STUDY GUIDELINES FOR LICENSE AND PERMIT EXAMS AGP (AGRICULTURAL PEST CONTROL); AGW (AGRICULTURAL WEED CONTROL); AQW (AQUATIC WEED CONTROL); ROW (RIGHT-OF-WAY WEED CONTROL)

SOME INFORMATION YOU SHOULD HAVE KNOWLEDGE OF BEFORE TAKING LICENSE AND/OR PERMIT EXAMINATION FOR AGRICULTURAL PEST, AGRICULTURAL WEED CONTROL, AQUATIC WEED CONTROL, AND RIGHT-OF-WAY WEED CONTROL

This outline may be used as a study guide for the license and/or permit examination for Agricultural Pest Control, Agricultural Weed Control, Aquatic Weed Control, Right-of-Way Weed Control and Horticultural Weed Control. The Mississippi Bureau of Plant Industry is providing a list of suggested references and this outline as aids in studying for the license and or permit exams. The use of the World Wide Web can provide a wealth of information and may be helpful in increasing your knowledge of the listed topics. Web sites from universities, extension, weed management societies and sites devoted to specific pest and weed control may provide detailed information. A copy of the Regulations Governing Commercial Insect, Rodent, Plant Disease and Weed Control Work can be found at The Mississippi Department of Agriculture and Commerce, Bureau of Plant Industry website, http://www.mdac.ms.gov/wp-content/uploads/11-Regulation-of-Professional-Services.pdf. **Please note that you should be familiar with the topics and suggested weed identification (photos will be provided on exams), for each category exam in this outline, but there is no guarantee that all of the topics or weed ID listed, or only the topics or weed ID listed will be included on any Licensing and/or Permit examinations.**

Revised January 9, 2017

APPLICABLE TO ALL LICENSE AND PERMIT EXAMS

1. You should be thoroughly familiar with Bureau of Plant Industry Regulations Governing Commercial Insect, Rodent, Plant Disease and Weed Control Work. Topics include, but are not limited to:

   Licensing/Permit requirements
   Licensing/Permit renewal requirements
   Registered technician standards
   Violations
   Record keeping requirements
   Bond requirements
   Insurance requirements
   Changing a mailing or physical address

2. Herbicides/Insecticides:

   Know how to interpret the label
   Perform basic calculations
   LD_{50} interpretation
   Signal word interpretation
   Formulations effectiveness on specific weeds
   WP; SP; EC; G
   Glyphosate
   2,4-D vs. Dicamba
   Systemic herbicides
   Common volume conversions
   Modes of action
   Weeds resistant to
   Turfgrass tolerance to

3. Pesticide mixing; Pesticide application; Pesticide cleanup; Pesticide transport; Pesticide spills; Pesticide disposal; Pesticide safety; Pesticide storage

4. Proficiency in botany and principals of weed science, as is applicable to each category of weed control , is recommended before attempting these exams.

5. Definitions: rhizome; bulb; tuber; stolon; surfactant; drift, allelopathic; annual; biennial; perennial

APPLICABLE FOR SPECIFIC EXAM CATEGORIES

CATEGORY AGP (AGRICULTURAL PEST CONTROL)

1. Be familiar with the following terminology:

science; physiology; adjuvant; vector; pathology; integrated pest management; economic threshold level; economic injury level; Acaricides

2. Be able to ID insects and related pests and the damage they cause and be familiar with their life cycle. Be able to ID diseases and the symptoms they cause. Be able to ID symptoms caused by nutritional deficiencies, weather related and mechanical damage and pesticide and/or fertilizer misapplication. BPI suggests referencing a good entomological and plant pathological textbook or use computer search engine to locate photos of insects and related pests and diseases and their symptoms.

   Diptera
   Leaf miner; leaf gall; crane fly
   Hymenoptera
   Imported fire ant
   Hemiptera
   Chinch bugs; stink bugs
   Coleoptera
   White grub; Japanese beetle; wireworm; billbugs
   Homoptera
   Leafhoppers; corn leaf aphid
   Lepidoptera
   Sod webworm; cutworm; Armyworm; bagworm; leaf roller; corn earworm
   Misc.
   Spider mite; European corn borer
   Diseases, nutrient deficiencies and the damage they cause
   Seedling blight; common maize rust; stalk rot; corn ear rot; kernel rot; anthracnose; Phytophthora root rot; bacterial blight

3. Insects. Structure, function and development

   External morphology. head, thorax and abdomen.
   Internal morphology including respiratory, circulatory, nervous, excretory, digestive, muscular and reproductive systems
   Metamorphosis

CATEGORY AGW (AGRICULTURAL WEED CONTROL)

1. Be able to ID the following (seedling stage and/or mature plant identification may be on exam):

Barnyardgrass; cocklebur (common); coffee senna; curly dock; goosegrass; horseweed; hemp sesbania; jimsonweed; lambsquarters (common); morningglory (cypressvine); morningglory (entireleaf); morningglory (ivy leaf); morniinglory (palmleaf); morningglory (pitted); morningglory (red);; morningglory (smallflower); morningglory (tall); northern jointvetch; prickly sida; prostrate spurge; purple moonflower; ragweed (common); ragweed (giant); redvine; shepherdpurse; sicklepod; smartweed; velvetleaf; wooly croton

2. Be familiar with Worker Protection Standards (WPS).

3. Be thoroughly familiar with commonly used herbicides and their preferred uses such as but not limited to: Canopy; Scepter; Sencor; Squadron; MSMA; Roundup; Simazine; Gramoxone.

4. Be familiar with the characteristics between grassy weeds and broadleaf weeds.

5. Be familiar with ester vs. amine formulations.

CATEGORY AQW (AQUATIC WEED CONTROL)

1. Be able to ID the following:

algae; alligatorweed; American lotus; bladderwort; bulrush; burreed; bushy pondweed; coontail; duckweed; fanwort; frogbit; hydrilla; lizards tail; mosquito fern; parrots feather; pondweed; spatterdock; spikerush; water hyacinth; white waterlily

2. Have knowledge of aquatic weed structure and reproduction

3. Be thoroughly familiar with commonly used aquatic herbicides, their preferred uses and how water quality affects performance. Herbicides include, but are not limited to:

Dichlobenil; Diquat; Endothall; Glyphosate; 2,4-D; Fluridone; Copper Sulfate; Imazapyr; Triclopyr; Slow-release herbicide pellets

4. Know how to calculate rate of application of aquatic herbicides for large irregular shaped bodies of water.

5. Be familiar with herbivorous fish, and other methods of biocontrol of aquatic weeds such as alligator flea beetle; stem borer moth; grass carp

6. Be familiar with the following terms:
Acid equivalent; epinastic; benthic; teratogenic

7. Be familiar with and know how best to control:
Duckweed
Pondweed
Hydrilla

CATEGORY ROW (RIGHT-OF-WAY WEED CONTROL)

1. Be able to ID the following:

baccharis (eastern); blackberry; bodock tree; brackenfern (eastern); broomsedge (bushy); bulrush; cactus (prickly pear); Cherokee rose; Chinese tallow tree; cogongrass; curly dock; English ivy; honey locust; honeysuckle (Japanese); Japanese privet; kudzu; mayapple; mimosa; poison ivy; redbud; redvine; sassafras; sumac; sweetgum; tropical soda apple; vaseygrass; vervain (blue); willow; yaupon

2. Be familiar with herbicide resistant weeds in Mississippi and the herbicide(s) it is resistant to (Weed Control Guidelines for MS).

3. Be familiar with basal spray technique; invert emulsions; dormant stem applications; even fan nozzle tip; rotary atomizer nozzle tip; large off-center flat fan nozzle tip; whirl chamber; flat fan.

4. Know the difference between anionic surfactants vs. cationic surfactants.

5. Be familiar with Worker Protection Standards (WPS).

6. Be thoroughly familiar with commonly used herbicides and their preferred uses such as but not limited to: glyphosate; sulfometuron; 2, 4-D; metsulfuron methyl; paraquat; triclopyr; imazapyr; atrazine

STUDY GUIDELINES FOR LICENSE AND PERMIT EXAMS HCW (HORTICULTURAL WEED CONTROL)

SOME INFORMATION YOU SHOULD HAVE KNOWLEDGE OF BEFORE TAKING A LICENSE AND/OR PERMIT EXAMINATION FOR HORTICULTURAL WEED CONTROL.

This outline may be used as a study guide for the license examination (Category HCW), Horticultural Weed Control. The Mississippi Bureau of Plant Industry is providing a list of suggested references and this outline as aids in studying for the license and or permit exams. The use of the World Wide Web can provide a wealth of information and may be helpful in increasing your knowledge of the listed topics. Web sites from universities, extension, weed management societies and sites devoted to specific weed control guidelines may provide detailed information. A copy of the Regulations Governing Commercial Insect, Rodent, Plant Disease and Weed Control Work can be found at The Mississippi Department of Agriculture and Commerce, Bureau of Plant Industry website, http://www.mdac.ms.gov/wp-content/uploads/11-Regulation-of-Professional-Services.pdf. **Please note that you should be familiar with the topics and suggested weed identification (photos will be provided on exams) but there is no guarantee that all of the topics or weed ID listed, or only the topics or weed ID listed will be included on any Licensing and/or Permit examinations.**

1. You should be thoroughly familiar with Bureau of Plant Industry Regulations Governing Commercial Insect, Rodent, Plant Disease and Weed Control Work. Topics include, but are not limited to:

   Licensing/Permit requirements
   Issuance of License/Permit requirements
   Licensing/Permit renewal requirements
   Violations
   Bond and insurance requirements
   Record keeping requirements
   Registered technician standards
   Equipment (marking of vehicle and equipment)

2. Herbicides:

   Know how to interpret the label
   Perform basic calculations
   LD_{50} interpretation
   Signal word interpretation
   Common volume conversions
   Modes of action
   Weeds resistant to
   Turfgrass tolerance to
   Drop vs. rotary spreaders
   Advantages/disadvantages of emulsifiable concentrates, granules, wettable powders, and suspension concentrates
   Ester formulations

3. Pesticide mixing; Pesticide application; Pesticide cleanup; Pesticide transport; Pesticide spills; Pesticide disposal; Pesticide safety; Pesticide storage

4. Proficiency in botany and principals of weed science, as is applicable to each category of weed control, is recommended before attempting these exams

5. Definitions: allelopathic; annual; biennial; perennial, thatch

6. Be able to ID the following:

American burnweed; bahiagrass; bermudagrass (common); bitterweed; blackberry; bluegrass (annual); blue vervain; buttercup; cactus (prickly pear); Carolina geranium; chickweed (common); cogon grass; crabgrass; curly dock; dallisgrass; foxtail (knotroot); hairy vetch; henbit; honeysuckle (Japanese); hop clover; horsetail; Johnsongrass; leafflower; Little barley; poison ivy; prostrate spurge; redvine; Spring beauty; St. Augustine grass; thistle; Virginia buttonweed; wild garlic; wooly croton; yellow nutsedge; Zoysiagrass

7. Be thoroughly familiar with the following herbicides below on their ability to control various weeds along with which turfgrasses are tolerant to them. Some herbicides may have use-restrictions.

   2, 4-D
   Dicamba
   Fenoxaprop
   Garlon (triclopyr)
   Glyphosate
   MSMA
   Oust (sulfometuron)
   Paraquat
   Pendimethalin (pendulum)
   Prodiamine (barricade)
   Sahara (diuron + imazapyr)
   Simazine (princep)
   Trifluralin (treflan)

8. Know how to calculate rate of application of herbicides for liquid and granular applications.

9. Be able to match the weeds listed in the Category III Commercial Certification reference manual, Part 1, Chapter 7: Weed Identification as one of the following:
   - Winter Annual Grassy Weed
   - Summer Annual Grassy Weed
   - Perennial Grassy Weed
   - Winter Annual Broadleaf Weed
   - Winter Perennial Broadleaf Weed
   - Summer Annual Broadleaf Weed
   - Summer Perennial Broadleaf Weed

10. Be familiar with pre-emergence; post-emergence; soil sterilants, and abatement control measures.

11. Be familiar with herbicide resistant weeds in Mississippi and the herbicide(s) it is resistant to – http://weedscience.org/Details/USState.aspx?StateAbbr=MS.

12. Be familiar with annuals, biennials, and perennials and control measures of each.

13. Be familiar with monocots vs. dicots.

14. Know method(s) used to determine presence of herbicide(s) in soil.

15. Pros/cons of hand pulling weeds.

STUDY GUIDELINES FOR LICENSE AND PERMIT EXAMS HCP (HORTICULTURAL PEST CONTROL)

SOME INFORMATION YOU SHOULD HAVE KNOWLEDGE OF BEFORE TAKING LICENSE AND/OR PERMIT EXAMINATION FOR HORTICULTURAL PEST CONTROL.

This outline may be used as a study guide for the license and/or permit examination (Category HCP), Horticultural Pest Control. The Mississippi Bureau of Plant Industry is providing a list of suggested references and this outline as aids in studying for the License and/or Permit examinations. The Handbook of Turfgrass Insect Pests, Pirone's, Diseases and Pests of Ornamental Plants and the Mississippi Cooperative Extension Service Category III Certification Study Manual are excellent references. Other entomological and plant pathological references, specifically dealing with the ornamental plants, shade trees and lawns, may also prove helpful. The use of the World Wide Web can provide a wealth of information and may be helpful in increasing your knowledge of the listed topics. Web sites from universities, extension, pest management societies and sites devoted to specific insects, pests and diseases may provide detailed information. A copy of the Regulations Governing Commercial Insect, Rodent, Plant Disease and Weed Control Work can be found at The Mississippi Department of Agriculture and Commerce, Bureau of Plant Industry website, http://www.mdac.ms.gov/wp-content/uploads/11-Regulation-of-Professional-Services.pdf. **Please note that you should be familiar with the topics and ID in this outline, but there is no guarantee that all of the topics and ID listed, or only the topics and ID listed will be included on any Licensing and/or Permit examinations.**

1. You should be thoroughly familiar with Bureau of Plant Industry Regulations Governing Commercial Insect, Rodent, Plant Disease and Weed Control Work. Topics include, but are not limited to:

   Licensing/Permit requirements
   Licensing/Permit renewal requirements
   Registered technician standards
   Violations
   Record keeping requirements
   Bond and insurance requirements

2. Be able to ID insects and related pests and the damage they cause and be familiar with their life cycle. Be able to ID diseases and the symptoms they cause. Be able to ID symptoms caused by nutritional deficiencies, weather related and mechanical damage and pesticide and/or fertilizer misapplication. BPI suggests referencing a good entomological and plant pathological textbook or use computer search engine to locate photos of insects and related pests and diseases and their symptoms.

   Diptera
   Leaf miner; leaf gall; crane fly
   Hymenoptera
   Cicada killer; imported fire ant
   Orthoptera
   House crickets; Field crickets; Mole crickets
   Hemiptera
   Chinch bugs; Boxelder bugs; Sycamore lace bug; Crape myrtle bark scale
   Coleoptera
   White grub; Japanese beetle
   Homoptera
   Leafhoppers; annual cicada, periodical cicada; mealy bug; two lined spittlebug; whitefly; aphid; ground pearls
   Mecoptera
   Hanging scorpion fly (not a pest, but similar in appearance to crane fly)
   Thysanoptera
   Thrips
   Lepidoptera
   Saddle back caterpillars; Sod webworm; cutworm; Armyworm; bagworm
   Misc.
   Spider mite; root knot nematode; plant parasitic nematode; mistletoe
   Diseases, nutrient deficiencies and the damage they cause; weather related; mechanical damage
   Anthracnose; black spot, cold injury; crown gall, crown rot, dollar spot; fairy ring; fire blight; fusiform rust; iron chlorosis; leaf spot; mowing; phloem necrosis; phytophthora root rot; powdery mildew; Quince rust; rose mosaic virus; rust; sooty mold; verticillium wilt

3. Insects. Structure, function and development

   External morphology. head, thorax and abdomen.
   Internal morphology including respiratory, circulatory, nervous, excretory, digestive, muscular and reproductive systems
   Metamorphosis

4. Insecticides. Know some common products for each class that is used in pest control
   Botanicals; Insect growth regulators; Nicotinoids; Carbamates; Inorganics; Spinosyns; Pyrethroids; Organophosphates; Fiproles (Phenylpyrazoles)

5. Pesticides (Insecticides, Fungicides, etc.)
   Know how to interpret the label
   LD_{50} interpretation
   Signal word interpretation
   Formulations effectiveness on specific pests
   Common volume conversions
   Modes of action
   Insecticides
   Larvicides
   Ovicides
   Nematicides
   Acaricides
   Fungicides
   Toxicant

STUDY GUIDELINES FOR LICENSE EXAM MBF (MOSQUITO AND BITING FLY CONTROL)

SOME INFORMATION YOU SHOULD HAVE KNOWLEDGE OF BEFORE TAKING LICENSE EXAMINATION FOR MOSQUITO AND BITING FLY CONTROL.

This outline may be used as a study guide for the license examination (Category MBF), Mosquito and Biting Fly Control. The Mississippi Bureau of Plant Industry is providing a list of suggested references and this outline as aids in studying for the License examination. Truman's Scientific Guide to Pest Control and the MSU Extension Service Publications are excellent references. Other entomological references specifically dealing with the pest control industry may also prove helpful. The use of the World Wide Web can provide a wealth of information and may be helpful in increasing your knowledge of the listed topics. Web sites from universities, extension, pest management societies and sites devoted to specific insects and pests may provide detailed information. A copy of the Regulations Governing Commercial Insect, Rodent, Plant Disease and Weed Control Work can be found at The Mississippi Department of Agriculture and Commerce, Bureau of Plant Industry website, http://www.mdac.ms.gov/wp-content/uploads/11-Regulation-of-Professional-Services.pdf. **Please note that you should be familiar with the topics and ID in this outline, but there is no guarantee that all of the topics and ID listed, or only the topics and ID listed will be included on any Licensing examination.**

1. You should be thoroughly familiar with Bureau of Plant Industry Regulations Governing Commercial Insect, Rodent, Plant Disease and Weed Control Work. Topics include, but are not limited to:

    Definitions
    Licensing/Permit requirements
    Licensing/Permit renewal requirements
    Issuance of license
    Equipment
    Registered technician standards
    Violations
    Record keeping requirements
    Bond and insurance requirements

2. Insects. Structure, function and development
    External morphology. Head, thorax and abdomen.
    Internal morphology including respiratory, circulatory, nervous, excretory, digestive, muscular, and reproductive systems
    Metamorphosis: none, gradual, incomplete, or complete.

3. Mosquitoes

    Common species found in Mississippi
    Be familiar with common species such as but not limited to (can be a question and/or photo ID):
    Aedes aegypti – yellow fever mosquito
    Aedes albopictus – Asian tiger mosquito
    Aedes sollicitans
    Aedes triseriatus – eastern tree hole mosquito
    Anopheles quadrimaculatus
    Coquillettidia perturbans
    Culex quinquefasciatus – southern house mosquito
    Toxorhynchites spp.
    Psorophora spp.
    Uranotaenia spp.
    Life cycle
    Feeding habits of males and females
    Hosts (mammals, reptiles, amphibians, birds, etc.)
    Habitats
    Definition: spermatheca
    Diseases transmitted by (know the primary vector(s) and match with the mosquito-borne disease below):
    West Nile virus (primary vector in MS; peak timing)
    Malaria
    Eastern equine encephalitis virus
    Dengue fever
    Chikungunya
    Zika virus
    St. Louis encephalitis virus
    LaCrosse encephalitis virus
    Management strategies
        Integrated Mosquito Management
        Adulticiding
        Larviciding
        CDC light trap
        CDC gravid trap
        New Jersey light trap
        BG Sentinel trap
        Ultra-low volume spray machine

4. Biting flies

    Life cycle
    Hosts
    Diseases transmitted by:
    Tularemia

    Match common names to family names:
        Black fly
        Deer and horse fly
        Sand fly
        Stable fly
    Control strategies

STUDY GUIDELINES FOR LICENSE AND PERMIT EXAMS DAP (DOMESTIC ANIMAL PEST CONTROL)

SOME INFORMATION YOU SHOULD HAVE KNOWLEDGE OF BEFORE TAKING LICENSE AND/OR PERMIT EXAMINATION FOR DOMESTIC ANIMAL PEST CONTROL.

This outline may be used as a study guide for the license and/or permit examination (Category DAP), Domestic Animal Pest Control. The Mississippi Bureau of Plant Industry is providing a list of suggested references and this outline as aids in studying for the License and/or Permit examinations. MSU Extension Service Publications are excellent references. Other entomological references specifically dealing with the pest control industry may also prove helpful. The use of the World Wide Web can provide a wealth of information and may be helpful in increasing your knowledge of the listed topics. Web sites from universities, extension, pest management societies and sites devoted to specific insects and pests may provide detailed information. A copy of the Regulations Governing Commercial Insect, Rodent, Plant Disease and Weed Control Work can be found at The Mississippi Department of Agriculture and Commerce, Bureau of Plant Industry website, http://www.mdac.ms.gov/wp-content/uploads/11-Regulation-of-Professional-Services.pdf. **Please note that you should be familiar with the topics in this outline, but there is no guarantee that all of the topics listed will be included on any Licensing and/or Permit examinations.**

1. You should be thoroughly familiar with Bureau of Plant Industry Regulations Governing Commercial Insect, Rodent, Plant Disease and Weed Control Work. Topics include, but are not limited to:

    Licensing/Permit requirements
    Licensing/Permit renewal requirements
    Registered technician standards and training
    Violations
    Record keeping requirements
    Bond and insurance requirements

2. Insects. Structure, function and development

    External morphology. Head, thorax and abdomen.
    Internal morphology including respiratory, circulatory, nervous, excretory, digestive, muscular, and reproductive systems
    Metamorphosis (incomplete, gradual, complete, etc.)
    Number of legs
    Spiracles

3. Pesticides

    Signs of an animal being affected
    Different formulations to use in cold vs. hot weather
    Know how to interpret the label
    Perform basic calculations
    LD_{50} interpretation
    Signal word interpretation
    Pros and cons of liquids vs. dusts
    Be familiar with the modes of application

4. Be familiar with the following insects and related pests along with the life cycles, potential hosts, diseases transmitted by, and control strategies.

    Horn fly
    Face fly
    Heel fly (cattle grub)
    Horse and deer flies
    Sheep Ked
    Scabies in sheep
    Nose bot in sheep
    Wool maggot
    Spinose ear tick
    Hog lice
    Mites (Spider; Red; Skin; Northern fowl; Southern fowl)
    Horse bots
    Chewing lice in poultry
    Chiggers
    Bed bugs

5. Definitions

    Integrated Pest Management
    Slaughter Interval
    Freshening Interval