ODA for the crops and sites you intend to serve, because a mixed operation (field crops plus horticultural crops plus turf) can require several category exams.

The aerial exam content differs from ground categories in emphasis rather than in kind. You are still tested on identifying agricultural pests, selecting products, reading labels and calculating rates — but with added weight on **aerial application equipment, droplet-size control, swath determination, drift management, buffer zones, and the interaction between aircraft operation and pesticide law**. If you have already passed CORE, the aerial exam feels like CORE's drift and calibration sections expanded into a full paper.

A practical note that catches new operators: passing the pesticide exam does not authorise you to fly the aircraft, and holding an FAA certificate does not authorise you to apply pesticide. The two systems are independent and both are mandatory. Module 9 covers the aviation side; the important framing here is that the ODA exam will test the pesticide half and will assume you have handled the aviation half separately.

Rotor downwash: the physics that makes drone spraying different

A multirotor drone does not simply carry nozzles over a crop — it generates a column of downward-moving air that actively pushes droplets into the canopy. This **downwash** is the reason drones frequently achieve better canopy penetration and underleaf coverage than a ground boom at comparable volumes, and it is why drone application can work at very low carrier volumes (often 1–3 gallons per acre) that would give poor coverage from a ground rig.

Downwash also creates hazards that do not exist for ground equipment. Flying too low compresses the vortex and can blast droplets laterally out of the swath or bounce them off the ground; flying too high lets the downwash dissipate before it reaches the canopy, leaving fine droplets exposed to ambient wind. There is a practical height window — commonly around 6 to 12 feet above the canopy for typical agricultural multirotors, with the manufacturer's guidance controlling — and both edges of that window degrade the application in different ways.

Speed interacts with all of it. Faster flight narrows the effective time each point spends under the rotor column, thins deposition and can leave streaking; slower flight increases deposit but reduces acres per hour and can over-apply at turns if the flow controller does not compensate. Modern flight controllers with flow-rate/speed linkage handle most of this, but you should still verify with **water-sensitive paper** laid across the swath at canopy height, because paper shows streaking, gaps and droplet density that no telemetry screen reports.

Droplet size classes, and the trade-off you manage on every job

Droplet size is measured in **microns** and classified by ASABE S572 categories: **Extremely Fine, Very Fine, Fine (roughly 106–235 µm), Medium (236–340 µm), Coarse (341–403 µm), Very Coarse (404–502 µm), Extremely Coarse (503–665 µm)** and Ultra Coarse. Labels increasingly specify a minimum droplet class — "apply as Medium or Coarser" — and that instruction is enforceable, so it constrains your atomiser or nozzle selection before anything else does.

The trade-off is unavoidable and it is the heart of the aerial exam. **Smaller droplets give better coverage and better contact-product efficacy but drift far more**; larger droplets resist drift but reduce the number of impact points per leaf and can run off waxy surfaces. Fine droplets suit contact fungicides and insecticides where coverage drives performance; coarse droplets suit systemic herbicides and any application near a sensitive downwind neighbour. The correct answer to "what droplet size should I use" is always "the coarsest size that still achieves biological efficacy, within what the label allows."

Control levers on a rotary-atomiser drone are the atomiser RPM (higher RPM produces finer droplets), the flow rate, and on nozzle-equipped systems the nozzle type and pressure. Adding a **drift-reduction adjuvant (DRA)** shifts the spectrum coarser by increasing viscosity — useful, but not a substitute for correct settings, and only where the label permits. Verify the actual spectrum with water-sensitive paper rather than trusting the setting alone.

Swath, overlap, buffers and the aerial label language

Your **effective swath** is narrower than the physical boom or the manufacturer's headline figure, because deposition tapers at the pattern edges. Determining effective swath empirically — laying paper or collectors perpendicular to the flight line and finding where deposition falls below an acceptable fraction of the centre — is the single highest-value calibration exercise in aerial application. Overlap is then planned as a percentage of that effective swath, commonly on the order of 10–30% depending on the pattern, so adjacent passes sum to a uniform rate.

Field geometry drives the rest. Fly perpendicular to the wind where possible so drift moves along the swath rather than across it, and always **plan the downwind edge first**: the pass adjacent to a sensitive boundary should be flown with the buffer already respected, not corrected afterwards. Set headland turns outside the treated area, and confirm that the flight controller stops flow during turns and ferry legs — an uncontrolled turn is a double-rate strip and a common source of crop injury complaints.

Read the label's aerial section as a distinct document. Modern agricultural labels contain aerial-specific language on **release height, minimum droplet size, boom length as a fraction of wingspan or rotor span, wind speed limits, temperature-inversion prohibitions, and downwind buffer distances to sensitive sites**. Several also require that spray be released no higher than a stated distance above the crop. These are not best practices; they are the terms under which the application is legal, and they are exactly what an ODA inspector reads alongside your record.

Finally, document the conditions. Record wind speed and direction, temperature, humidity, start and end times, droplet class or atomiser setting, release height, effective swath and the buffer you observed. A drone gives you telemetry logs that most ground applicators cannot produce; using them turns a drift complaint from an argument into a review of data. That evidentiary advantage is a genuine competitive asset and costs nothing but the habit.

Practice questions

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

1. Compared with larger droplets, smaller spray droplets:

- A) Drift less and cover less
- B) Drift more but provide better coverage
- C) Drift less and cover more
- D) Have no effect on drift

2. Under the ASABE S572 classification, "Medium" droplets are approximately:

- A) Under 100 μm
- B) 236–340 μm
- C) 404–502 μm
- D) Over 700 μm

3. Rotor downwash on a spray drone primarily:

- A) Increases drift in all cases
- B) Drives droplets down into the canopy, improving penetration
- C) Cools the pesticide
- D) Reduces the need for calibration

4. Flying too high above the canopy tends to:

- A) Improve canopy penetration
- B) Let downwash dissipate and expose fine droplets to ambient wind
- C) Eliminate drift
- D) Increase droplet size

5. Effective swath width is:

- A) The same as the physical boom width
- B) Narrower than the boom, determined by where deposition falls off
- C) Always 30 feet
- D) Set by the FAA

6. The best tool for verifying droplet density and pattern uniformity in the field is:

- A) The flight controller display
- B) Water-sensitive paper placed across the swath at canopy height
- C) A rain gauge
- D) The product label

7. When spraying next to a sensitive downwind neighbour, you should:

- A) Fly the downwind edge last and correct as needed
- B) Plan and respect the label buffer on the downwind edge before you start
- C) Increase atomiser RPM for finer droplets
- D) Ignore wind direction

8. A drift-reduction adjuvant works by:

- A) Lowering the boom
- B) Increasing spray viscosity to shift the droplet spectrum coarser
- C) Reducing the label rate
- D) Cooling the tank

9. If the label states "apply as Medium or Coarser," that instruction is:

- A) A recommendation you may ignore
- B) Enforceable label language you must follow
- C) Only for fixed-wing aircraft
- D) Optional if wind is calm

10. Flow should be shut off during headland turns and ferry legs because:

- A) It saves battery only
- B) Continuing flow creates double-rate strips and off-target application
- C) It is required by the FAA
- D) It improves droplet size

Answer key & explanations

- 1. B)** Drift more but provide better coverage — Small droplets stay airborne longer (more drift) but give more impact points per leaf (better coverage). Use the coarsest size that still works.
- 2. B)** 236–340 μm — Fine $\approx 106\text{--}235\ \mu\text{m}$, Medium $\approx 236\text{--}340\ \mu\text{m}$, Coarse $\approx 341\text{--}403\ \mu\text{m}$, Very Coarse $\approx 404\text{--}502\ \mu\text{m}$.
- 3. B)** Drives droplets down into the canopy, improving penetration — Downwash actively pushes droplets into the canopy, which is why drones can work at low carrier volumes.
- 4. B)** Let downwash dissipate and expose fine droplets to ambient wind — Above the effective downwash window, droplets are released into ambient air and drift risk rises sharply.
- 5. B)** Narrower than the boom, determined by where deposition falls off — Deposition tapers at pattern edges, so effective swath is narrower and must be determined empirically.
- 6. B)** Water-sensitive paper placed across the swath at canopy height — Water-sensitive paper shows actual droplet density, streaking and gaps that telemetry cannot report.
- 7. B)** Plan and respect the label buffer on the downwind edge before you start — Buffers are planned into the flight, not corrected afterwards. Fly perpendicular to wind and respect the downwind buffer first.
- 8. B)** Increasing spray viscosity to shift the droplet spectrum coarser — DRAs coarsen the spectrum. They supplement — never replace — correct droplet-size settings, and only where the label allows.
- 9. B)** Enforceable label language you must follow — Droplet-size directions in the label's aerial section are enforceable use directions.
- 10. B)** Continuing flow creates double-rate strips and off-target application — Uncontrolled flow during turns over-applies and is a common source of crop-injury complaints.

Module 10 — The Aviation Half: Part 107, Part 137, 44807 & Airspace

Category 1 (Aerial) exam · 8 practice questions · The six federal steps to legally spray from a drone, why Part 137 is separate from Part 107, exemptions and waivers, and airspace/LAANC in plain language.

Key numbers & facts to memorise

Step 1	Part 107 remote pilot certificate
Step 2	Aircraft registration (N-number for >55 lb)
Step 3	Section 44807 exemption — the long-lead item
Step 4	Part 137 Agricultural Aircraft Operator Certificate
Airspace	Class G needs no authorisation; controlled airspace needs LAANC or DroneZone. 400 ft AGL limit

Two independent legal systems, both mandatory

Spraying from a drone sits at the intersection of two regulators that do not talk to each other on your behalf. The **FAA** governs the aircraft and the act of dispensing a substance from it. **ODA** (under FIFRA authority and Ohio law) governs the pesticide, the applicator and the business. You must satisfy both. Holding an FAA Part 107 remote pilot certificate does not permit you to apply pesticide; holding an Ohio applicator licence does not permit you to fly commercially.

Understanding why matters for the exam and for your business plan. FIFRA makes it unlawful to use a registered pesticide in a manner inconsistent with its labelling — and the label's aerial directions apply regardless of whether the aircraft is crewed. Separately, **14 CFR Part 137** governs agricultural aircraft operations, defined to include dispensing any economic poison from an aircraft. A drone dispensing pesticide is an agricultural aircraft operation and requires an **Agricultural Aircraft Operator Certificate**.

The practical consequence is a sequencing problem. The federal approvals take months and involve several separate applications; the state licence involves exams offered on a schedule with results posted weeks later. Anyone planning a spray season should work backwards from the date they want to fly for hire and start the longest-lead item first — which is almost always the federal exemption package.

The six federal steps, in order

Step 1 — Part 107 remote pilot certificate. Obtain a knowledge-test-based certificate covering airspace, weather, loading, performance, regulations and operations. This is the entry credential for any commercial drone work and the prerequisite that most other approvals assume.

Step 2 — Aircraft registration. Agricultural spray drones almost always exceed 55 pounds, which puts them outside standard small-UAS registration; heavier aircraft register under the process for larger aircraft

and receive an N-number. **Step 3 — Section 44807 exemption.** Because most spray drones exceed 55 lb and the operation cannot comply with certain Part 137 provisions written for crewed aircraft, operators petition the FAA for exemption under **49 U.S.C. § 44807**. This petition is the long-lead item, is granted with specific conditions and limitations, and is the document that makes the rest of the operation legal.

Step 4 — Part 137 certificate. Apply for the Agricultural Aircraft Operator Certificate, which involves a knowledge and skill demonstration to the FAA covering the specific operation. **Step 5 — Waivers as needed.** Common requests include operations over people, beyond visual line of sight, at night, or with multiple aircraft under one pilot. **Step 6 — State licensing.** The ODA applicator licence and business licence, which is what the rest of this course covers. Budget realistically: the federal package commonly takes several months end to end, and none of it should be started the month before planting.

One more federal wrinkle worth knowing: if you apply pesticide to another person's crop for compensation, you are a commercial applicator in the state system and an operator in the federal system, and both regimes expect records. Aligning your FAA operational log with your ODA application record — same job, same date, same field — is far easier than reconstructing them separately after an inquiry.

Airspace, LAANC and the pre-flight check

Airspace classes determine whether you need authorisation before you fly. **Class G** (uncontrolled) covers most rural Ohio farmland and needs no airspace authorisation. **Class E** surface areas, and **Class D, C and B** around airports of increasing size, are controlled airspace where drone operations require authorisation. Controlled airspace often reaches the ground in a ring around an airport and is stepped upward further out, so a field five miles from a regional airport can be in controlled airspace at the surface while a field eight miles away is not.

LAANC (Low Altitude Authorization and Notification Capability) provides near-instant automated authorisation for controlled-airspace operations up to published ceiling values on the UAS Facility Maps, through approved third-party apps. Where a LAANC grid shows a ceiling of 0 feet, automated approval is unavailable and you must submit a manual **FAA DroneZone** authorisation request, which takes considerably longer. Check the grid before you quote the job, not on the morning of the application.

Beyond airspace class, your pre-flight check should cover: **temporary flight restrictions** (TFRs) — stadiums, VIP movements, wildfires; nearby heliports and private airstrips, which are common in farm country and often unmarked on consumer apps; power lines, irrigation pivots, grain legs, towers and guy wires; the crewed agricultural aircraft that may be working the same neighbourhood; and the **400-foot** altitude limit above ground level, which spray operations never approach but which still frames the regulatory envelope. Combine that with your pesticide checks — label, weather, buffers, endangered species bulletin, hive locations — into a single pre-flight card you actually run through, because the failure mode is remembering four of six items under time pressure.

Practice questions

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

1. Holding an FAA Part 107 certificate allows you to:

- A) Apply pesticides commercially
- B) Fly a small drone commercially, but not to apply pesticides
- C) Skip the state licence
- D) Fly above 400 ft AGL

2. Dispensing a pesticide from an aircraft is governed by:

- A) 14 CFR Part 61
- B) 14 CFR Part 137
- C) 14 CFR Part 91 only
- D) No federal rule

3. Spray drones over 55 pounds typically require an exemption under:

- A) 49 U.S.C. § 44807
- B) 14 CFR Part 107.31
- C) FIFRA Section 18
- D) Ohio Revised Code 921

4. LAANC provides:

- A) A pesticide licence
- B) Near-instant authorisation to operate in controlled airspace up to published ceilings
- C) Weather forecasts
- D) Aircraft insurance

5. Most rural Ohio farmland is in which airspace class?

- A) Class B
- B) Class D
- C) Class G (uncontrolled)
- D) Class A

6. The general maximum altitude for small UAS operations is:

- A) 200 ft AGL
- B) 400 ft AGL
- C) 1,000 ft AGL
- D) No limit

7. An Agricultural Aircraft Operator Certificate is issued by:

- A) ODA
- B) The FAA
- C) EPA
- D) OSU Extension

8. If a LAANC grid shows a ceiling of 0 feet for your field, you must:

- A) Fly anyway
- B) Submit a manual FAA DroneZone airspace authorisation request
- C) Call the airport tower and proceed
- D) Reduce altitude to 50 ft

Answer key & explanations

1. **B)** Fly a small drone commercially, but not to apply pesticides — Part 107 covers commercial drone flight. Dispensing pesticide additionally requires Part 137 and a state applicator licence.
2. **B)** 14 CFR Part 137 — Part 137 governs agricultural aircraft operations, which include dispensing economic poisons from an aircraft.
3. **A)** 49 U.S.C. § 44807 — Section 44807 exemptions authorise operations that cannot meet provisions written for crewed aircraft.
4. **B)** Near-instant authorisation to operate in controlled airspace up to published ceilings — LAANC gives automated airspace authorisation via approved apps; a 0-ft grid requires a manual DroneZone request.
5. **C)** Class G (uncontrolled) — Class G is uncontrolled and requires no airspace authorisation, though other rules still apply.
6. **B)** 400 ft AGL — 400 feet above ground level, with allowances near structures. Spray operations fly far below this.
7. **B)** The FAA — The FAA issues the Part 137 certificate; ODA issues the pesticide applicator and business licences.
8. **B)** Submit a manual FAA DroneZone airspace authorisation request — Zero-foot grids are not eligible for automated approval; a manual authorisation request is required and takes longer.

Module 11 — Worker Protection Standard, REI & Notification Duties

CORE exam · 8 practice questions · What the WPS requires of you when you spray someone else's farm: REIs, posting and oral notification, decontamination supplies, the application exclusion zone, and the paperwork.

Key numbers & facts to memorise

Rule	Worker Protection Standard, 40 CFR Part 170
REI	Keep workers out for the labelled interval
Double notification	Posted signs AND oral notification when the label requires it
AEZ	Application exclusion zone — stop if anyone untrained enters
Information display	30 days after the REI expires; handler training annual, records 2 years

Who the WPS covers and why it applies to custom applicators

The **Worker Protection Standard (WPS)**, at 40 CFR Part 170, is the federal rule that protects **agricultural workers** (people performing hand labour in treated crops) and **pesticide handlers** (people who mix, load, apply, clean equipment or handle open containers). It applies to agricultural pesticides used in the production of agricultural plants on farms, forests, nurseries and greenhouses. If you spray other people's crops for hire, WPS obligations attach to the work you do and to the site you leave behind.

The rule allocates duties between the **agricultural employer** (usually the farm) and the **handler employer** (often you, the application business). Both sets exist simultaneously, and the common failure is assuming the other party handled something. Sort it out contractually before the season: who posts the field, who tells the farm crew about the REI, who supplies decontamination water at the mix site, and who keeps the application information available for the required period.

Exam questions here are usually definitional — who is a worker, who is a handler, what the employer must provide — because the rule is prescriptive. The practical value is different: WPS obligations are the single most common source of avoidable enforcement exposure for custom applicators, because they occur after the spray is finished and the applicator has driven away.

REI, posting and oral notification

The **restricted-entry interval (REI)** is the period after application during which entry into the treated area is limited. It is product- and crop-specific, printed on the label, and enforceable — 4 hours, 12 hours, 24 hours and 48 hours are common, with longer intervals for some products and some crops. Do not confuse it with the **pre-harvest interval (PHI)**, which protects the consumer from residues at harvest; REI protects the person walking into the field.

Workers must be kept out during the REI, with narrow exceptions for specified short-term and early-entry tasks that carry their own PPE requirements. Employers must notify workers about treated areas either by **posting warning signs** at the usual points of entry, by **oral notification**, or by both when the label requires "double notification." The label controls: some products explicitly require both posting and oral warning, and that instruction is enforceable.

Posted signs must use the standard WPS design and be in place before the application and removed within three days after the end of the REI. Oral notification must be in a manner the worker can understand and must cover the location, the description of the treated area, the dates and times of the REI, and the instruction not to enter. As the applicator, the useful discipline is to hand the farm a written summary at the end of the job: product, EPA registration number, area, time finished, REI expiry time. It takes two minutes and removes the ambiguity entirely.

Application exclusion zone, decontamination and information access

The **application exclusion zone (AEZ)** is the area surrounding the application equipment that must be free of people other than trained, properly equipped handlers during application. Its size depends on the application method and droplet size — larger for aerial and air-blast applications and fine sprays, smaller or not applicable for certain ground and low-drift methods. For aerial application the AEZ is substantial, and as a drone operator you must both establish it and stop application if anyone enters it.

Handler employers must provide **decontamination supplies**: enough water for routine and emergency washing, soap, single-use towels, and a clean change of clothing, located within a reasonable distance of the handler's work area. For eye-flush situations, additional water capacity is required where the label mandates protective eyewear. This is one of the requirements most often missing on real jobs, and it is trivially cheap to satisfy — a jug, soap and towels in the truck.

Employers must also make **application-specific information** accessible to workers and handlers — product name, EPA registration number, active ingredient, application date and time, treated area, and REI — along with the label's safety data sheet, displayed at a central location for **30 days** after the REI expires. Handlers must be trained before performing handler tasks and retrained annually, and the employer must keep training records for two years. Anyone applying a **restricted-use pesticide** must be a certified applicator or work under the direct supervision of one.

Practice questions

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

1. The Worker Protection Standard primarily protects:

- A) Retail customers
- B) Agricultural workers and pesticide handlers
- C) Airline passengers
- D) Product manufacturers

2. The restricted-entry interval (REI) is:

- A) The time before harvest
- B) The time workers must stay out of the treated area after application
- C) The shelf life of the product
- D) The time between tank loads

3. "Double notification" on a label means workers must be warned:

- A) Twice orally
- B) By both posted signs and oral notification
- C) Two days in advance
- D) By mail

4. The application exclusion zone must be free of:

- A) All equipment
- B) Everyone except trained, properly equipped handlers involved in the application
- C) Only children
- D) Nothing

5. Application-specific information and the safety data sheet must remain accessible to workers for:

- A) 24 hours
- B) 7 days
- C) 30 days after the REI expires
- D) 3 years

6. Decontamination supplies for handlers must include:

- A) Only a first-aid kit
- B) Water, soap, single-use towels and a clean change of clothing
- C) A fire extinguisher only
- D) Nothing if PPE is worn

7. Handler training under WPS must be provided:

- A) Once in a career
- B) Before performing handler tasks and annually thereafter
- C) Only for restricted-use products
- D) Only for aerial application

8. A person applying a restricted-use pesticide must be:

- A) Over 21
- B) A certified applicator or under the direct supervision of one
- C) A landowner
- D) A licensed pilot

Answer key & explanations

1. B) Agricultural workers and pesticide handlers — WPS (40 CFR Part 170) protects agricultural workers and handlers through REIs, PPE, training, decontamination and notification.

2. B) The time workers must stay out of the treated area after application — REI protects people entering the field; PHI protects the consumer by controlling residues at harvest.

- 3. B)** By both posted signs and oral notification — When the label requires double notification, both posting and oral notification are mandatory.
- 4. B)** Everyone except trained, properly equipped handlers involved in the application — Application must stop if anyone other than a trained, equipped handler enters the AEZ.
- 5. C)** 30 days after the REI expires — WPS requires display at a central location for 30 days after the REI expires.
- 6. B)** Water, soap, single-use towels and a clean change of clothing — Water for routine and emergency washing, soap, single-use towels and clean clothing must be reasonably accessible.
- 7. B)** Before performing handler tasks and annually thereafter — Handlers must be trained before doing handler tasks and retrained annually; records are kept for two years.
- 8. B)** A certified applicator or under the direct supervision of one — RUP application requires certification or direct supervision by a certified applicator, with additional recordkeeping.

Module 12 — Ohio Records, Renewal, Recertification & Reciprocity

CORE exam · 11 practice questions · The exact record fields ODA requires, the same-day and ten-day rules, the September 30 renewal, the third-year recertification maths, and which states Ohio reciprocates with.

Key numbers & facts to memorise

Written	In English, the DAY of application
Submitted	To the central/registered location within 10 DAYS
Retained	3 YEARS
Licence expires	September 30 annually; late renewal to March 31 if hours were done by Sept 30
Recertification	Every 3rd year: 5 hours minimum (1 CORE + 0.5 per category). Credits do NOT carry over

The record fields, the deadlines, and the retention period

Ohio commercial applicators must keep a record of each pesticide application, and the rules are specific enough that they are reliably examined. Records must be **written in English**, must be **made the day of the application**, must be **submitted to the applicator's central or registered business location within 10 days**, and must be **retained for three years**. Writing the week up on Friday is a violation even when every substantive detail is correct — the timing requirement is independent of the accuracy requirement.

The required content covers who, where, when, what and how much: the **name and address of the customer or property owner**; the **location of the treated site**; the **date and time** of application; the **brand name and EPA registration number** of every product applied; the **rate and the total amount applied**; the **size of the area treated**; the **target pest**; the **name and licence number of the applicator**; and, for outdoor applications, the **weather conditions** at the time of application. Restricted-use pesticide applications carry additional federal and state recordkeeping expectations layered on top.

Drone operators should record more than the minimum because they can. Add release height, droplet class or atomiser setting, effective swath, ground speed, observed downwind buffer, start and end times, and — where relevant — the endangered-species bulletin you checked and the hive locations you notified. Your flight controller already logs most of it; exporting the log and attaching it to the record costs a minute and produces evidence no ground applicator can match. In a drift complaint, the investigator asks what, at what rate, in what conditions, and where the boundary was. A complete same-day record answers all four in five minutes.

Renewal on September 30, and the March 31 grace window

Ohio commercial applicator licences and pesticide business licences are valid for one year and **expire on September 30**. Renewal is annual: submit the renewal with the current fee, and confirm that your recertification obligation is satisfied. Calendar the date the day your card arrives, because the licence lapsing is the one administrative failure that can stop your business mid-shoulder-season.

There is a limited grace path. If you miss September 30 you may still renew **through March 31** — but only if all required recertification hours were completed **before September 30**. In other words, the grace window forgives late paperwork, not late education. If the hours were not earned in time, the grace window does not help you and you may be facing exams again.

Fees are set by rule and change, so verify on the form you are actually submitting. Current OSU Extension guidance for commercial applicators lists a **\$35 application fee and a \$35 annual renewal fee**, with additional charges for categories as applicable and separate fees for the pesticide business licence. Relative to the cost of a spray drone, licensing is the cheapest line item in the business — and the one whose absence shuts everything else down.

Recertification: the third-year maths that catches people

Ohio does not require continuing education every single year. Instead, **every third year before renewal** you must recertify, and you can do it one of two ways: **retake the exams**, or **earn at least 5 credit hours** of ODA-approved continuing instruction. The 5 hours are structured, not free-form: a minimum of **1 hour of CORE**, plus a minimum of **0.5 hour for each category you hold**, with the remainder in any category. Hold CORE plus Category 1 Aerial and you need 1 hour CORE, 0.5 hour Category 1, and 3.5 hours in anything approved.

The rule that costs people their licence is that **credits do not carry over**. Hours earned beyond the requirement in one cycle do not bank toward the next, and hours earned after the deadline do not retroactively fix a lapse. Attend earlier in the cycle rather than in the final winter, and verify with ODA's **recertification credit search** that the hours were actually posted — a sign-in sheet is not a receipt.

OSU Extension's Pesticide Safety Education Program runs most of Ohio's approved recertification programming, including winter conference sessions across the state and online options; pested.osu.edu/commercialrecert lists what is scheduled. Treat the content as useful rather than as a box to tick: labels acquire new droplet-size restrictions and mitigation menus, endangered-species bulletins update monthly, and Ohio's handling of uncrewed application continues to develop. Recertification is where you learn about a change before a neighbour learns about it for you.

Reciprocity, and moving between states

Ohio may issue a commercial applicator licence **without an Ohio exam** to applicators already licensed in certain states. The current reciprocity list includes **Alabama, Florida, Georgia, Illinois, Indiana, Louisiana, Michigan, Minnesota, Mississippi, New York, Pennsylvania, Texas, Virginia and West Virginia**. Reciprocity is discretionary and category-dependent, so confirm the specific categories with ODA rather than assuming a blanket transfer — and confirm before you decline to schedule an exam.

Reciprocity runs both ways in practice, which matters if your service territory crosses a state line. An Ohio licence does not automatically authorise work in Indiana, Michigan, Kentucky, Pennsylvania or West Virginia; each state licenses independently, and several require a separate business licence and proof of

insurance filed in that state. Custom applicators near a border should get licensed in every state they intend to invoice in, and should not rely on a customer's belief that "it's all federal."

Also remember that reciprocity applies only to the pesticide credential. Your **FAA** authorisations — Part 107, aircraft registration, the Section 44807 exemption and the Part 137 certificate — are federal and travel with you, but their conditions and limitations may restrict where and how you may operate. Keep the pesticide and the aviation paperwork in one binder (and one cloud folder) so that whichever regulator asks, you produce the whole file at once.

Practice questions

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

1. Ohio commercial applicator application records must be written:

- A) Within 30 days
- B) The same day as the application, in English
- C) Whenever convenient
- D) Only when the customer requests it

2. Records must be submitted to the central or registered business location within:

- A) 24 hours
- B) 10 days
- C) 30 days
- D) 90 days

3. Ohio commercial application records must be retained for:

- A) 1 year
- B) 2 years
- C) 3 years
- D) 7 years

4. Which is NOT a required field in an Ohio commercial application record?

- A) EPA registration number of each product
- B) Total amount applied and area treated
- C) The applicator's personal bank details
- D) Target pest

5. Ohio commercial applicator and pesticide business licences expire on:

- A) December 31
- B) September 30
- C) March 31
- D) Your birthday

6. If you miss the September 30 renewal, you may still renew through March 31 only if:

- A) You pay double
- B) All recertification hours were completed before September 30
- C) You retake CORE
- D) You move to another state

7. Ohio recertification is required:

- A) Every year
- B) Every third year before renewal
- C) Every five years
- D) Never

8. The minimum recertification structure for Ohio is:

- A) 5 hours, all CORE
- B) 5 hours: at least 1 hour CORE plus at least 0.5 hour per category held, remainder any category
- C) 2 hours, any topic
- D) 10 hours per category

9. Recertification credit hours earned beyond the requirement:

- A) Carry over to the next cycle
- B) Do not carry over
- C) Double in value
- D) Replace the renewal fee

10. Ohio may license without an Ohio exam applicators already licensed in which of these states?

- A) California
- B) Indiana
- C) Oregon
- D) Arizona

11. The OSU Extension figure for the Ohio commercial applicator application fee is:

- A) \$10
- B) \$35
- C) \$100
- D) \$250

Answer key & explanations

- 1. B)** The same day as the application, in English — Records must be in English and made the day of the application.
- 2. B)** 10 days — Ohio requires submission to the applicator's central or registered location within 10 days.
- 3. C)** 3 years — Three years is the Ohio retention period for commercial applicator application records.
- 4. C)** The applicator's personal bank details — Records cover customer, site, date/time, product and EPA reg number, rate and total, area, target pest, applicator name and licence number, and weather for outdoor work.
- 5. B)** September 30 — Both expire September 30 annually.
- 6. B)** All recertification hours were completed before September 30 — The grace window forgives late paperwork, not missing recertification hours.

7. B) Every third year before renewal — Every third year you either retake the exams or earn at least 5 approved credit hours.

8. B) 5 hours: at least 1 hour CORE plus at least 0.5 hour per category held, remainder any category — At least 5 total hours: 1 hour CORE minimum, 0.5 hour minimum per category held, remainder in any category.

9. B) Do not carry over — Credits do not carry over between recertification cycles.

10. B) Indiana — The reciprocity list includes AL, FL, GA, IL, IN, LA, MI, MN, MS, NY, PA, TX, VA and WV. Confirm categories with ODA.

11. B) \$35 — ANR-0140 lists \$35 application and \$35 annual renewal. Fees are set by rule — verify on the current ODA form.

Module 13 — Ohio Pesticide Business Licence, Insurance Limits & Supervision

CORE exam · 9 practice questions · The second licence a spray-for-hire operation needs, the exact OAC 901:5-11-07 insurance minimums for aerial work, direct supervision rules, and the trained-serviceperson pathway.

Key numbers & facts to memorise

Two licences	Commercial applicator (person) + pesticide business (entity)
OAC 901:5-11-07	Aerial businesses must meet paragraphs (B) AND (D)
Paragraph (B)	\$300,000 general aggregate / \$300,000 per occurrence / \$300,000 products & completed ops
Paragraph (D)	\$100,000 property damage per occurrence / \$100,000 BI per person / \$300,000 BI per occurrence
Order	Get the applicator licence BEFORE the business licence

Two licences, two different things

People routinely conflate the two Ohio credentials, and the distinction has real consequences. The **commercial applicator licence** is issued to a **person** and certifies that individual's competence in CORE plus one or more categories. The **pesticide business licence** is issued to a **business entity** and authorises the company to hold itself out as offering pesticide application services for compensation. If you spray other people's crops for money, you need both — and each business location generally needs at least one licensed commercial applicator.

ODA's own guidance recommends obtaining your **applicator** licence before applying for the **business** licence, because the business application requires you to designate a licensed applicator. Sequencing it the other way stalls the file. Both licences expire **September 30** and renew annually, so once you are established the two renewals land together.

This is also where the honest business-planning conversation belongs. A spray drone purchase does not shorten the licensing timeline: the federal package (Part 107, registration, Section 44807 exemption, Part 137) commonly runs several months, and the state path involves an accepted application, scheduled exams and results posted weeks later. Anyone intending to fly for hire in a given season should start the licensing work at least two seasons' worth of lead time ahead of the first invoice, not after the aircraft arrives.

Financial responsibility: the OAC 901:5-11-07 numbers

Ohio requires a licensed pesticide business to demonstrate **financial responsibility** — in practice, an insurance certificate on file with ODA. The minimums live in **Ohio Administrative Code 901:5-11-07**, and ODA has stated that a business performing **aerial pest control (including uncrewed aircraft)** must satisfy the requirements of **paragraphs (B) and (D)**. Both, not either.

Paragraph (B) sets the general and professional liability floor: **\$300,000 policy general aggregate, \$300,000 per occurrence, and \$300,000 products and completed operations aggregate**. Paragraph (D) adds comprehensive aerial chemical liability: **\$100,000 property damage per occurrence, \$100,000 bodily injury per person, and \$300,000 bodily injury per occurrence**, excluding passengers. Memorise the pattern — three \$300,000 figures under (B); \$100k/\$100k/\$300k under (D) — because it is exactly the kind of specific, verifiable number an Ohio exam asks about.

Two practical notes. First, these are **regulatory minimums, not commercially adequate limits**: a single drift claim across a specialty-crop neighbour can exceed them comfortably, and most serious operators carry more. Chemical drift coverage in particular is often excluded from generic general-liability policies and must be specifically endorsed — read the exclusions, not the summary page. Second, the certificate must actually be on file and current; a policy that exists but was never filed with ODA does not satisfy the requirement.

Direct supervision and the trained serviceperson

Not everyone who touches a sprayer needs their own licence, but the alternatives are tightly defined. Under **direct supervision**, an uncertified person may apply pesticide when a certified applicator has provided instructions and is available if needed. Ohio gives that availability a concrete meaning for the trained-serviceperson pathway: the supervising licensed applicator must be **within 25 miles or available within two hours**. "Available by phone from another state" does not satisfy it.

The **trained serviceperson** route lets a business employ workers who apply pesticide under a licensed applicator's supervision after documented training, subject to registration and recordkeeping obligations. It is how a growing operation scales without every employee sitting exams — but it does not extend to everything. **Restricted-use pesticides** require certification or genuine direct supervision, and the supervising applicator remains legally responsible for the application, the record and the outcome.

For a drone operation, the supervision question intersects with the aviation rules in a way worth planning around: the person flying must hold the appropriate FAA credentials for the operation, and the pesticide side must be covered by a licensed applicator. Those may or may not be the same person, and if they are not, both sets of authority must be documented for the same job. Write down who held which role on each application. It is a one-line note that resolves an otherwise ambiguous enforcement question.

Enforcement, penalties and what an inspection looks like

ODA has authority to inspect records and equipment, investigate complaints, sample residues, and take action ranging from **warning letters and civil penalties to licence suspension or revocation**, with criminal referral available for serious or wilful violations. The most common triggers are drift complaints from neighbours, use inconsistent with labelling, applying without the required licence, and incomplete or late records. Notice that two of those four are paperwork failures — the cheapest violations to avoid and the most common to commit.

A routine inspection is document-driven. Expect to produce your applicator licence, the business licence, the insurance certificate, application records for the period in question, product labels for what you applied, and — increasingly for aerial work — evidence of the conditions at the time of application. Organise so that a request for "the records for that field in June" takes two minutes rather than an afternoon. A tidy file communicates competence before anyone reads a single number.

The defensive posture that actually works is boringly consistent: read the label every time even for a product you have used for years, record the same day, photograph the boundary and the weather station reading, note the buffer you observed, keep the endangered-species bulletin, and tell the neighbour before you spray rather than after they call. Most enforcement actions against otherwise competent applicators come from small omissions repeated across a season, not from a single dramatic mistake.

Practice questions

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

1. You spray a neighbour's field for payment. Besides your commercial applicator licence, Ohio requires:

- A) Nothing else
- B) A pesticide business licence
- C) Only a federal EIN
- D) A commercial driver licence

2. Which OAC 901:5-11-07 paragraphs apply to a business doing aerial (including drone) pest control?

- A) (B) only
- B) (C) only
- C) (B) and (D)
- D) (D) only

3. Under paragraph (B), the minimum policy general aggregate is:

- A) \$50,000
- B) \$100,000
- C) \$300,000
- D) \$1,000,000

4. Under paragraph (D), minimum bodily injury coverage per occurrence (excluding passengers) is:

- A) \$50,000
- B) \$100,000
- C) \$300,000
- D) \$500,000

5. Under paragraph (D), minimum property damage coverage per occurrence is:

- A) \$25,000
- B) \$100,000
- C) \$300,000
- D) \$1,000,000

6. For the trained-serviceperson pathway, the supervising licensed applicator must be:

- A) On the same field at all times
- B) Within 25 miles or available within two hours
- C) In the same state
- D) Reachable within 24 hours

7. ODA recommends obtaining which licence first?

- A) The business licence, then the applicator licence
- B) The applicator licence, then the business licence
- C) Both simultaneously only
- D) Neither — they are optional

8. The insurance limits in OAC 901:5-11-07 are best described as:

- A) Generous commercial coverage
- B) Regulatory minimums that may be well below adequate coverage
- C) Maximum allowed coverage
- D) Optional guidance

9. Restricted-use pesticides may be applied by a trained serviceperson:

- A) Freely, with no oversight
- B) Only when certified or under genuine direct supervision by a certified applicator
- C) Never, under any circumstance
- D) Only on weekends

Answer key & explanations

1. B) A pesticide business licence — Applying pesticide to another's property for compensation requires a pesticide business licence, with a licensed commercial applicator per location.

2. C) (B) and (D) — ODA states aerial pest control businesses must meet both paragraph (B) general/professional liability and paragraph (D) comprehensive aerial chemical liability.

3. C) \$300,000 — Paragraph (B): \$300,000 general aggregate, \$300,000 per occurrence, \$300,000 products and completed operations aggregate.

4. C) \$300,000 — Paragraph (D): \$100,000 property damage per occurrence, \$100,000 bodily injury per person, \$300,000 bodily injury per occurrence.

5. B) \$100,000 — \$100,000 property damage per occurrence under paragraph (D).

6. B) Within 25 miles or available within two hours — Ohio defines the availability requirement as within 25 miles or available within two hours.

7. B) The applicator licence, then the business licence — The business application requires designating a licensed applicator, so get the applicator licence first.

8. B) Regulatory minimums that may be well below adequate coverage — They are floors. Drift claims can exceed them, and chemical drift coverage often requires a specific endorsement.

9. B) Only when certified or under genuine direct supervision by a certified applicator — RUP application requires certification or direct supervision; the supervising applicator remains legally responsible.

Module 14 — Exam Blueprint, Exam Day Strategy & Free Official Resources

CORE exam · 9 practice questions · What is actually on the test, how the label question block works, a timing and elimination strategy, and every free government and university resource worth using.

Key numbers & facts to memorise

Passing score	70%
Length	Roughly 25–150 questions depending on the category
Label block	A pesticide label is supplied with most exams
Results	About 2–4 weeks; minimum 5 business days before retesting
Window	One year from an accepted application to pass your exams

The blueprint: what you will actually be tested on

Ohio pesticide applicator exams are **multiple choice** and **closed book**, with the number of questions varying by category — published OSU Extension guidance describes exams ranging from roughly **25 to 150 questions**. The **passing score is 70%**, and — the detail most candidates are unprepared for — **most exams include a block of questions about a pesticide label that is provided with the exam**. You are handed a real label and asked to extract rate, restricted-entry interval, pre-harvest interval, PPE, signal word, EPA registration number, site list and precautionary language from it under time pressure.

The **CORE** exam's published content areas are: **laws and regulations; pesticide label reading; pesticide handling and storage; pesticide calculations; human toxicity and health effects; applicator safety; and environmental protection**. Those seven areas map directly onto Modules 1 through 7 and 11 of this course. Weight your study accordingly: label reading and calculations are the two areas where preparation converts most reliably into points, because both are procedural skills rather than recall.

Category exams add pest identification and management for the specific sites and crops in that category. For **Category 1, Aerial Pest Control** — the credential a drone spray operation needs — expect agricultural pest and crop questions plus aerial-specific content on application equipment, droplet size and classification, swath and overlap, drift management, buffer zones and weather constraints. Modules 8 and 9 target that material. If your business will also serve horticultural crops or turf grown for sale, you may need additional category exams, each a separate paper.

Exam-day logistics and a strategy that actually raises scores

Apply to ODA first: your accepted application starts a **one-year window** to pass your exams, and it gives you the Applicator ID number you will need at the test site. Register in advance through ODA's exam registration or by calling the Pesticide & Fertilizer Section at **614-728-6987** — sites have limited seating and walk-ins can be turned away. Bring photo identification, your Applicator ID and a calculator you are already comfortable with; expect results to post in roughly **2–4 weeks**, and note that if you must retest, published guidance calls for waiting at least **five business days**.

On the paper itself, work in two passes. First pass: answer everything you know immediately and mark anything requiring arithmetic or label lookup. Second pass: do the calculation questions with units written out, then the label block with the label in front of you. This ordering protects your easy points from the clock and puts your freshest attention on the questions that reward care. Read every question completely — "which is NOT required" and "all of the following except" reverse the answer, and rushing past a negation is the most common avoidable error.

Use disciplined elimination. Options containing absolutes ("always," "never," "any amount is safe") are usually wrong in pesticide law, where the correct answer is almost always "follow the label" or "the more restrictive requirement." Where two options are numerically adjacent, the question is testing a specific published figure — those are the facts worth memorising cold: 43,560 sq ft per acre, 128 fl oz per gallon, 70% to pass, three-year record retention, ten days to the central location, 15–20 minutes of eye flushing, six months for an endangered-species bulletin. Guess rather than leave blanks; there is no penalty for a wrong answer that a blank avoids.

Free official resources — federal, state and university

The most useful free Ohio-specific document is **OSU Extension fact sheet ANR-0140, "Commercial Pesticide Applicator Licensing in Ohio"** at ohioline.osu.edu/factsheet/anr-0140, which sets out categories, exam structure, the 70% passing score, fees and recertification in plain language at no cost. **OSU Extension's Pesticide Safety Education Program (PSEP)** at pested.osu.edu is the hub for Ohio training, and its **online training area** (pested.osu.edu/OnlineTraining) hosts free self-paced modules; pested.osu.edu/commercialrecert lists recertification programming. PSEP can be reached at **614-292-4070** or pested@osu.edu.

On the state regulatory side, **agri.ohio.gov** hosts the Pesticide & Fertilizer Regulation Section: licence applications and current fees, the exam schedule and registration, an **exam results lookup**, a **recertification credit search** so you can verify your hours were actually recorded, and a **pesticide product search** for checking Ohio registration status. The section's phone number, **614-728-6987**, is the fastest way to resolve a question about your own file, and it is the number to call about incidents and complaints.

Federally, **EPA's pesticide pages** (epa.gov/pesticides) provide the label and registration framework at no cost, **Bulletins Live! Two** (epa.gov/endangered-species/bulletins) delivers the county- and month-specific endangered-species bulletins that some labels make enforceable, and the **Worker Protection Standard** pages explain REI, notification and AEZ duties. **The National Pesticide Information Center** (npic.orst.edu, **1-800-858-7378**) answers product and toxicity questions free of charge. For labels themselves, manufacturer sites and free label databases let you practise the exam's label block on real documents.

Two honest caveats. First, Ohio's **official CORE manual and category study guides are sold, not free** — they are available through OSU Extension publications (extensionpubs.osu.edu), and if you can afford one item, buy the study guide for the category you are testing in, because ODA exams track those materials. Second, the free federal and extension materials above are excellent for the concepts and the law but do not reproduce the exam's question set; use them alongside the practice exam on this page rather than instead of a study guide. Everything time-sensitive — fees, schedules, recertification hours, category structure — should be confirmed with ODA before you rely on it.

Practice questions

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

1. Ohio pesticide applicator exams require a passing score of:

- A) 60%
- B) 70%
- C) 75%
- D) 80%

2. Published guidance describes Ohio exams as containing approximately:

- A) Exactly 50 questions
- B) 25 to 150 questions depending on the category
- C) Always 100 questions
- D) 10 questions

3. Most Ohio pesticide exams include a block of questions about:

- A) Aircraft weight and balance
- B) A pesticide label provided with the exam
- C) Ohio tax code
- D) Soil survey maps

4. Which is NOT one of the published CORE content areas?

- A) Pesticide calculations
- B) Environmental protection
- C) Aircraft maintenance and airworthiness
- D) Human toxicity and health effects

5. After an accepted ODA application, how long do you have to pass your exams?

- A) 30 days
- B) 6 months
- C) One year
- D) No limit

6. Published guidance says that after failing an exam you should wait at least:

- A) 24 hours
- B) Five business days
- C) Three months
- D) One year

7. Ohio's official CORE manual and category study guides are:

- A) Free from ODA
- B) Sold through OSU Extension publications
- C) Only available at the exam
- D) Not published

8. To verify that your recertification credit hours were recorded, you should:

- A) Assume the sign-in sheet was processed
- B) Use ODA's recertification credit search
- C) Ask the instructor next year
- D) Wait for a letter

9. The National Pesticide Information Center provides:

- A) Paid consulting only
- B) Free answers to pesticide product and toxicity questions
- C) Applicator licences
- D) Aircraft registration

Answer key & explanations

- 1. B)** 70% — 70% is the passing score per OSU Extension ANR-0140.
- 2. B)** 25 to 150 questions depending on the category — Question count varies by category, roughly 25–150 questions.
- 3. B)** A pesticide label provided with the exam — A label is supplied with the exam and you must read rate, REI, PHI, PPE and precautionary information from it.
- 4. C)** Aircraft maintenance and airworthiness — CORE covers laws, labels, handling and storage, calculations, human toxicity, applicator safety and environmental protection. Aircraft airworthiness is an FAA matter.
- 5. C)** One year — The accepted application starts a one-year window to pass CORE and your category exams.
- 6. B)** Five business days — A minimum five-business-day wait before retesting, with results posting roughly 2–4 weeks after the exam.
- 7. B)** Sold through OSU Extension publications — The official study guides are paid publications via extensionpubs.osu.edu, though many supporting resources (ANR-0140, PSEP online training) are free.
- 8. B)** Use ODA's recertification credit search — ODA provides a recertification credit lookup; verifying beats assuming, since lapsed credit can force retaking exams.
- 9. B)** Free answers to pesticide product and toxicity questions — NPIC (npic.orst.edu, 1-800-858-7378) is a free federally supported information service.

Free official resources

OSU Extension ANR-0140 — Commercial Pesticide Applicator Licensing in Ohio — ohioline.osu.edu/factsheet/anr-0140

OSU Pesticide Safety Education Program — pested.osu.edu

PSEP free online training — pested.osu.edu/OnlineTraining

PSEP commercial recertification schedule — pested.osu.edu/commercialrecert

ODA Commercial Applicator licensing — agri.ohio.gov/divisions/plant-health/pesticides/commercial

ODA Pesticide Businesses — agri.ohio.gov/divisions/plant-health/pesticides/business/pesticide-business

EPA Pesticides — epa.gov/pesticides

EPA Bulletins Live! Two (endangered species) — epa.gov/endangered-species/bulletins

EPA Worker Protection Standard — epa.gov/pesticide-worker-safety

National Pesticide Information Center — npic.orst.edu · 1-800-858-7378

FAA Part 137 agricultural aircraft operations — faa.gov/uas/advanced_operations/agriculture