Lawn and Residential Landscape Pest Control

A Guide for Maintenance Gardeners

WORKBOOK

Mary Louise Flint
Associate Director
Urban and Community IPM
UC Statewide IPM Program
Extension Entomologist
University of California, Davis

UNIVERSITY OF CALIFORNIA
STATEWIDE INTEGRATED PEST MANAGEMENT PROGRAM
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Sample Test Questions
This workbook is designed to help you prepare for the licensing exam for the Maintenance Gardener Pest Control pesticide applicator certificate, Category Q, from the California Department of Pesticide Regulation. The category Q certificate authorizes you to use pesticides or supervise the use of pesticides in your work as a maintenance gardener.

Use this workbook in conjunction with the official study guide, *Lawn and Residential Landscape Pest Control: A Guide for Maintenance Gardeners*, Volume 8 of the Pesticide Application Compendium. This book is available through the University of California ANR Communication Services (http://anrcatalog.ucdavis.edu) and from many county University of California Cooperative Extension offices. It contains the information you are required to know to become licensed.

The Department of Pesticide Regulation has developed lists of Knowledge Expectations (KEs) describing the information you must know to pass the exam. This workbook is organized around these KEs and includes one workbook exercise for each KE. The KEs are shown in a shaded box in top corner of each page. A few KEs have been eliminated from the exam, and exercises for these have not been included in this workbook. As a result, you will see that the numbers of the workbook exercises sometimes skip a number. However, the missing KEs are noted (“Good to Know”). Knowing this “Good to Know” information will help you perform better in your job.

To prepare for the exam, we recommend that you read each chapter in *Lawn and Residential Landscape Pest Control* and then do the exercises in this workbook for the chapter. The correct answers for the workbook exercises are at the end of each chapter. If you get any of the answers wrong, review the relevant pages in *Lawn and Residential Landscape Pest Control*. You can find them easily by looking for the KE number in the margins.

Once you have completed the workbook exercises, take the sample test questions at the back of the workbook. These questions are similar in style to the ones that will be on the actual exam. The answers are included after the sample questions.

If you have been able to complete all the workbook exercises and practice exam questions correctly, you should be ready to take the exam. Contact your Agricultural Commissioner or the California Department of Pesticide Regulation to find out when the next exam will be given.
Chapter 1. Pesticide Laws and Regulations

Write the name of the agency that does each job. Choose from the following agencies.

1. This agency writes pesticide regulations for the entire country (through the Federal Insecticide, Fungicide, and Rodenticide Act, also known as FIFRA).

2. This agency issues Maintenance Gardener Pest Control Business licenses and qualified applicator licenses and certificates.

3. This agency enforces pesticide laws at the local level.

4. This agency inspects pesticide use reports and employee training records.

5. This agency writes pesticide regulations for California (found in the California Food and Agricultural Code).
Answer the questions below by writing the name of the license or certificate needed. Use the table for reference.

<table>
<thead>
<tr>
<th>Nature of Work</th>
<th>LANDSCAPE MAINTENANCE PEST CONTROL (CATEGORY B)</th>
<th>MAINTENANCE GARDENER PEST CONTROL (CATEGORY Q)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pest control is a large part of the work.</td>
<td>Pest control is a small part of the work. Work is mostly mowing, pruning, planting, and maintaining landscapes.</td>
<td></td>
</tr>
<tr>
<td>Types of Pesticides Used</td>
<td>Restricted and general use pesticides</td>
<td>General use pesticides only</td>
</tr>
<tr>
<td>Types of Pest Control Performed</td>
<td>All types of landscape maintenance pest control</td>
<td>Limited pest control as part of maintenance gardening</td>
</tr>
</tbody>
</table>

1. Bob is starting his own gardening business. He plans to use herbicides about once a month. Bob has a Maintenance Gardener (Category Q) applicator certificate. What else does he need?

Anyone paid to do pest control must work for a licensed pest control business AND must be certified as a commercial pesticide applicator by the DPR (Department of Pesticide Regulation) or be supervised by someone who is certified by the DPR.

2. José has a Maintenance Gardener Pest Control Business License for his gardening business. Only one of his employees is certified as a commercial pesticide applicator and José is not certified. If this employee quits, what must José do if he wants the company to continue to apply pesticides?

3. María has had her own gardening business for many years. She has a Maintenance Gardener (Category Q) applicator certificate and a Maintenance Gardener Pest Control Business License. She is offered a job by a customer who wants her to use herbicides regularly. What additional licenses or certification will she need to take the new job?
REQUIREMENTS
You must renew your Maintenance Gardener Pest Control Applicator Certificate (Category Q) every two years and you must take 8 hours of DPR-approved continuing education classes to renew. Two of the 8 hours must cover laws and regulations.

You must also renew your Maintenance Gardener Pest Control Business License every two years. However, no continuing education classes are required. To renew the business license, you must provide:

- Proof of financial responsibility for chemical liability
- Proof of workers’ compensation insurance if you have employees
- Proof of business registration, such as a Fictitious Business Name Statement
- Your license number and the date your license expires, as well as the names, license and certificate numbers, and expiration dates of any QAL or QAC-qualified employees, including your own

QUESTIONS
1. How often must you renew a Maintenance Gardener (Category Q) certificate?

2. How many hours of DPR-approved continuing education classes do you need to renew the Category Q applicator certification?

3. How many hours of the continuing education class credits must cover laws and regulations?

4. Which of the following are NOT needed to renew your Maintenance Gardener Pest Control Business License? (Circle the letters.)
   a. Names of any QAL or QAC-qualified employee and their license numbers
   b. Proof of financial responsibility for chemical liability
   c. Corporation or Fictitious Business Name Statement
   d. 8 hours of continuing education credits
Read the requirements for recordkeeping. Then fill out the monthly summary pesticide use report on the next page. Use the sample application information.

- REQUIREMENTS FOR PESTICIDE USE RECORDKEEPING

Office Records
You must record every use of pesticides and keep copies of these records in your office for two years. The Agricultural Commissioner may ask to inspect them.

Records must include:
- Date of use
- Name of property owner or manager
- Property location
- Type of plants treated and location of these plants on the property
- Total acres or number of plants treated
- Pesticide name and EPA registration number
- Amount of pesticide applied

Summary Record for Agricultural Commissioner
You must file a monthly pesticide use report to the county Agricultural Commissioner, summarizing your total use over the month. If you work in more than one county, you must file a separate report for each county.

Fill out the monthly summary report on the next page, using the sample information below and the pesticide label at right.

- SAMPLE APPLICATION INFORMATION
Over the last month, you made 3 applications of Roundup (glyphosate) herbicide to control weeds. You used a total of 7.5 ounces to treat 900 sq. feet at the fence lines of the properties.

Use the information on the Roundup label at right for the EPA registration number and manufacturer’s name.
- **SAMPLE PESTICIDE LABEL**

- **FILL OUT THIS MONTHLY SUMMARY REPORT USING THE SAMPLE APPLICATION INFORMATION**

![Image of a monthly summary pesticide use report form](image)

**STATE OF CALIFORNIA**

**MONTHLY SUMMARY PESTICIDE USE REPORT**

**INSTRUCTIONS FOR COMPLETING THIS FORM ARE INDICATED BELOW AND ON THE REVERSE SIDE**

<table>
<thead>
<tr>
<th>OPERATOR (FIRM NAME)</th>
<th>ADDRESS</th>
<th>CITY</th>
<th>ZIP CODE</th>
<th>PHONE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPERATOR IDENTIFY NUMBER</td>
<td>LICENSE NUMBER</td>
<td>COUNTY WHERE APPLIED</td>
<td>COUNTY NUMBER</td>
<td>MONTH/YEAR OF USE</td>
</tr>
</tbody>
</table>


2. Complete Column F by using one of the following codes:

   - **Code 10:** Structural Pest Control
   - **Code 20:** Landscape Maintenance Pest Control
   - **Code 40:** Roadway Pest Control
   - **Code 60:** Public Health Pest Control
   - **Code 80:** Ventline Pest Control
   - **Code 90:** Commodity Pest Control (Nonfood/nonlint)
   - **Code 100:** Regulatory Pest Control

3. Complete Column G if used and fill in one of the above codes.

   **A**
   - **MANUFACTURER NAME OF PRODUCT APPLIED**
   - **LABEL CODE**
   - **TOTAL PRODUCT USED**
   - **(Check One Unit of Measure)**
   - **NUMBER OF APPLICATIONS**
   - **CODE**
   - **COMMUNITY OR SITE TREATED**
   - **ACRES/TREATED**

**REPORT PREPARED BY**

**DATE**
Read the requirements and fill out the form using information from a recent application or an available pesticide container. Be sure to check the label for special hazards.

- NOTIFICATION REQUIREMENTS

You must notify and get consent from the property owner or manager before applying pesticides. Below is an example of a notification form you could use.

**PESTICIDE APPLICATION NOTIFICATION**

Pest to be controlled: __________________________________________________________

Pesticides to be used (active ingredients): _______________________________________

Area to be treated: ___________________________________________________________

Date to be treated: ___________________________________________________________

Please keep children and pets out of the treatment area for at least _____ hours.

**PLEASE NOTE ANY SPECIAL INSTRUCTIONS HERE:**

____________________________________________________________________________

____________________________________________________________________________

**FOR MORE INFORMATION, CONTACT:**

Name of applicator: ___________________________________________________________

Business name: __________________________________________________________________

Telephone: ____________________________

For further information about pesticides, contact the county agricultural commissioner.

If you believe you may be experiencing poisoning symptoms, contact your doctor or poison control center at 1-800-222-1222.
Answer the questions, using the labels below.

1. Which pesticide can be used on tall fescue lawns? ________________

2. Which pesticide can be used on azaleas? ________________

3. Can either of these pesticides be used on vegetables? ________________

4. Should Pesticide A be used on a bermudagrass lawn? ________________

5. Can the agricultural commissioner cite you if you use a pesticide on a plant or on an area not listed on the label? ________________

Know the requirement to use only registered pesticide products that include the intended use site on the label.
Answer these questions about the pesticide label on the next page. Circle the letter of the correct answer.

1. Where on the label can you find the overall toxicity of the pesticide?
   a. Ingredients
   b. U.S. EPA registration number
   c. Signal word
   d. Directions for use

2. Where on the label can you find first aid instructions if you are exposed to the pesticide?
   a. Precautionary statements
   b. Signal words
   c. Directions for use
   d. Formulation

3. On the label, where can you find the plants or sites that you may apply the product to?
   a. Precautionary statement
   b. US EPA registration number
   c. Directions for use
   d. Signal word

4. Where on the label can you find the unique number of the pesticide product? (You will need this number for the pesticide use report.)
   a. Trade name
   b. Formulation
   c. US EPA registration number
   d. Manufacturer

5. Which signal word indicates the most toxic pesticides?
   a. Danger-poison
   b. Danger
   c. Warning
   d. Caution

6. Which signal word indicates the least toxic pesticides?
   a. Danger–Poison
   b. Danger
   c. Warning
   d. Caution

Know different sections of the label, be able to locate them, and be able to find specific information.
1 Trade Brand Name. This is the name the manufacturer has given the product. It is used for marketing purposes and is not a reliable guide to the actual chemical makeup of the product.

2 Formulation. The formulation describes the way the active ingredient is mixed with other ingredients to make the product ready to mix or use.

3 Ingredients. The active ingredient is the pesticide chemical with the toxic effect. The inert or other ingredients do not need to be named. Both are listed as percentages.

4 Signal Word. At registration every pesticide is assigned a toxicity category that indicates its level of acute toxicity. Signal words do not indicate potential long-term effects such as cancer.

All products must bear the statement “Keep Out of Reach of Children.” Signal words are as follows:

<table>
<thead>
<tr>
<th>Signal Word</th>
<th>Toxicity</th>
<th>Approved Human Lethal Dosage</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger – Poison (must have skull and crossbones)</td>
<td>Highly toxic</td>
<td>A taste to a teaspoonful</td>
<td>I</td>
</tr>
<tr>
<td>Danger</td>
<td>Highly hazardous</td>
<td>Pesticide-specific (see label)</td>
<td>I</td>
</tr>
<tr>
<td>Warning</td>
<td>Moderately toxic or hazardous</td>
<td>1 teaspoonful to 1 oz</td>
<td>II</td>
</tr>
<tr>
<td>Caution</td>
<td>Low toxicity</td>
<td>1 oz or more up to relatively nontoxic</td>
<td>III</td>
</tr>
</tbody>
</table>

5 Manufacturer.

6 U.S. EPA Registration and Establishment Numbers. Every pesticide has a registration number assigned to it. The establishment number is the code that identifies the site of manufacture or repackaging.

7 Precautionary Statements. These describe the human environmental hazards associated with a pesticide, how to avoid exposure, personal protective equipment required, and how to store and dispose of it. It includes first aid instructions and may include instructions for physicians.

8 Directions for Use. This section lists the plants or sites and the target pests on which the pesticide may legally be used. It tells how to mix and apply the pesticide, and how much to use. Always follow these directions carefully.
Read the storage information below. Then write “yes” or “no” in each blank space in the table.

Store all pesticides in a locked cabinet or container. Post warning signs if the signal word on any of the pesticides is DANGER or WARNING. When storing pesticides in tanks or other service containers, label them properly. Never store pesticides in food or drink containers.

- WRITE “YES” OR “NO” IN EACH COLUMN TO SHOW REQUIREMENTS FOR PESTICIDE USE FOR EACH SIGNAL WORD.

<table>
<thead>
<tr>
<th>PESTICIDE SIGNAL WORD</th>
<th>MUST BE STORED IN A LOCKED CABINET</th>
<th>MUST POST WARNING SIGN ON STORAGE UNIT</th>
<th>MUST LABEL SERVICE CONTAINERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANGER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WARNING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAUTION</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
It is legal to carry pesticide containers in some parts of your truck, but not others. For each part of the truck, mark the “yes” box if it is legal to carry a pesticide there. Mark the “no” box if it is not legal.

- **IS IT LEGAL TO CARRY PESTICIDE CONTAINERS . . .**

  1. In the cab of the truck? □ YES □ NO
  2. Anywhere in the open bed of the truck? □ YES □ NO
  3. In a secure locker in the back of the truck? □ YES □ NO
  4. In the bed of the truck if secured with rope, bungee cord, or tarp? □ YES □ NO
These pictures show how to triple-rinse a pesticide container, but the steps are out of order. Read the rinsing information. Then put the steps in the right order by writing the letters in the blanks.

**RINSING INFORMATION**

Empty pesticide containers must be triple-rinsed before placing them in the trash or taking them to the dump. If there is any pesticide in a container, you must use it up or take it to a hazardous materials site.

**STEPS**

- Step 1. _______
- Step 2. _______
- Step 3. _______
- Step 4. _______
- Step 5. _______
- Step 6. _______
- Step 7. _______

**Fig. Sidebar 1.1 #1**

A. Apply the mix at an appropriate site.

**Fig. Sidebar 1.1 #2 and 3**

B. Repeat steps 2, 3, and 4 at least two more times and until the rinsate is clear.

**Fig. Sidebar 1.1 #6**

C. Replace lid and shake or swirl to rinse all inner surfaces.

**Fig. Sidebar 1.1 #5**

D. Drain rinse solution into mix tank.

**Fig. Sidebar 1.1 #7**

E. Add water to the pesticide container.

**Fig. Sidebar 1.1 #1**

F. Punch a hole in the bottom of the triple-rinsed container so it cannot be reused.

**Fig. Sidebar 1.1 #2 and 3**

G. Drain the last drops from the pesticide container into the mix tank.

1-10

Know how to legally and properly dispose of excess pesticides and empty containers.
Training must cover all of the topics on the checklist below. Read the information. Then read the list and place a check mark before each topic covered in your training. By the time you complete this course and workbook, you should have covered all of the topics.

- **TRAINING INFORMATION**

Employers must train employees to use pesticides safely. Each new employee must be trained before starting work, and training should be repeated every year. If an employer wishes to use a new pesticide, employees must be trained in the use of the new product. Employers must keep a training record for each employee.

### PESTICIDE HANDLER TRAINING CHECKLIST

- [ ] Pesticide label: Format and meaning of information, such as precautionary statements about human health hazards
- [ ] Hazards of pesticides, including acute and chronic effects, delayed effects, and sensitization, as identified in pesticide product labeling, Material Safety Data Sheets, or Pesticide Safety Information Series leaflets
- [ ] Routes by which pesticides can enter the body
- [ ] Signs and symptoms of overexposure
- [ ] Emergency first aid for pesticide overexposure
- [ ] How to obtain emergency medical care
- [ ] Routine and emergency decontamination procedures, including
  - [ ] Spill cleanup
  - [ ] The need to thoroughly shower with soap and warm water after the exposure period
- [ ] Personal protective equipment: Limitations
- [ ] Personal protective equipment: Appropriate use and sanitation
- [ ] Heat illness: Prevention, recognition, and first aid
- [ ] Safety requirements and procedures for handling, transporting, storing, and disposing of pesticides
- [ ] Environmental concerns such as drift, run-off, and wildlife hazards
- [ ] Warnings to not take home pesticides or pesticide containers
- [ ] Pesticide safety requirements, including information in Material Safety Data Sheets and DPR Pesticide Safety Information Series leaflets
- [ ] The location of the written Hazard Communication Information for Employees
- [ ] Handling Pesticides (DPR Pesticide Safety Information Series leaflet N-8); other DPR Pesticide Safety Information Series leaflets; and Material Safety Data Sheets
- [ ] The employee’s rights, including the right
  - [ ] To personally receive information about pesticides to which he or she may be exposed
  - [ ] For his or her physician or employee representative to receive information about pesticides to which he or she may be exposed
  - [ ] To be protected against retaliatory action due to the exercise of any of his or her rights

1-11

Know worker safety requirements, including providing pesticide safety training for handler employees and emergency medical care for all employees.
Be aware of personal protective equipment (PPE) requirements. Then fill in the table below by putting an “X” in the appropriate column.

**EQUIPMENT REQUIREMENTS**

Some PPE is always required when you handle a pesticide in California. Other equipment is required only for certain pesticides. Read the label to find out if a pesticide requires special equipment.

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>ALWAYS REQUIRED IN CALIFORNIA</th>
<th>SOMETIMES REQUIRED (READ THE LABEL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coveralls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gloves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water, soap, clean towels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical-resistant headgear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical-resistant footwear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye Protection</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter One: Answers to Exercises

EXERCISE 1-1
1. US Environmental Protection Agency
2. California Department of Pesticide Regulation
3. County Agricultural Commissioner’s Office
4. County Agricultural Commissioner’s Office
5. California Department of Pesticide Regulation

EXERCISE 1-2
1. Maintenance Gardener Pest Control Business License
2. José or an employee must get a Maintenance Gardener Pest Control Applicator Certificate (category Q)
3. María will need both a Landscape Maintenance Pest Control Applicator Certificate (category B) and a business license

EXERCISE 1-3
1. every two years
2. 8 hours
3. 2 hours
4. d

EXERCISE 1-4
Fill out the form with your name and address, county and current month. Total number of applications is 3.

EXERCISE 1-5
Fill in the form with your own specific information. There is no single correct answer.

EXERCISE 1-6
1. A
2. B
3. No
4. No
5. Yes

EXERCISE 1-7
1. c
2. a
3. c
4. c
5. a
6. d

EXERCISE 1-8
DANGER: YES YES YES
WARNING: YES YES YES
CAUTION: YES NO YES

EXERCISE 1-9
1. No
2. No
3. Yes
4. Yes

EXERCISE 1-10
Step 1. G
Step 2. E
Step 3. C
Step 4. D
Step 5. B
Step 6. F
Step 7. A

EXERCISE 1-11
Fill out this checklist as you complete your training. (No correct answer.)

EXERCISE 1-12
Coveralls—Sometimes required
Gloves—Always required
Water, soap, clean towels—Always required
Chemical-resistant headgear—Sometimes required
Chemical-resistant footwear—Sometimes required
Eye Protection—Always required
Chapter 2. Pests and Pest Diagnosis

The plants shown below have all been damaged. Each photo is followed by a short description of the symptoms. After each description, write “P” if the damage is from pests. Write “A” if the damage is from by abiotic (nonliving) causes.

<table>
<thead>
<tr>
<th>1. Curling of leaves caused by aphids</th>
<th>2. Yellowing caused by iron deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Injury to tree trunk caused by car</td>
<td>4. Leaf spotting caused by leafhoppers</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>5. Leaf curling caused by herbicides</td>
<td>6. Trunk damage caused by anthracnose disease</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>7. Grass burned by fertilizer</td>
<td>8. Branch dieback due to drought</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>9. Branch dieback due to bacterial canker disease</td>
<td></td>
</tr>
</tbody>
</table>

2-1
Know that plants may be injured or stressed by inadequate or improper cultural practices, environmental conditions such as drought and nutritional deficiency, and chemical injury such as air pollutants and spray drift.

Also good to know . . .

2-2
Know what questions to ask to find out whether a problem is caused by a pest or nonliving factors such as poor management practices or chemical toxicities.
2-3 List and describe groups of organisms that are common pests (insects, mites, weeds, vertebrate pests, fungi, bacteria, and viruses) and the damage they cause to landscape plants.

### PEST GROUP

- **Vertebrates**
- **Invertebrates**
- **Weeds**
- **Plant pathogens**

### DAMAGE

1. May feed on any plant part, reducing plant growth and health. May produce holes, discolorations, or distorted growth on plants. Some kill plants.

2. Grow on or in plants and may cause disease symptoms such as leaf spots, powdery fungal growth, cankers, wilting, or plant distortion. Reduce the growth and health of a plant and may eventually kill it.

3. Damage plants through their feeding. May dig holes in turf, damage irrigation lines, and kill young trees.

4. Compete with desirable plants for water, nutrients, and light. Reduce the visual beauty of the landscape.
Match the name of each invertebrate pest with its photo by writing the letter of the photo after the name of the pest.

1. Aphid ______________ 6. Snail/slug ____________
2. Caterpillar __________ 7. Lawn grub ____________
3. Whitefly ____________ 8. Mite _________________
4. Ant _________________ 9. Mealybug ____________
5. Scale ______________

2-4
Be able to recognize and distinguish the following invertebrate pest groups: aphids, whiteflies, mites, scales, caterpillars, snails and slugs, lawn grubs, ants, and mealybugs.

2-5
Distinguish damage caused by insects with sucking mouthparts from damage done by insects with chewing mouthparts.

2-6
Describe the developmental stages of insects with complete and incomplete metamorphosis.

Also good to know . . .

Also good to know . . .
Write the name of the type of weed below each picture. Then answer the questions below.

**CHOOSE FROM THESE WEED TYPES:**
- Broadleaf
- Grass
- Sedge

**QUESTIONS**

1. Which weed type has netlike veins in the leaves? ________________

2. Which weed type has narrow leaves in sets of two? ________________

3. Which weed type has a triangular stem, as seen in a cross section? ________________
Read the list of plant life cycles and look at the pictures. Write the name of the correct life cycle below each picture.

- **PLANT LIFE CYCLES**
  - Summer annual
  - Winter Annual
  - Perennial

1. Life Cycle Name: ____________________________
   ![Image of plant life cycle](image1)

2. Life Cycle Name: ____________________________
   ![Image of plant life cycle](image2)

3. Life Cycle Name: ____________________________
   ![Image of plant life cycle](image3)
Read the paragraph. Use a line to connect each weed photo to the drawing of its vegetative structure type.

**VEGETATIVE STRUCTURES OF PERENNIAL WEEDS**
Burning, chopping, or cutting does not provide good control of perennial weeds because weeds can regrow from their vegetative structures. Chopping or rototilling the structures may just result in several new plants, increasing the problem.

**DRAW A LINE FROM EACH PERENNIAL WEED TO ITS VEGETATIVE STRUCTURE**

- **Nutsedge—Tubers**
- **Bermuda buttercup—Bulbs**
- **Bermudagrass—Stolons**
- **Johnsongrass—Rhizomes**

Describe how vegetative reproductive structures of perennial weeds, such as rhizomes, bulbs, and stolons, make them difficult to control.
Read the paragraph. Write “TRUE” or “FALSE” after each of the sentences.

- **EXPERT DIAGNOSIS**

Fungi, bacteria, and viruses are the most common pathogen groups causing disease in landscape plants. These organisms are so tiny that they are often too small to see without a microscope or other laboratory equipment. Disease symptoms often resemble damage caused by nonliving (abiotic) factors or by other pathogens. To get a diagnosis: 1) collect samples of the diseased roots, leaves, and other parts; 2) place them in a zip lock bag, seal it; and 3) keep the bag cool until you can take it to an expert at a University of California Cooperative Extension or an Agricultural Commissioner’s office.

- **TRUE OR FALSE?**

1. Plant pathogen damage often looks like damage from abiotic causes.

   [ ] TRUE

2. Organisms that cause diseases in plants are often too small to see without a microscope.

   [ ] TRUE

3. Laboratory tests are often needed to be sure a disease is causing the damage.

   [ ] TRUE

4. Some diseases can only be positively identified by a lab test performed by an expert plant pathologist.

   [ ] TRUE
Study the paragraph and diagram. In the list below, place a check mark next to any factor that makes powdery mildew disease more likely.

**THE DISEASE TRIANGLE**
White growth on leaves and buds indicates powdery mildew on roses. Disease symptoms only occur if the three factors listed below are all present at the same time.

1. A susceptible host—in this case a rose
2. The pathogen that causes the disease—in this case a fungus
3. A favorable environment—in this case, shady conditions and leaves that are not wet

Together these three factors—susceptible host, the pathogen and favorable conditions—are called the sides of the Disease Triangle.

**WHICH FACTORS MAKE POWDERY MILDEW ON ROSES MORE LIKELY?**
- 1. Presence of rose powdery mildew fungus, *Sphaerotheca pannosa*
- 2. Susceptible host: rose
- 3. Nonhost: bamboo
- 4. Water on leaves
- 5. Shady conditions
- 6. Sunny conditions

2-12. Describe symptoms and conditions associated with root and crown diseases.
In the list below, place a check mark next to any resources you’ve already used. Before your licensing exam, visit or find out about those you have not used.

- 1. County UC Cooperative Extension office
- 2. County Agricultural Commissioner’s office
- 3. Landscape Pest Identification Cards (UC cards)
- 4. Pests of Landscape Trees and Shrubs (UC book)
- 5. University of California IPM web site at www.ipm.ucdavis.edu

Know where to go to seek information about pest identification.
Chapter 2: Answers to Exercises

EXERCISE 2-1
1. P
2. A
3. A
4. P
5. A
6. P
7. A
8. A
9. P

EXERCISE 2-3
Vertebrates—3
Invertebrates—1
Weeds—4
Plant pathogens—2

EXERCISE 2-4
1. Aphid—G
2. Caterpillar—C
3. Whitefly—F
4. Ant—H
5. Scale—A
6. Snail/slug—D
7. Lawn grub—I
8. Mite—E
9. Mealybug—B

EXERCISE 2-7
Pictures, left to right: sedge, grass, broadleaf
1. broadleaf
2. grass
3. sedge

EXERCISE 2-8
1. winter annual
2. summer annual
3. perennial

EXERCISE 2-9
Nutsedge—D (tubers)
Bermuda buttercup—B (bulbs)
Bermudagrass—C (stolons)
Johnsongrass—A (rhizomes)

EXERCISE 2-10
1. True
2. True
3. True
4. True

EXERCISE 2-11
Numbers 1, 2, and 5 make powdery mildew on rose more likely. The other numbers make the disease less likely to occur.

EXERCISE 1-13
This question does not have right or wrong answers.
Match the locations in the picture with the routine checking you would do at each location. After each description, write the letter of a location shown in the picture.

Know which pests are causing which problems, and look for those pests in the places where they are likely to be.

- PLACE A LETTER FROM THE PICTURE ABOVE IN EACH BLANK BELOW.

1. Check rose bushes for pests. __________________

2. Check mulches to see that they are thick enough. ____________________________

3. Rats, snails, and earwigs like to live in thick ground covers. __________________

4. Grass does not grow well in very shady areas. Consider other ground covers. ________________

5. Wet area under drippy faucet or sprinkler head supports nutsedge and other weeds. __________________________

6. Ants may be tending honeydew-producing insects, such as aphids or scales. Look for sticky honeydew and sooty mold. __________________

7. In the spring, new growth in trees can show symptoms of disease or insect damage. ______

8. Yellow or brown patches of grass from dog urine or fertilizer spill. ______________________

9. Standing water provides a supportive environment for root pathogens. Look for signs of disease. __________________________

Good to know . . .

3-1
List the components of an IPM program.

3-2
Know how to routinely check a landscape to keep on top of pest problems.
Each group of photos shows one of the types of pest management tools in the list. Write the type below each group.

- **TYPES OF TOOLS USED IN AN IPM PROGRAM**
  - cultural
  - biological
  - mechanical/physical
  - chemical

1. Type of tools _____________________________  2. Type of tools ____________________________

3. Type of tools _____________________________  4. Type of tools ____________________________

Describe the main pest management tools used in an IPM program, including cultural, biological, mechanical and physical and chemical.
RESISTANT VARIETIES
If you know a pest is present in your landscape, choose plants or varieties that are resistant or less susceptible to the pest. In the photo below the redgum eucalyptus trees on the left have been attacked by redgum eucalyptus lerp psyllids. The trees on the right are a different eucalyptus species and are unharmed.

1. The healthy eucalyptus trees at right are _______________________________
to the lerp psyllid.

2. One way to avoid _______________________________ treatments in an IPM program is to plant less susceptible plant varieties.

- POSSIBLE ANSWERS
  a. susceptible
  b. resistant
  c. pesticide
  d. weed control
Read the information on cultural practices and complete the exercises.

- **CIRCLE THE GRASS BLADES THAT SHOW THE BEST MOWING HEIGHT**
  If you cut off too much of the grass blade when you mow, it can weaken the grass plant, making it easier for weeds to invade the lawn. What is the best mowing height?

  1. 2/3 blade removed
  2. 1/2 blade removed
  3. 1/3 blade removed
  4. 1/4 blade removed

- **CIRCLE TWO PEST PROBLEMS ASSOCIATED WITH IMPROPER PRUNING**
  Proper pruning is important for maintaining tree health. The tree in the photo below was topped. What problems may follow?

  1. weeds
  2. wood decay diseases
  3. boring insects
  4. gophers

3-5

Explain how cultural practices, such as proper fertilization, irrigation, pruning, and mowing height, are important in preventing lawn weed, insect, and pathogen problems.
Each picture shows one type of weed management tool. Match each tool with one of the instructions below by writing a letter in the box next to the instruction.

- **TYPES OF WEED MANAGEMENT TOOLS**

  A. Header

  B. Mulch

  C. Hand hoes and hula hose

  D. Weed trimmer

- **MATCH THE INFORMATION BELOW WITH ONE OF THE WEED TOOLS SHOWN ABOVE.**

  1. Place tree guards around tree trunks before you use this tool.

  2. These tools remove annual weeds.

  3. The planting bed must be weed-free before applying this.

  4. This tool keeps grass in lawns from spreading into planting beds.
Read the information about natural enemies. The photos show a predator, a pathogen, a parasite, and a pest. Below each photo, identify the type of organism shown.

- **TYPES OF NATURAL ENEMIES**

Natural enemies can reduce the problems caused by insect pests. Protect natural enemies by avoiding the insecticides that kill them. Natural enemies can be:

- predators—hunting down and killing pests
- parasites—living in or on pests
- pathogens, including nematodes—causing diseases in pests

- **WRITE THE TYPE OF ORGANISM BELOW EACH PHOTO**

1. Type of organism

2. Type of organism

3. Type of organism

4. Type of organism

3-7 Define natural enemies, explain how they control pests, and know how to protect them.
Write the name of each natural enemy below its photo, choosing from the names in the list.

- EXAMPLES OF NATURAL ENEMIES
  A. aphid mummy and parasitic wasp
  B. lacewing adult
  C. lacewing larva
  D. lady beetle adult
  E. lady beetle larva
  F. syrphid fly adult
  G. syrphid fly larva

Be able to recognize adults and immatures of the following natural enemies: lady beetles, lacewings, and syrphid flies. Know that aphid mummies indicate parasitic wasp activity.
Read the information below. Then choose the best way to avoid the problem.

**PESTICIDES CAN KILL NATURAL ENEMIES**
Applying insecticides to kill one pest can also kill the natural enemies that are controlling another pest. The example below shows what can happen when a pyrethroid (in this case, permethrin) is applied to control aphids.

A. Pesticide spray

B. Later: No natural enemies. More pests.

**WHAT COULD YOU DO TO AVOID THIS PROBLEM?**
Circle all that apply.

1. Use an insecticide that is not very toxic to natural enemies, such as insecticidal soap or oil.
2. Spray the aphids off with water.
3. Wait a few days to treat to see if natural enemies will control the aphids.
4. Any of the above.

**Also good to know . . .**

3-10. Know the benefits of keeping track of pest problems and management practices on each property.

3-11. Know how to recognize when pest control efforts have not been successful and what to do next.
Look at the following University of California resources for pest management information.

- **UC IPM WEB SITE**
  www.ipm.ucdavis.edu

  The UC IPM home-and-garden web site can help you to:
  
  - identify insect, disease, weed and vertebrate pests on hundreds of landscape plants
  - manage lawn problems (click on “Homes, gardens, landscapes, and turf,” then “Lawns and turf” then “UC Guide to Healthy Lawns”)
  - choose the safest pesticides for lawn and landscape pests
  - identify common beneficial insects

- **UC IPM PUBLICATIONS**

  You may purchase the following publications at your county UC Cooperative Extension office or at http://anrcatalog.ucdavis.edu

  - **Pests of Landscape Trees and Shrubs**
    Loaded with photographs, this book helps you identify and manage pests on hundreds of landscape trees and shrubs.

  - **Landscape Pest Identification Cards**
    This is a set of 46 pocket-sized cards you can carry with you to identify the most common landscape pests.

  - **Wildlife Pest Control Around Gardens and Homes**
    This book includes all you need to know to manage gophers, squirrels, deer, rats, rabbits, and other wildlife pests.
Chapter Three: Answers to Exercises

**EXERCISE 3-2**
1. C
2. D
3. F
4. G
5. A
6. H
7. I
8. E
9. B

**EXERCISE 3-3**
1. Cultural
2. Mechanical/physical
3. Biological
4. Chemical

**EXERCISE 3-4**
1. (b) resistant
2. (c) pesticide

**EXERCISE 3-5**
Mowing height:
3 (1/3 blade removed)

Improper pruning:
2 (wood decay diseases)
and 3 (gophers)

**EXERCISE 3-6**
1. D
2. C
3. B
4. A

**EXERCISE 3-7**
1. Pathogen
   (nematodes emerging from a diseased grub)

2. Parasite
   (a parasitic wasp laying her egg in a caterpillar)

3. Pest
   (a caterpillar feeding on a leaf)

4. Predator
   (an assassin bug attacking a leafhopper)

**EXERCISE 3-8**
1. lady beetle adult (D)
2. lady beetle larva (E)
3. lacewing larva (C)
4. aphid mummy and parasitic wasp (A)
5. syrphid fly adult (F)
6. lacewing adult (B)
7. syrphid fly larva (G)

**EXERCISE 3-9**
Answer: 1, 2, 3, and 4. All would be good ways to avoid the problem.

**EXERCISE 3-12**
No question.
Chapter 4. Pesticides and Their Hazards

Using the information in the table, answer the questions in the spaces provided.

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>Trade name</th>
<th>CHEMICAL NAME</th>
<th>Trade name</th>
<th>CHEMICAL NAME</th>
<th>Trade name</th>
<th>CHEMICAL NAME</th>
<th>Trade name</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISULFOTON</td>
<td>2 in 1</td>
<td>METALDEHYDE</td>
<td>Slug &amp; Snail Death</td>
<td>CARBARYL</td>
<td>Sevin Ready-To-Spray Bug Killer</td>
<td>GLYPHOSATE</td>
<td>Remuda Full Strength</td>
</tr>
<tr>
<td></td>
<td>Systemic Rose &amp; Flower Care</td>
<td>(72155-49)</td>
<td>(8119-11)</td>
<td>(264-334-71004)</td>
<td>(228-366-54705)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>insecticide</td>
<td>molluscicide</td>
<td>insecticide</td>
<td>herbicide</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral LD&lt;sub&gt;50&lt;/sub&gt; (mg/kg)</td>
<td>347 mg/kg</td>
<td>630 mg/kg</td>
<td>1,947 mg/kg</td>
<td>over 5,000 mg/kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight equivalent for a person (who weighs 60 kg or 132 pounds)</td>
<td>less than 1 ounce</td>
<td>slightly over 1 ounce</td>
<td>approximately 4 ounces</td>
<td>more than 10 ounces</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal word</td>
<td>WARNING</td>
<td>CAUTION</td>
<td>CAUTION</td>
<td>CAUTION</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. What is the term used to indicate the relative amount required to kill half of the population of test animals when taken by mouth?

2. Is a pesticide with an LD<sub>50</sub> of 347 mg/kg MORE toxic or LESS toxic than a pesticide with an LD<sub>50</sub> of 1,947 mg/kg?

3. Which signal word indicates the more toxic pesticide: CAUTION or WARNING?

4. Write the chemical name for the least toxic pesticide listed in the table.

5. Write the trade name for the most toxic pesticide listed in the table.
The toxicity of a pesticide does not change, but you can reduce the chance that injury will occur. Below are five examples of actions you can take to make an application procedure safer. Complete the table below by writing the letter of each example next to the factor it best illustrates.

<table>
<thead>
<tr>
<th>FIVE FACTORS THAT INFLUENCE PESTICIDE SAFETY OR EFFECTIVENESS</th>
<th>EXAMPLE OF AN ACTION YOU CAN TAKE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chemical properties of the pesticide product</td>
<td>A. Don’t spray when it is windy.</td>
</tr>
<tr>
<td>2. Application procedures</td>
<td>B. Your application site is near a creek. Adjust the treatment so no spray is applied within 10 feet of the creek.</td>
</tr>
<tr>
<td>3. Weather and water management</td>
<td>C. Put the pesticide in a bait station instead of spraying or spreading it.</td>
</tr>
<tr>
<td>4. Condition of treated plant</td>
<td>D. Choose a less toxic pesticide to protect bees and natural enemies.</td>
</tr>
<tr>
<td>5. Characteristics of the site</td>
<td>E. Don’t apply insecticidal oils to water-stressed plants.</td>
</tr>
</tbody>
</table>
Draw a line from the pesticide name to the type of pest it controls.

1. HERBICIDE
2. MOLLUSCICIDE
3. ACARICIDE OR MITICIDE
4. FUNGICIDE
5. INSECTICIDE
6. RODENTICIDE

Know how pesticides are classified according to target pest.
For each pest problem listed below, choose the best herbicide from the products shown. Write the letter of your choice in the box provided.

- **HERBICIDE PRODUCTS**

A. Glyphosate: a nonselective herbicide

B. 2,4-D and MCPP: selective herbicides for killing broadleaf weeds

C. Fluazifop: A selective herbicide for killing grassy weeds

- **WHICH HERBICIDE WOULD YOU USE FOR EACH PROBLEM?**

  - 1. Bermudagrass is growing in the landscape beds.  
  - 2. You are removing a lawn and want all weeds and turf killed.  
  - 3. The lawn is seriously infested with several broadleaf weed species. You plan to keep the lawn and overseed after killing the weeds.

Define pesticide selectivity and explain why it is important.
Draw a line from each pesticide formulation type to the best way to apply it.

**PESTICIDE FORMULATIONS**

1. 

2. 

3. 

4. 

**WAYS TO APPLY**

A. 

B. No special applicator required.

C. 

D. 

4-5

Be familiar with different pesticide formulations.
For each drawing below, write either “preemergent herbicide” or “postemergent herbicide” to indicate which type of pesticide timing is shown.

- HERBICIDE TIMING: PREEMERGENT OR POSTEMERGENT?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply before weed seeds germinate.</td>
<td>Apply after weeds germinate.</td>
</tr>
</tbody>
</table>
Read the information on contact and systemic herbicides. Circle the letter of the best type of herbicide for each situation described below.

**CONTACT AND SYSTEMIC HERBICIDES**

**CONTACT HERBICIDE**
Contact herbicides usually kill only the green parts of the plant where the spray touches the plant. Contact herbicides will kill young plants fairly quickly. They may not kill older plants or the roots.

**SYSTEMIC HERBICIDE**
Systemic herbicides are taken up by green plant parts or through roots and are transported to the growing tips of roots and shoots. It may take several days for a systemic herbicide to kill a plant.

**WHICH TYPE OF HERBICIDE SHOULD YOU USE?**
1. Young annual weeds have just appeared in mulch around shrubs.
   a. contact herbicide
   b. systemic herbicide

2. You are preparing a bed for planting, but it contains a thick growth of difficult-to-control perennial weeds, including bermudagrass.
   a. contact herbicide
   b. systemic herbicide

4-7 Explain the difference between contact and systemic herbicides.
Select the right type of insecticide, systemic or nonsystemic, for each statement in the table. Write an “X” in the correct column.

| Requires good coverage of all infested plant parts | SYSTEMIC | NONSYSTEMIC |
| Insecticide moves through the plant to areas where insects feed. | | |

4-8 Explain the difference between systemic insecticides and other insecticides.

- **NONSYSTEMIC INSECTICIDE**
  - Apply to all areas or plant parts where insects are present.

- **SYSTEMIC INSECTICIDE**
  - Apply to soil for plant uptake.
Study the picture showing pesticide movement. Select the type of pesticide movement, drift or runoff, for each condition listed in the table below. Write an “X” in the correct column.

<table>
<thead>
<tr>
<th></th>
<th>DRIFT</th>
<th>RUNOFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windy weather</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overwatering</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### PESTICIDE MOVEMENT

- Pesticides drift in air.
- Sprinkler or rain water washes pesticides down drains.
- Pesticides move in water or stick to soil particles and wash down drains.

4-9

Explain how pesticides move in the environment in air, water, and sediment and injure non-target organisms.
Determine which of the following symptoms on roses are most likely to be the result of herbicide phytotoxicity. Circle the number of the correct answer.

**WHICH IS THE RESULT OF HERBICIDE PHYTOTOXICITY?**

1. Buds and leaves sticky and covered with small insects

2. Stunted leaves, yellowing, no insects, no powdery growth

3. Powdery growth over leaves and buds

Recognize the causes and effects of phytotoxicity (injury to plants) from landscape and turfgrass pesticide applications.
Each picture shows one way people can be exposed to pesticides.

- **HOW PEOPLE CAN BE EXPOSED TO PESTICIDES**

- 1. Touching treated surfaces immediately after application
- 2. Pesticide spills
- 3. Pesticide residue on clothing or equipment
- 4. Applying pesticide without wearing protective equipment
- 5. Pesticide drift
- 6. Splashing when mixing pesticides
- 7. Breakage of application hoses or equipment

Explain how people get exposed to pesticides in landscape and turf settings.
Match each statement below with one of the ways that pesticides can enter the body. Write the letter for this type of entry in the box next to the statement.

**HOW PESTICIDES ENTER THE BODY**

<table>
<thead>
<tr>
<th>A. Skin</th>
<th>B. Mouth</th>
<th>C. Lungs</th>
<th>D. Eyes</th>
</tr>
</thead>
</table>

- WRITE THE LETTER FOR THE CORRECT BODY PART IN EACH BOX.

- 1. This is the most common way people are exposed to pesticides.
- 2. Protective equipment must always be worn to protect this part of the body.
- 3. Failing to wash your hands before you eat can lead to this kind of exposure.
- 4. Some pesticide labels require that you wear a respirator to protect this body part.
Answer these questions about pesticide exposure.

1. Circle the letter of any symptom that might indicate pesticide injury. You may circle more than one letter.
   a. rash, skin reddening
   b. eye irritation
   c. headache, dizziness
   d. blurred vision
   e. nausea, vomiting
   f. cramps, diarrhea
   g. flu-like symptoms

2. How can you be sure that a pesticide is the cause of the injury? Write your answer in the space below.
Chapter Four: Answers to Exercises

EXERCISE 4-1
1. Oral LD_{50}
2. MORE toxic
3. The signal word WARNING indicates a more toxic pesticide
4. glyphosate
5. 2 in 1 Systemic Rose and Flower Care

EXERCISE 4-2
1. D
2. C
3. A
4. E
5. B

EXERCISE 4-3
1. D
2. F
3. B
4. A
5. E
6. C

EXERCISE 4-4
1. C
2. A
3. B

EXERCISE 4-5
1. C
2. A
3. D
4. B

EXERCISE 4-6
Pictures, left to right: Preemergent herbicide, Postemergent herbicide

EXERCISE 4-7
1. a or b
2. b

EXERCISE 4-8
Requires good coverage of all infested plant parts: nonsystemic
Insecticide moves through the plant to areas where insects feed: systemic

EXERCISE 4-9
Rain—Runoff
Windy weather—Drift
Overwatering—Runoff

EXERCISE 4-10
The correct answer is 2: Stunted leaves, yellowing, no insects, no powdery growth.

EXERCISE 4-11
1. F
2. B
3. G
4. E
5. D
6. A
7. C

EXERCISE 4-12
1. A (skin)
2. D (eyes)
3. B (mouth)
4. C (lungs)

EXERCISE 4-13
1. Any of these symptoms could indicate pesticide injury. All letters should be circled.
2. You must go to the doctor to confirm that symptoms are caused by pesticide exposure.
Chapter 5. Protecting People and the Environment and Handling Emergencies

5-1 Review the three sources of pesticide safety information and the three places to find the information. Match each information source with the place you would expect to find it by drawing a line from each photo to the correct source.

**INFORMATION SOURCES**

1. the label

2. MSDS

3. Pesticide Safety Information Series

**PLACES TO FIND INFORMATION**

A. from the County Agricultural Commissioner’s office or the California Department of Pesticide Regulation (DPR) web site

B. on the pesticide container

C. from the store where you purchased the pesticide, or the manufacturer
Circle two areas on the pesticide label below that can help you decide if the pesticide is dangerous to people or wildlife.

Know how to select pesticides that are less hazardous to people, water quality, and wildlife by comparing label information.

CONTROLS INSECTS ON HOME LAWNS, FLOWERS, VEGETABLES, TREES AND SHRUBS

Kills aphids, ants, beetles, borers, flies, crickets, caterpillars, whiteflies, loopers, scale, and other listed insects on yard and garden plants

Active Ingredient
Permethrin 2.5%
Other Ingredients 97.5%

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION: May be harmful if swallowed or absorbed through skin. Avoid breathing spray mist. Avoid contact with skin, eyes, clothing; wash thoroughly with soap and water after handling. Food utensils such as measuring cups and measuring spoons should not be used for food purposes after use with pesticides. Keep people and pets out of areas being treated and off treated areas until the spray has dried.

FIRST AID
If swallowed: Call a physician or Poison Control Center immediately.
If on skin: Wash promptly with plenty of soap and water; wash contaminated clothing.
If in eyes: Flush with plenty of water for 15 minutes. Call physician if irritation persists.
If inhaled: Remove to fresh air. Get medical attention if breathing is difficult.

ENVIRONMENTAL HAZARDS
This product is highly toxic to fish. Do not apply directly to water. Do not allow drift and runoff from treated areas to contact water. Do not contaminate water when disposing of equipment washwater.

PERSONAL PROTECTIVE EQUIPMENT
When applying or handling this product, the following protective equipment is required: long-sleeve shirt and long pants, shoes and socks, chemical resistant gloves, protective eyewear. Clothing worn during product applications should be laundered separately from family and household laundry.

DIRECTIONS FOR USE
It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Mix and apply: For lawns and vegetables, measure the area to be sprayed, calculate square feet by multiplying length by width. For all other applications, apply as a thorough cover spray. For use on specific plants and for specific pests, consult the directions in the enclosed booklet. Use a clean sprayer. Carefully measure and mix the amount of product and water as directed. Spray as directed, applying when insects first appear. Repeat applications as directed. Flush sprayer with clean water after each use.

STORAGE AND DISPOSAL
Store in a cool, dry place. Do not re-use container. Triple rinse container thoroughly, wrap in newspaper before discarding in trash.
Circle the products that represent special dangers to pets.

Be aware of the hazards of vertebrate pest control materials and snail baits to pets and nontarget organisms.

Insecticidal spray oil

Strychnine gopher bait

Insecticidal soap

Metaldehyde snail bait

Iron phosphate snail bait
Look at the five types of personal protective equipment (PPE) shown in the photos. Write the correct letter next to the name of each type of PPE.

1. Coveralls __________

2. Chemical-resistant gloves (always required) __________

3. Head protection __________

4. Eye protection (always required) __________

5. Chemical-resistant boots __________
Read the list of jobs that require wearing PPE. Then look at the photos. Under each photo, write the letter of the matching job from the list.

- **ALWAYS WEAR PPE WHEN DOING ANY OF THESE JOBS**
  A. cleaning equipment
  B. transferring materials or application equipment into or out of the truck
  C. opening containers
  D. handling measuring equipment

- **WRITE THE LETTER OF THE CORRECT JOB BELOW EACH PHOTO.**

1. ______

2. ______

3. ______

4. ______

Know that you can be contaminated by touching pesticide application equipment, which exposes you to harmful pesticide residues.
Place a check mark next to each action that will help protect residents, pets, and the public when applying pesticides.

<table>
<thead>
<tr>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notify residents before applying pesticides.</td>
</tr>
<tr>
<td>Apply pesticides only when people and pets are away from the area.</td>
</tr>
<tr>
<td>Always wear goggles and gloves.</td>
</tr>
<tr>
<td>Prevent drift.</td>
</tr>
<tr>
<td>Warn residents to stay away from treated areas until the pesticide has dried (or longer if the label advises).</td>
</tr>
<tr>
<td>Choose the right herbicides.</td>
</tr>
</tbody>
</table>

List precautions that can be taken to protect people and pets that might enter a treated area.
Look at the gardener in the picture. He is doing two things that increase the risk of pesticide exposure for the nearby children. Indicate these two mistakes by circling the correct numbers in the following list.

**WHAT IS THE GARDENER DOING WRONG? CIRCLE TWO ACTIONS.**
1. Pesticides should not be applied when a wind is blowing.
2. Landscape trees should never be sprayed.
3. Pesticides should not be applied when children are nearby.
4. Spray should not be applied with too large a droplet size.
Look at the picture showing how pesticides move from storm or household drains into creeks and rivers. Check “True” or “False” after each statement in the list below.

1. It is okay to pour leftover pesticide down indoor drains because the water will be decontaminated at the wastewater treatment plant.

2. Pesticides should not be dumped into storm drains because the contaminated water may flow directly into a creek, a river, a lake or pond, or an ocean.

3. It is a good idea to water the lawn right after a pesticide application.

4. Triple-rinsed containers of home-use pesticides can be placed in the trash.

5. Partially-filled containers of home-use pesticides can be placed in the trash.

6. Any pesticide container with pesticides still in it must be disposed of at an approved hazardous materials location.

Know how to keep pesticides out of the environment through proper application and disposal practices.
Look at the steps for protecting yourself after handling pesticides. Then look at the photos. Each shows one of these steps. Under each photo, write the letter of the step in the list that matches it.

- **PROTECT YOURSELF AFTER HANDLING PESTICIDES**

  A. Wash goggles and other PPE in soapy water, but keep your gloves on to do this.

  B. Remove gloves last, after all other application and PPE equipment is cleaned and put away.

  C. Shower and put on clean clothes as soon as you get home.

  D. Launder work clothes daily. Keep separate from other laundry.

- **WRITE THE LETTER OF THE MATCHING STEP BELOW EACH PHOTO.**

  1. _______

  2. _______

  3. _______

  4. _______
Look at the two responses to pesticide exposure and the four types of exposure. Choose the best response for each type of exposure by writing “A” or “B” in the box provided.

- **TWO RESPONSES TO PESTICIDE EXPOSURE**
  A. Leave contaminated area, remove contaminated clothing, flush the exposed area with water, and then call 911 and get immediate medical care.
  B. Call 911 or seek other immediate medical care.

- **TYPES OF EXPOSURE**
  MATCH THE CORRECT RESPONSE BY PUTTING “A” OR “B” IN THE BOX.

  - 1. Pesticide sprayed in eyes.
  - 2. Pesticide spilled on skin.
  - 3. Pesticide swallowed.
  - 4. Possible inhalation or ingestion if the person applying the pesticide feels sick to the stomach or has difficulty breathing.

Know how to recognize pesticide exposure symptoms and respond to emergencies.
Look at the pictures and read the descriptions of steps to follow when cleaning up after a pesticide spill. Put the steps in the right order by writing a letter after each number in the list.

- **STEPS**
  - Step 1. _______
  - Step 2. _______
  - Step 3. _______
  - Step 4. _______
  - Step 5. _______
  - Step 6. _______

A. Contain the spill using absorbent material, such as sawdust, cat litter, or newspaper.
B. Dispose of everything at a hazardous waste dump.
C. Put used absorbent materials and remaining pesticide in a sealed container, and label the container.
D. Clear the area of people and pets.
E. Put on your PPE.
F. Apply absorbent material, wash exposed surfaces with detergent, and scoop and sweep up.

**Also good to know . . .**

**5-12**
Know how to respond to pesticide fires.

**5-13**
Know what to do when pesticides are misapplied.
Show how you plan to handle your financial responsibility requirement by checking one of the statements. (Either choice is a legal option.)

- **THE FINANCIAL RESPONSIBILITY REQUIREMENT**
If you run a Maintenance Gardener Pest Control Business, you must take financial responsibility for any damage caused by pesticides applied by you or the people you supervise.

- **HOW WILL YOU HANDLE THE REQUIREMENT?**
- [ ] I will get liability insurance through an insurance company.
- [ ] I will sign a financial responsibility statement.

Financial Responsibility Requirement
- [ ] I declare under penalty of perjury, that as to chemical bodily injury and chemical property damage resulting from my pest control operation, I am financially able to respond to damages using my own personal assets (3CCR Section 6524).

Know that you will be liable if you apply a pesticide that injures plants, people, animals, or property.
### Chapter Five: Answers to Exercises

<table>
<thead>
<tr>
<th>Exercise 5-1</th>
<th>Exercise 5-5</th>
<th>Exercise 5-9</th>
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<tbody>
<tr>
<td>2. C</td>
<td>2. C</td>
<td>2. A</td>
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<table>
<thead>
<tr>
<th>Exercise 5-2</th>
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<tbody>
<tr>
<td>Two areas that should be circled are:</td>
</tr>
<tr>
<td>1. The signal word, <strong>CAUTION</strong></td>
</tr>
<tr>
<td>2. The section on <strong>ENVIRONMENTAL HAZARDS</strong></td>
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<tr>
<th>Exercise 5-3</th>
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<tr>
<td>Strychnine gopher bait and metaldehyde snail bait present special hazards to pets.</td>
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<td>3. A</td>
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<td>4. B</td>
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<td>5. E</td>
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<tr>
<th>Exercise 5-6</th>
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<tbody>
<tr>
<td>All items should be checked. All will help protect people and the environment.</td>
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<tr>
<th>Exercise 5-7</th>
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<tr>
<td>Both 1 and 3 should be circled.</td>
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<tbody>
<tr>
<td>1. False</td>
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<td>2. True</td>
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<td>3. False</td>
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<td>4. True</td>
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<td>5. False</td>
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<td>6. True</td>
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<th>Exercise 5-9</th>
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<td>1. D</td>
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<td>3. C</td>
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<tbody>
<tr>
<td>1. A</td>
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<td>2. A</td>
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<td>3. B</td>
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<td>4. A</td>
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<table>
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<tr>
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<tbody>
<tr>
<td>Step 1. D</td>
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<td>Step 2. E</td>
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<td>Step 3. A</td>
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<td>Step 4. C</td>
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<td>Step 5. F</td>
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<td>Step 6. B</td>
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<tr>
<th>Exercise 5-14</th>
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<tr>
<td>Either answer is valid.</td>
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</table>
Chapter 6. Selection and Use of Pesticide Application Equipment

Read the story. Then identify the most likely cause of the problem by circling the best explanation.

- **USING A BACKPACK SPRAYER**

  Joe used a backpack sprayer to apply an herbicide to a client's lawn for weed control one morning. In the afternoon of the same day, he used the same sprayer to apply an insecticide to a small ash tree infested with aphids.

  Before Joe sprayed the tree the leaves were green. A few days later, the property owner called to complain that the tree leaves had suddenly turned brown and appeared to be dying. When Joe went back to the property, this is what he saw:

  ![Brown leaves](image-url)

- **WHAT WAS THE LIKELY CAUSE OF THE PROBLEM?**

  1. The insecticide didn’t work, and aphids killed the leaves.
  2. There was herbicide residue in the sprayer, which mixed with the insecticide and injured the leaves.
  3. The insecticide was not labeled for use on ash trees.
  4. Powdery mildew killed the leaves.
Write the correct name below each picture showing a type of application equipment. Then draw a line from the application equipment to its description.

### TYPES OF APPLICATION EQUIPMENT

- hose-end sprayer
- trigger pump sprayer
- compressed air sprayer
- backpack sprayer
- rotary or broadcast spreader
- drop spreader

### DESCRIPTIONS OF APPLICATION EQUIPMENT

A. A backflow prevention device required to protect the water supply

B. Ready-to-use for spot treatments

C. Good overall sprayer for liquid sprays, pump on top

D. Good overall sprayer for liquid sprays, hand pump at waist

E. For granules applied to lawns and landscapes, can scatter pesticide off site

F. For granules applied to lawns and landscapes, less likely to scatter pesticide off the application site
Below is a list of six sprayer parts. All of these parts are shown in the picture of the sprayer. Draw a line from the name of each part to its location in the picture.

- **SPRAYER PARTS**
  1. wand
  2. hose
  3. pump
  4. tank
  5. nozzle
  6. control valve

The photos below show three types of nozzles: flat fan spray, cone, and adjustable. Write the type of nozzle shown below each photo. Circle the photo of the nozzle used mainly for herbicide sprays.

- **NOZZLE TYPES**
  - cone
  - adjustable
  - flat fan spray

Type of nozzle
1. 

Type of nozzle
2. 

Type of nozzle
3. 

Identify and know the function of the following components of liquid application equipment: tank, hose, pump, wand, control valve, and nozzle (including cone, flat fan, and adjustable nozzles.)
Read sections of *Lawn and Residential Landscape Pest Control* related to cleaning equipment, on page 174. Then identify what’s wrong with the procedures below by circling a letter in each one.

1. What’s wrong with cleaning application equipment with water in a utility sink?
   a. There is no need to wash application equipment as long as you empty the sprayer.
   b. Rinse water should not run into the drain. Rinse water should be sprayed in the landscape on plants or sites listed on the pesticide label.
   c. You need to add soap to the water to reduce contamination.

2. What’s wrong with cleaning a filter screen with a toothbrush without wearing gloves?
   a. Filters should not be removed from nozzles because filters can break.
   b. There is no need to wash the filters.
   c. Gloves must be worn when washing any application equipment.

3. What’s wrong with dislodging dirt from a nozzle with a screwdriver?
   a. Metal tools, such as screwdrivers, can break nozzles. A wooden toothpick would be better for this job.
   b. Nozzles should not be cleaned. Cleaning can make them inaccurate.
   c. Blowing on a nozzle is the most efficient way to clean it.
The photos below show bait stations and applicators. Each is used to control one of the target pests in the list. Write the name of the target pest below each device, using the list.

1. ________________________
2. ________________________
3. ________________________
4. ________________________

- **TARGET PESTS**
  A. ants
  B. rats and other rodents
  C. snails and slugs
  D. earwigs
  E. gophers
Look at the pictures below. Each picture shows one mistake you could make when mixing pesticide spray. Three possible mistakes are listed next to each picture. For each picture, circle the number of the mistake shown in the picture.

- MIXING PESTICIDES

Picture 1

1. Water should be added to the tank first.
2. Gloves and other PPE must be worn when mixing pesticides.
3. There should be an air gap between the water source and the pesticide in the tank.

Picture 2

1. Water should be added to the tank first.
2. Gloves and other PPE must be worn when mixing pesticides.
3. There should be an air gap between the water source and the pesticide in the tank.

Picture 3

1. Water should be added to the tank first.
2. Gloves and other PPE must be worn when mixing pesticides.
3. There should be an air gap between the water source and the pesticide in the tank.
The measuring cup below would be appropriate for measuring one of the amounts in the list. Circle the letter of the appropriate amount.

- WHAT AMOUNT WOULD YOU MEASURE WITH THIS CUP?
  1. 1 tablespoon
  2. 6 dry ounces
  3. 4 fluid ounces
  4. 2 cups

Be aware of the hazards involved with using improper measuring and mixing tools.
Read the information about calibration. Then match each picture to one of the reasons by writing its letter in the box.

**WHY CALIBRATE YOUR EQUIPMENT?**

Calibration means checking and adjusting your pesticide application equipment to make sure you are applying the correct amount of pesticide. Four important reasons for calibrating are shown below.

- Reduce cost by preventing waste.
- Ensure good pest control.
- Make sure you are meeting label and legal requirements by following the recommended application rate.
- Prevent injury to humans, the environment, wildlife, and plants in the landscape.

**MATCH THE PICTURES ABOVE WITH THE REASONS TO CALIBRATE BELOW**

A. Reduce cost by preventing waste.
B. Ensure good pest control.
C. Make sure you are meeting label and legal requirements by following the recommended application rate.
D. Prevent injury to humans, the environment, wildlife, and plants in the landscape.

Also good to know...

Know how to calibrate liquid sprayers and dry applicators for turfgrass and ornamental applications.
Read the sample problem. Then answer the questions below.

- **HOW MUCH PESTICIDE SHOULD YOU USE?**
You are applying Roundup to an area of lawn you want to replant. The label says to use five tablespoons of Roundup to a gallon of water for every 300 square feet. The area you need to treat is shown in the diagram below.

![Diagram of lawn area](image)

1. How much Roundup will you need to cover the area? Circle the correct answer.
   a. 1 tablespoon
   b. 2.5 tablespoons
   c. 5 tablespoons
   d. 10 tablespoons

2. How much water should you put in the tank? Circle the correct answer.
   a. 1/2 gallon
   b. 1 gallon
   c. one quart
   d. two gallons
Read the elements of a successful application. Then look at the examples of mistakes made when applying pesticides. Match each element with a related mistake. Write an element number next to each example.

- **ELEMENTS OF A SUCCESSFUL APPLICATION**
  A. Correct application equipment including personal protective equipment
  B. Correct pesticide application rate and dilution for the site
  C. Correct type of coverage (broadcast or spot treatment)
  D. Life stage of target pest when pesticide is most likely to be effective
  E. A site where the pesticide can be safely applied without injuring people or the environment

- **EXAMPLES OF MISTAKES MADE WHEN APPLYING PESTICIDES**

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Preemergent herbicides are used after weeds have germinated or sprouted from seeds.</td>
<td></td>
</tr>
<tr>
<td>2. A plant shows leaf burn after a pesticide is applied at the wrong rate.</td>
<td></td>
</tr>
<tr>
<td>3. Worker doesn’t wear gloves and gets a skin rash.</td>
<td></td>
</tr>
<tr>
<td>4. A whole tree is treated for borers, although borers only enter at the trunk.</td>
<td></td>
</tr>
<tr>
<td>5. Worker applies pesticides on the sidewalk near a storm drain.</td>
<td></td>
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</tbody>
</table>

6-11
Know why the following are necessary for a successful pesticide application:
- Appropriate equipment
- Correct application rate and dilution
- Proper application site
- Appropriate coverage (broadcast versus spot treatment)
- Vulnerable life stage of the target pest
- Personal protective equipment

Also good to know...

6-12
Know how to determine whether a pesticide application was successful.
Chapter Six: Answers to Exercises

EXERCISE 6-1
2. There was herbicide residue in the sprayer.

EXERCISE 6-2
1. compressed air sprayer, C
2. drop spreader, F
3. hose-end sprayer, A
4. rotary or broadcast spreader, E
5. backpack sprayer, D
6. trigger pump sprayer, B

EXERCISE 6-3
Sprayer parts

Nozzle types
1. flat fan spray
2. cone
3. adjustable
The flat fan spray is used mostly for herbicides.

EXERCISE 6-4
1. b
2. c
3. a

EXERCISE 6-5
1. E
2. A
3. A
4. B

EXERCISE 6-6
Picture 1: 2
Picture 2: 3
Picture 3: 1

EXERCISE 6-7
The correct answer is 3 (4 fluid ounces).

EXERCISE 6-8
1. D
2. B
3. A
4. C

EXERCISE 6-10
1. b
2. a

EXERCISE 6-11
1. D
2. B
3. A
4. C
5. E
CHAPTER ONE

1. The county agricultural commissioner
   □ a. is responsible for local enforcement of pesticide laws and regulations
   □ b. can charge fines
   □ c. is a good resource for information about pest control issues
   □ d. all of the above

2. If you hold a valid Maintenance Gardener Pest Control Business License, you must also have (Note: There are two correct answers.)
   □ a. a restricted materials permit
   □ b. proof of financial responsibility
   □ c. approval from the city where you will apply pesticides to buildings
   □ d. an Applicator Certificate in category Q or B

3. To renew your Qualified Applicator Certificate (category Q), you must have completed
   □ a. 40 hours of continuing education
   □ b. 20 hours of continuing education
   □ c. 8 hours of continuing education
   □ d. a written exam

4. Your pesticide use records and use reports must be able to be inspected by the
   □ a. county health department
   □ b. California Department of Food and Agriculture
   □ c. Regional Water Quality Control Board
   □ d. county agricultural commissioner

5. Pesticide application notification can help by
   □ a. warning residents that a pesticide has been applied so they can avoid recently treated areas
   □ b. warning parents not to allow babies to crawl in recently treated areas
   □ c. assuring that clients are aware of all pesticides recently applied in yards
   □ d. all of the above

6. If the intended use site is not shown on the pesticide label, the pesticide may be used only
   □ a. in California
   □ b. in the United States
   □ c. if you have a license
   □ d. never

7. Pesticide label information is key to applicator safety. Which information is not found on a pesticide label?
   □ a. the manufacturer’s latest discount for bulk purchases
   □ b. specific safety information for handlers
   □ c. what to do in the case of a fire in a pesticide storage area
   □ d. the name and amount of the active ingredient

8. Pesticides must be stored
   □ a. with application and safety equipment
   □ b. near garage exits so they are easy to locate
   □ c. in locked enclosures
   □ d. outside

9. A service container should be labeled with which of the following information?
   □ a. product name
   □ b. signal word
   □ c. responsible party
   □ d. all of the above

10. Never transport pesticides in passenger vehicles unless they are
    □ a. to be used by a commercial applicator
    □ b. out of reach of children
    □ c. in a nonpassenger part of the vehicle
    □ d. mixed with fertilizers

11. Half-full pesticide containers can be disposed of
    □ a. at certain household hazardous waste sites
    □ b. down storm drains
    □ c. by the applicator only
    □ d. by mixing with other leftover pesticides

12. Worker safety requirements include
    □ a. providing pesticide safety training for handler employees
    □ b. arranging for emergency medical care
    □ c. providing all necessary safety equipment and training in its use
    □ d. all of the above
1. Which of the following is not an abiotic disorder that damages plants?
   □ a. mechanical injury
   □ b. chewing damage from caterpillars
   □ c. overwatering
   □ d. pesticide injury

2. Proper identification of pests is important for pest management because
   □ a. misidentification or lack of information about a pest could cause you to make poor management decisions and not solve the problem
   □ b. you must be certain that the damage you see is actually due to a pest and not some other cause
   □ c. damage symptoms caused by pests and abiotic disorders often look similar
   □ d. all of the above

3. If several different species of plants in one area of a landscape suddenly develop brown areas on their leaves, what would you suspect might be the cause?
   □ a. an insect
   □ b. a disease
   □ c. an abiotic factor
   □ d. a fungus

4. All of the following are true of gophers, ground squirrels and moles, EXCEPT
   □ a. They are vertebrate pests.
   □ b. Their burrows damage landscapes.
   □ c. They eat landscape plants.
   □ d. They are natural enemies of pests.

5. If leaves are covered with a sticky sugary substance and black mold, what might you suspect is the cause?
   □ a. an abiotic disorder
   □ b. a bacterial disease
   □ c. overwatering
   □ d. a sucking insect pest

6. Insects that undergo major shape changes between the immature and adult stage are said to have
   □ a. many nymphs
   □ b. gradual metamorphosis
   □ c. mature metamorphosis
   □ d. complete metamorphosis

7. _______________ weeds live one year or less. They sprout from seeds, mature, and produce seeds for the next generation during this period.
   □ a. annual
   □ b. woody
   □ c. broadleaf
   □ d. perennial

8. Why are many perennial weeds difficult to kill?
   □ a. they grow very fast
   □ b. they produce a lot of seed
   □ c. they produce underground reproductive structures, such as rhizomes, that allow them to regrow
   □ d. they produce poisonous tubers

9. What are the three components of the disease triangle?
   □ a. pathogen, susceptible host, and favorable environment
   □ b. bacteria, wet leaves, and wind
   □ c. pathogen, susceptible host, and many trees
   □ d. none of the above

10. For most efficient use of your time when checking a landscape for pests, focus your efforts
    □ a. on the highest value plants
    □ b. on plant species and areas known to have problems
    □ c. on planting beds rather than lawns
    □ d. on lawns rather than planting beds

11. Write in the correct name of the pest in the photos at right. Choices are: lawn grub, ant, scale, mealybug, snail, mite, aphid, whitefly
CHAPTER THREE

1. To manage pests, integrated pest management programs primarily rely on
   □ a. pesticides
   □ b. biological control
   □ c. a combination of methods
   □ d. action thresholds

2. There are five components to a successful IPM program. They include the following: prevention through good cultural practices; regular monitoring for pests and problems; action thresholds: treat only when necessary; and integration of appropriate management methods. One component is missing. It is
   □ a. pest and symptom identification
   □ b. organically acceptable pesticides
   □ c. removing target organisms
   □ d. cultural practices

3. Which of the following is an example of a cultural control practice?
   □ a. traps
   □ b. applying an herbicide
   □ c. releasing natural enemies
   □ d. setting irrigation timers to water lawns in early morning

4. What is one reason why you should avoid over-watering plants?
   □ a. it may promote root diseases
   □ b. it will result in small plants
   □ c. it attracts insects
   □ d. it will make pests harder to find

5. Why is it important to choose resistant or tolerant plant varieties?
   □ a. reduce pest problems, especially plant diseases
   □ b. reduce reliance on pesticides
   □ c. improve long-term pest management through prevention
   □ d. all of the above

6. Mowing turfgrass too short can
   □ a. prevent disease problems
   □ b. increase weed problems
   □ c. increase fertilizer requirements
   □ d. prevent absorption of pesticides
7. Mulches suppress weeds by
   □ a. encouraging weed-feeding insects
   □ b. limiting light required for weed establishment
   □ c. discouraging people from walking near landscape plants
   □ d. acting as a natural herbicide

8. Write the name of the aphid predator next to its photograph.
   lady beetle
syrphid fly
green lacewing

A.____________________
B.____________________
C.____________________

9. Insecticides can cause pest outbreaks by
   □ a. killing natural enemies of pests
   □ b. reducing photosynthesis
   □ c. causing phytotoxicity
   □ d. insecticides never cause pest outbreaks

10. Why is it a good idea to keep good records of pest management actions for each landscape you manage?
    □ a. you will be able to predict the weather
    □ b. you will not have to comply with pesticide regulations
    □ c. it will help you determine which treatments are effective against pests
    □ d. all of the above

11. What are some good sources of information for finding out how to control a specific pest?
    □ a. UC Cooperative Extension office
    □ b. books from the University of California
    □ c. UC IPM Web site www.ipm.ucdavis.edu
    □ d. all of the above

— CHAPTER FOUR —

1. Which signal word means the least amount of hazard?
   □ a. WARNING
   □ b. CAUTION
   □ c. DANGER
   □ d. POISON

2. The acute toxicity of a pesticide is usually measured by its
   □ a. no observable effect level (NOEL)
   □ b. long-term health effects
   □ c. LD₅₀
   □ d. half-life

3. What pest do molluscicides control?
   □ a. rodents
   □ b. natural enemies
   □ c. fungi and bacteria
   □ d. snails and slugs

4. A ____________ pesticide kills a wide range of pests and nontarget organisms, whereas a ____________ pesticide controls a smaller group of closely related organisms.
   □ a. persistent, selective
   □ b. selective, broad-spectrum
   □ c. broad-spectrum, selective
   □ d. strong, weak

5. ____________ formulations are pre-mixed pesticides in containers such as aerosol cans or hand pump squirt containers.
   □ a. flowables
   □ b. baits
   □ c. granules
   □ d. ready-to-use

6. A contact postemergent herbicide
   □ a. is applied before weeds germinate
   □ b. must be translocated in the plant to be effective
   □ c. usually causes injury to any green part of the plant it comes in contact with
   □ d. provides systemic weed protection

7. Insecticides or herbicides that are taken up by the crop, plant, or animal and move, after application, to other plant tissues are called
   □ a. systemic insecticides
   □ b. contact insecticides
   □ c. internal insecticides
   □ d. stomach insecticides
8. Most fungicides are surface ________________ that must be applied before the fungal spores germinate and enter the plant.
   □ a. oils
   □ b. protectants
   □ c. eradicants
   □ d. pathogens

9. Pesticides move through the air in three ways:
   □ a. leaching, runoff, and drainage
   □ b. volatilization, spray drift, and dust-borne particles
   □ c. spray drift, leaching, and fog
   □ d. rain, runoff, and spills

10. In urban areas, pesticides may reach creeks and rivers through
    □ a. storm drains
    □ b. grass clippings
    □ c. pesticide containers
    □ d. birds and other wildlife

11. Which of the following could contribute to phytotoxicity problems when spraying a pesticide onto plants?
    □ a. drift of a broadleaf herbicide applied to a lawn
    □ b. application to the soil of an herbicide that is taken up by plant roots
    □ c. oil spray to control mites
    □ d. all of the above

12. The main reason food containers should not be used for storing pesticides is
    □ a. pesticides soften plastic and corrode metal
    □ b. people may mistake the contents for something to eat or drink
    □ c. these containers cannot be properly sealed
    □ d. these containers are not accurate enough for measuring pesticides

13. Which of the following is the most frequent route of pesticide exposure among pesticide workers?
    □ a. oral (through the mouth)
    □ b. dermal (through the skin)
    □ c. inhalation
    □ d. eye

14. The seriousness of a pesticide injury from an exposure usually is related to the
    □ a. time of day an exposure occurs
    □ b. toxicity and dose of the pesticide
    □ c. type of application equipment used
    □ d. frequency of application of that pesticide

CHAPTER FIVE

1. All pesticides can be toxic and cause problems. You can learn about pesticide hazards and safety by studying
   □ a. pesticide labels
   □ b. Material Safety Data Sheets (MSDSs)
   □ c. Pesticide Safety Information Series (PSIS) leaflets
   □ d. all of the above

2. How do you select the personal protective equipment for applying a pesticide?
   □ a. use whatever personal protective equipment is available
   □ b. follow the pesticide label requirements
   □ c. avoid using personal protective equipment whenever possible
   □ d. follow the spill cleanup guidelines on the Material Safety Data Sheet (MSDS)

3. How often must you clean personal protective equipment?
   □ a. at the end of each work day, before using the equipment again
   □ b. at least once per week if the equipment is used more than 2 days
   □ c. at least once per week if the equipment has visible residues on it
   □ d. you do not need to clean personal protective equipment

4. What is one tip to follow when trying to select a pesticide that is less hazardous to waterways, people, and wildlife?
   □ a. choose a pesticide that will kill a broad range of pests
   □ b. avoid low-persistence insecticides such as insecticidal soaps
   □ c. choose a pesticide with the signal words DANGER or WARNING
   □ d. avoid pesticides that say on the label that they are extremely toxic to fish and wildlife

5. When transporting pesticides in a vehicle
   □ a. secure the packages inside the passenger compartment
   □ b. carry them on the floor in the cab of the truck
   □ c. secure the containers in the cargo area of the truck
   □ d. strap the containers to the top of the vehicle
6. Keep pets away from vertebrate pest control materials by
   □ a. putting baits out of their reach such as in bait boxes
   □ b. discarding dead rodents
   □ c. never scattering them on the soil surface
   □ d. all of the above

7. Prevent pesticide drift and other off-site movement by
   □ a. applying when there is little wind
   □ b. using larger droplets
   □ c. leaving a buffer zone between where you treat and the untreated landscape
   □ d. all of the above

8. Recognizing when exposure to pesticides has occurred is important because
   □ a. you must decontaminate immediately
   □ b. symptoms are always easy to detect
   □ c. if you don’t have symptoms within 15 minutes, no exposure occurred
   □ d. a small amount of exposure will never cause illness

9. You will find first aid and other emergency information for pesticide accidents
   □ a. in the front section of the local telephone directory
   □ b. in a pesticide manufacturer’s informational brochure
   □ c. on the bottom of the pesticide container
   □ d. in the precautionary statements section of the pesticide label

10. When cleaning up a spilled pesticide, contain the spill by
    □ a. using water to wash the spill and any contaminated cleanup material into a storm drain or drainage ditch
    □ b. using paper towels and cat litter to soak up pesticide, and then throwing the contaminated paper towels and cat litter in the trash
    □ c. placing obstacles around spilled area, containing the spill, soaking it up with an absorbent material, and then placing the contaminated absorbent material into a sealable container
    □ d. none of the above

11. If the wrong pesticide has been accidentally applied to a site, you should
    □ a. immediately notify the property owner and the county agricultural commissioner
    □ b. immediately notify your pesticide dealer and the regional water quality control board
    □ c. immediately call 9-1-1 for the Poison Control Center for advice
    □ d. immediately call 9-1-1 for the nearest emergency medical facility for advice

12. Dealing with fires involving pesticides requires
    □ a. large amounts of water to disperse the burning materials
    □ b. professional help that is equipped and trained to fight pesticide fires
    □ c. seeking immediate help from anyone nearby
    □ d. large amounts of sand to smother the flames and contain the blaze

13. As long as you follow some of the pesticide label directions, you are not liable for injury to plants, animals, or people except when you
    □ a. use more than the label allows
    □ b. apply on a site that is not addressed on the label
    □ c. apply a lower rate
    □ d. you are always liable for injury caused by pesticides you apply

### CHAPTER SIX

1. Why is it important to use separate pesticide application equipment for applying herbicides only?
   □ a. to assure that susceptible plants are not injured by herbicide residues when fungicides or insecticides are applied
   □ b. to make the pesticide application more efficient
   □ c. to save time cleaning out the pesticide tank
   □ d. to reduce fire hazard, risk of explosion, or possibility of damage to the equipment

2. What component of liquid pesticide application equipment is used to move the pesticide mixture from the tank to the nozzle?
   □ a. trigger
   □ b. filter
   □ c. pump
   □ d. screens
3. What type of nozzle is used for applying insecticides and fungicides to dense foliage?
   - a. fan nozzle
   - b. flat-spray nozzle
   - c. cone nozzle
   - d. low-volume

4. Why is it important to conduct regular inspections of pesticide application equipment?
   - a. to make sure you have adjustable nozzles
   - b. to prevent accidents or spills caused by ruptured hoses, faulty fittings, damaged tanks, or other problems
   - c. to prevent theft
   - d. it is required by law

5. What should be done with unused mixed pesticides in the spray tank?
   - a. keep in sprayer tank for several days until needed
   - b. as soon as possible spray on plants according to label directions until empty
   - c. drain into sanitary sewer
   - d. spray it onto an industrial drain as soon as possible

6. The best way to clean screens and nozzles is
   - a. to blow on them
   - b. use a metal wire
   - c. with a stick
   - d. flush with clean water and soft brush

7. Dry granules can be applied using a
   - a. drop spreader
   - b. hand-held dust applicator
   - c. hose-end sprayer
   - d. trigger pump

8. Bait stations are recommended for use in urban areas because
   - a. rodents are more likely to take the bait
   - b. they help protect pets
   - c. they allow for more targeted applications for some pests and lower the risk of human exposure
   - d. all of the above

9. Which are important for a successful spot or broadcast pesticide application?
   - a. vulnerable life stage of the target pest
   - b. the best equipment for use at the site
   - c. the label rate and dilution
   - d. all of the above

10. Frequent calibration of your application equipment will assure that you
    - a. are using the correct amount of pesticide
    - b. always use the maximum amount of pesticide allowed by law
    - c. have fewer mechanical breakdowns and less wear and tear of sprayer parts
    - d. can make effective pesticide applications during severe weather conditions

11. For liquid calibration, which factors need to be known?
    - a. tank size
    - b. size of area to be treated
    - c. pesticide application rate, tank capacity, and size of area to be treated
    - d. size of area to be treated, tank capacity, and nozzle type

12. Calibration of granule applicators requires that you know
    - a. the treatment area size
    - b. the applicator setting for the desired rate
    - c. the actual applicator output
    - d. all of the above

13. To most effectively use systemic insecticides as a drench, you must
    - a. measure the height of all trees in the area
    - b. know precisely how many shrubs you wish to treat
    - c. read and follow the label application directions
    - d. be sure to apply to very dry soil

14. One of the methods to determine whether a pesticide application is successful is to
    - a. inspect plants to see if natural enemies have declined
    - b. verify that the amount of product you used matches the amount you estimated
    - c. look for signs of excessive runoff of the pesticide applied
    - d. determine which weed species were controlled immediately after you apply a preemergent herbicide
### ANSWER SHEET

#### CHAPTER 1
1. d  
2. b and d  
3. c  
4. d  
5. d  
6. d  
6. a  
8. c  
9. d  
10. c  
11. a  
12. d

#### CHAPTER 2
1. b  
2. d  
3. c  
4. d  
5. d  
6. d  
7. a  
8. c  
9. a  
10. b  
11. A. ant  
B. lawn grub  
C. snail  
D. scale  
E. mealybug  
F. whitefly  
G. mite  
H. aphid

#### CHAPTER 3
1. c  
2. a  
3. d  
4. a  
5. d  
6. b  
7. b  
8. A. ladybeetle  
B. green lacewing  
C. syrphid fly  
9. a  
10. c  
11. d
- **CHAPTER 4**
  1. b  
  2. c  
  3. d  
  4. c  
  5. d  
  6. c  
  7. a  
  8. b  
  9. b  
  10. a  
  11. d  
  12. b  
  13. b  
  14. b

- **CHAPTER 5**
  1. d  
  2. b  
  3. a  
  4. d  
  5. c  
  6. d  
  7. d  
  8. a  
  9. d  
  10. c  
  11. a  
  12. b  
  13. d  
  14. b

- **CHAPTER 6**
  1. a  
  2. c  
  3. c  
  4. b  
  5. b  
  6. d  
  7. a  
  8. d  
  9. d  
  10. a  
  11. c  
  12. d  
  13. c  
  14. b