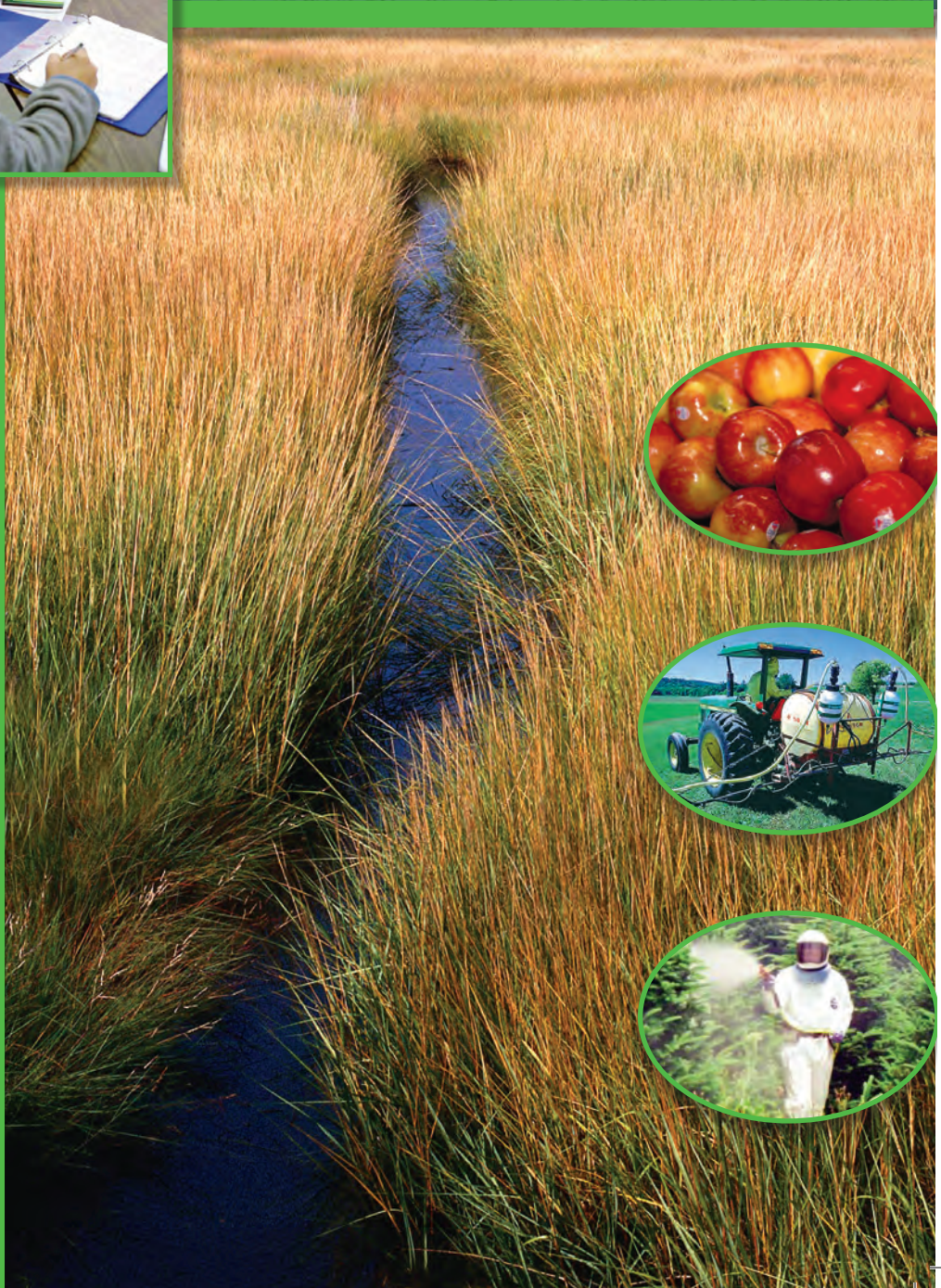
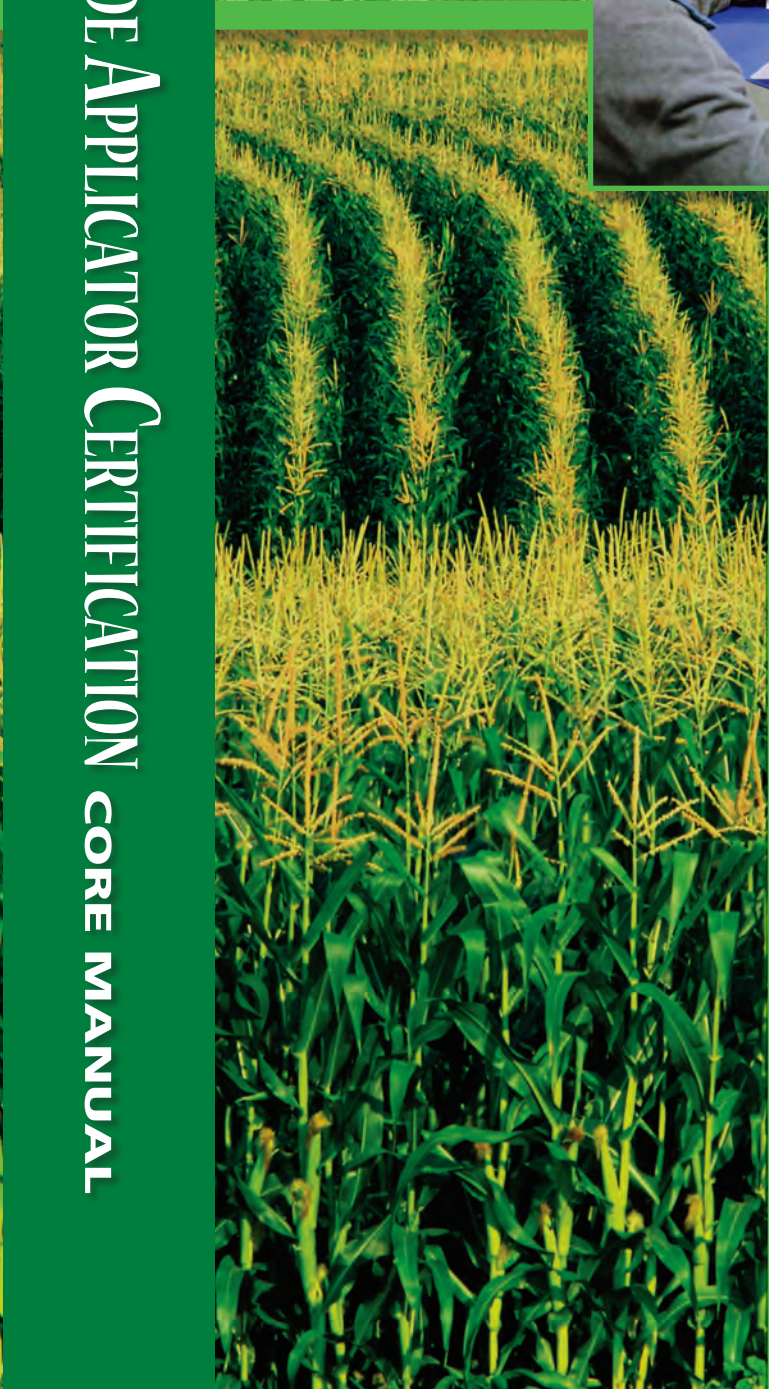




NATIONAL PESTICIDE APPLICATOR CERTIFICATION CORE MANUAL



CONTENTS

INTRODUCTION	xiii
---------------------------	-------------

CHAPTER 1 PEST MANAGEMENT	1
--	----------

Pest Control Over the Years	2
-----------------------------------	----------

Pest Recognition	4
------------------------	----------

Ways to Identify Pests	4
------------------------------	----------

Characteristic Damage	5
-----------------------------	----------

Pest Management Methods	5
-------------------------------	----------

Biological Control	5
--------------------------	----------

Mechanical Control	6
--------------------------	----------

 Cultivation

 Exclusion

 Trapping

Cultural Control	7
------------------------	----------

 Cultural Practices

 Sanitation

Physical/Environmental Modification	7
---	----------

Host Resistance or Genetic Control	8
--	----------

Chemical Controls	8
-------------------------	----------

Regulatory Pest Control	9
-------------------------------	----------

Integrated Pest Management (IPM)	10
--	-----------

Why Practice IPM?	10
-------------------------	-----------

Components of IPM	11
-------------------------	-----------

 1. Identify the Pest and Understand its Biology

 2. Monitor the Pest to be Managed

 3. Develop the Pest Management Goal

 4. Implement the Integrated Pest Management Program

 5. Record and Evaluate Results

Effectiveness of Pest Management Programs	14
---	-----------

Pesticide Resistance	14
----------------------------	-----------

Summary	16
---------------	-----------

Review Questions	17
------------------------	-----------

CHAPTER 2 FEDERAL PESTICIDE LAWS	19
---	-----------

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	19
---	-----------

Pesticide Registration	21
------------------------------	-----------

Pesticide Reregistration	22
--------------------------------	-----------

Tolerances	22
------------------	-----------

Violative Acts and Federal Penalties	24
Penalties	24
Civil Penalties	
Criminal Penalties	
Other Federal Laws and Regulations	25
Federal Food, Drug, and Cosmetic Act (FFDCA)	25
Food Quality Protection Act (FQPA)	25
Worker Protection Standard (WPS)	25
Endangered Species Act (ESA)	26
Federal Record-keeping Requirements	26
Application Records	26
Maintaining Training Records	27
Summary	27
Review Questions	29
 CHAPTER 3 PESTICIDE LABELING	 31
EPA Approval of Pesticide Labeling	32
The Label	32
Background of the Label	32
Toxicity and Toxicological Tests	
Efficacy or Performance Tests	
Degradation, Mobility, and Residue Tests	
Effects on Wildlife and the Environment	
Types of Pesticide Registration	34
Section 3 Registrations	34
Special Local Need Registrations	34
Emergency Exemptions	34
Minimum-risk Pesticides	35
When to Read the Pesticide Label	35
Parts of the Label	36
Trade, Brand, or Product Name	36
Ingredient Statement	36
Use Classification Statement	37
Type of Pesticide	37
Net Contents	37
Name and Address of Manufacturer	37
Emergency Telephone Number	37
Registration Numbers	38
Establishment Number	38
Signal Words and Symbols	38
Precautionary Statements	38
Routes of Entry Statements	
Specific Action Statements	
Protective Clothing and Equipment Statements	
Other Precautionary Statements	
Statement of Practical Treatment	40
Environmental Hazards	40
Special Toxicity Statements	
General Environmental Statements	
Physical or Chemical Hazards	41
Agricultural Use Requirements	41
Restricted-entry Intervals (REI)	

Non-agricultural Use Requirements	42
Storage and Disposal	43
Directions for Use	43
Material Safety Data Sheets	45
Development of the MSDS	45
Components of the MSDS	45
Chemical Product Identification	
Physical and Chemical Properties	
Fire and Explosion Hazards	
Toxicological Information/Human Health Data	
Cholinesterase Inhibition	
Regulatory Levels and Classification	
Personal Protection Recommendations	
Additional Information	
Summary	47
Review Questions	49

CHAPTER 4 PESTICIDE FORMULATIONS 51

An Overview of the Formulation Process.	52
Solution	53
Suspension	53
Emulsion	53
Liquid Formulations.	53
Emulsifiable Concentrates (EC or E)	53
Solutions (S)	54
Ready-to-use Low-concentrate Solutions (RTU).	54
Ultra-low Volume (ULV)	54
Invert Emulsions	55
Flowables (F)/Liquids (L)	55
Aerosols (A)	55
Ready-to-use Aerosols	
Formulations for Smoke or Fog Generators	
Liquid Baits	56
Dry or Solid Formulations	56
Dusts (D).	56
Tracking Powders	
Baits (B)	57
Pastes, Gels, and Other Injectable Baits	
Granules (G)	58
Pellets (P or PS)	59
Wettable Powders (WP or W)	59
Soluble Powders (SP or WSP)	60
Water-dispersible Granules (WDG) or Dry Flowables (DF)	60
Other Formulations	60
Microencapsulated Materials	60
Water-soluble Packets	61
Attractants	61
Impregnates	61
Repellents	61
Animal Systemics	61
Pesticide/Fertilizer Combinations	61
Fumigants	62

Pesticide Mixtures	62
Incompatibility	62
Adjuvants	63
Types of Adjuvants	63
Surfactants	
Stickers	
Extenders	
Plant Penetrants	
Compatibility Agents	
Buffers or pH Modifiers	
Drift Control Additives	
Defoaming Agents	
Thickeners	
How to Choose the Right Adjuvant	65
Summary	66
Review Questions	67

CHAPTER 5 PESTICIDE HAZARDS AND FIRST AID **69**

Toxicity, Exposure, and Hazard	70
Harmful Effects of Pesticides	71
Contact Effects	71
Systemic Effects	71
Allergic Effects	71
Exposure—How Pesticides Enter the Body	72
Skin or Dermal Route	73
Eyes	73
Inhalation Route	74
Oral Route	74
Product Toxicity and Health Concerns	74
Acute Toxicity	74
Signal Words and Skull & Crossbones Symbol	
Chronic Toxicity	77
Delayed Effects	78
Symptom Recognition	78
Cholinesterase Inhibition	79
Cholinesterase Monitoring	
First Aid for Pesticide Poisoning	80
General First Aid	80
Pesticide on the Skin	
Pesticide in the Eye	
Inhaled Pesticide	
Pesticide in the Mouth or Swallowed	
Antidotes	
Heat Stress	83
Symptoms of Heat Stress	83
Summary	84
Review Questions	85

CHAPTER 6 PERSONAL PROTECTIVE EQUIPMENT	87
Chemical-resistant Clothing	88
Protect Your Skin	90
Work Clothes	90
Coveralls	90
Chemical-resistant Suit	91
Chemical-resistant Apron	91
Gloves and Footwear	91
Hats	93
Protect Your Eyes	93
Protect Your Respiratory Tract	94
Respirators	94
Use Respirators Properly	96
Maintaining Personal Protective Equipment	98
Disposables	98
Reusables	98
Washing PPE	99
Maintaining Eyewear and Respirators	100
Summary	101
Review Questions	103
CHAPTER 7 PESTICIDES IN THE ENVIRONMENT	105
The Environment	106
Pesticide Characteristics	106
Solubility	106
Adsorption	106
Persistence	106
Pesticide Degradation	
Volatility	107
How Pesticides Move in the Environment	107
Movement in Air	107
Movement in Water	107
Movement on or in Objects, Plants, or Animals	108
Preventing Pesticide Drift	109
Spray Drift	109
Temperature Inversions	
Vapor Drift	111
Particle Drift (Dust Drift)	111
Applicator Responsibility	112
Sources of Water Contamination	112
Pesticide Contamination of Surface Water	113
Pesticide Contamination of Groundwater	113
Leaching	
Soil Properties	
Preventing Surface Water and Groundwater Contamination	115
Preventing Pesticide Effects to Sensitive Areas and Non-target Organisms	117
Sensitive Areas	117
Pesticide Effects on Non-target Organisms	117
Non-target Plants	
Bees and Other Beneficial Insects	

Fish, Wildlife, and Livestock	
Protecting Endangered Species	119
Summary	119
Review Questions	121
CHAPTER 8 TRANSPORTATION, STORAGE, AND SECURITY	123
Transportation	124
Transport Vehicle	124
Vehicle Operator	125
Other Safety Precautions	125
Transportation Security	126
Pesticide Storage	127
Secure the Site	127
Prevent Water Damage	127
Control the Temperature	128
Provide Adequate Lighting	128
Use Non-porous Materials	128
Maintain the Storage Site	129
Keep Labels Legible	129
Store Pesticide Containers Safely	129
Look for Damage	129
Note Shelf Life of Pesticides	130
Follow These Safety Tips	130
Isolate Waste Products	131
Pesticide Site Security	131
Benefits of Security Efforts	131
Risk Assessment	132
Employee Training and Security Awareness	132
Evaluating Pesticide Security	132
Steps for Preventing Security Problems	133
Summary	134
Review Questions	135
CHAPTER 9 EMERGENCY OR INCIDENT RESPONSE	137
Emergency Response Planning	137
Fires	140
Precautions to Reduce Fire Hazards	140
Pesticide Spills	142
Control the Spill	142
Contain the Spill or Leak	143
Clean Up the Spill	144
Prevent Spills	145
Summary	145
Review Questions	147

CHAPTER 10	PLANNING THE PESTICIDE APPLICATION	149
Selecting the Pesticide		150
Reviewing the Pesticide Label		150
Compatibility of Pesticides		150
Conducting a Compatibility Test		152
Making Tank Mixes		
Safe Mixing and Loading Practices		153
Select an Appropriate Mixing/Loading Area		153
Protect Water Sources		153
Select Personal Protective Equipment (PPE)		153
Opening Containers		154
Measuring		154
Transferring Pesticides		154
Cleaning and Disposing of Pesticide Containers		155
Container Rinsing Procedures		155
Applying Pesticides Correctly		156
Personal Protective Equipment (PPE)		156
Application Procedures		157
After Mixing, Loading, and Application		157
Cleaning Procedures		158
Summary		159
Review Questions		161
 CHAPTER 11	 PESTICIDE APPLICATION PROCEDURES	 163
Application Methods		163
Safety Systems		164
Closed Mixing and Loading Systems		164
Mechanical Systems		
Water-soluble Packaging		
Enclosed Cabs		165
Pesticide Containment Systems		165
Application Equipment		166
Sprayers		166
Sprayer Components		167
Granular Applicators		168
Other Application Equipment		168
Equipment Calibration		169
Calculating Areas		169
Calculating the Application Rate		170
Techniques for Minimizing Drift		172
Summary		174
Review Questions		175

CHAPTER 12 PROFESSIONAL CONDUCT	177
Supervision	178
Pesticide Security and Supervision	179
Public and Customer Communications	179
How to Answer Consumer Questions	181
Your Professional Image	181
Summary	182
Review Questions	183
APPENDICES	
A. Answers to Review Questions	185
B. Glossary	187
C. Conversions & Calculations	199
Pesticide Calculations	200
Mixing Soluble and Wettable Powders	200
Mixing Liquid Formulaions.	201
Square Feet vs. Acre Mixing.	202
D. Additional Federal Pesticide Laws & Federal Record-keeping Requirements	203
Worker Protection Standard (WPS)	203
Pesticide Handlers	203
Agricultural Workers	203
Field Sanitation Standard	204
Hazardous Materials Transportation Uniform Safety Act (HMTUSA)	205
Hazard Communication Standard (HCS)	205
Federal Occupational Safety and Health Act (OSHA)	206
Superfund Amendments and Reauthorization Act (SARA Title III)	206
Emergency Planning	206
Emergency Release Notification.	206
Penalties	207
Resource Conservation and Recovery Act (RCRA)	207
Federal Aviation Administration	207
Federal Trade Commission Act	207
Record-keeping Requirements for Commercial Applicators	208
Federal Pesticide Record-keeping Program for Private Applicators	208
Record-keeping Requirements under the Worker Protection Standard	209
E. Practice Exam	211
F. Selected Pesticide References	219
G. Pesticide-related Resources	221
Relevant Web Sites	221
EPA Regional Pesticide Program Offices	223
Index	225