Entomology

Purpose

Insects are extremely important animals; some are very destructive and many are beneficial. Insects may damage or kill cultivated plants, they may damage or contaminate stored foods and other products, and they may attack man or animals and bite, sting, or act as vectors of disease. Insects can be beneficial for pollination of crops, parasites and predators of destructive species. They are also important as food for birds, fish and other animals, and provide products of commercial value such as honey, wax, silk, and shellac. It is important that FFA members be able to recognize some of the more important beneficial and destructive species of insects and their relatives. In addition to proper identification of the pest, it is important to be aware of control strategies and know how to properly apply pesticides safely should chemical control be required.

Objectives

Students participating in this CDE should be able to:

I.   Identify many beneficial and destructive insects and their close relatives.

II.   Identify the class and order, type of metamorphosis, type of mouthparts, and understand common pest control strategies.

III. Understand how to apply pesticides safely.

IV.   Understand insect biology, behavior, and collection techniques.

Crosswalk with Show-Me Standards

Objectives – Students participating in the Career Development Event should be able to:	Show-Me Standards	
	Knowledge Standards (Content Areas)	Performance Standards (Goals)
1. Identify many beneficial and destructive insects and their close relatives.	MA.1, MA.2	1.5, 1.10
2. Identify the class and order, type of metamorphosis, type of mouthparts, and understand common pest control strategies.	SC.3, SC.4, SC.8 HP.3, HP.6, HP.7	3.1, 3.5, 3.8 4.4, 4.7, 4.8
3. Understand how to apply pesticides safely.		
4. Understand insect biology, behavior, and collection techniques.		

Corresponding Secondary Agriculture Curriculum			
Course and/or Curriculum:	Agricultural Science II	Unit(s):	Entomology Plant Science - Lesson 4 Crop Science - Lesson 9
	Greenhouse Operation and Management		Unit VI – Plant Health

Event Format

The Entomology CDE shall consist of the following three (3) components:

1. **Insect Identification** – There will be 40 adult insect specimens chosen from the six insect relatives and 109 insect groups on the FFA Insect Checklist (Form 50C). Contestants will give the name of the specimens; the order; the type of metamorphosis; and the type of mouthparts. Contestants will be allowed one (1) minute per insect to identify, and ten minutes will be provided at the end of the rotation for students to go back and review any insect(s) or bubble their scansheets. **Duplicate samples may not be used in any identification portion of the event.**
2. **Practicum A – Insect/Plant Diagnosis** – Five (5) stations with two (2) questions per station. 10 total questions at five (5) points each. See "Guide Sheet A" below. Only insects listed on "Guide Sheet A" may be used for this portion.
3. **Practicum B – Pesticide Formulation.** 10 questions at five (5) points each. Questions will be based on examples found in the National Pesticide Applicator Certification Core Manual (MX328), Chapter 12 "Calculating Dilutions and Site Size. Questions may be stand alone or progressive in nature.
4. **Insect Biology and Control Strategies Written Test** – The Pesticide Application Exam will consist of 75 true/false and multiple choice questions taken directly from listed references.

Event Scoring

Event	Points
1. Insect Identification (40 specimens worth 8 possible points)	320
Correct Name 2 pts	
Correct Order 2 pts	
Correct type of Metamorphosis 2 pts	
Correct type of Mouthparts 2pts	
2. Practicum A - Insect/Plant diagnosis – 5 stations, 2 questions per station	50
3. Practicum B – Pesticide Formulation	50
4. Pesticide Application Quiz (75 questions @ 2 pts each)	150
TOTAL	**570**

Event Rules and Regulations

1. All written materials will be furnished for the CDE. Contestants should provide pencils and clean clipboards. Scratch paper will be provided.
2. Calculators may be used. In all events, only *six-function*, (**nonprogrammable** and **non-graphing)** models may be used. Therefore, the calculators are limited to the following keys: Plus (+); Minus (-); Multiplication (x); Division (/); Equals (=); Memory Clear/Recall (MRC) Memory Minus (M-); Memory Plus(M+); Plus / Minus (+/-); Percentage (%); Square Root (√). See page 3, rule #8 of the General CDE Guidelines for an example.

3. Contestants will not be able to touch or handle insect specimens. Magnifying glasses will be allowed, but will not be provided.
4. Contestants will be given a number by which they will be identified throughout the event.
5. All contestants must be prompt at their stations throughout the event. No provisions will be made for tardiness and will most certainly cause late contestants to lose event points.
6. Contestants will not communicate with each other while the CDE is in progress.
7. Each contestant will be provided the Insect Identification List (Form 50B) and the appropriate scansheet during the CDE.

References

A Field Guide to the Insects of America North of Mexico by Donald J. Borror and Richard E. White, 1970. Houghton Mifflin Company, Boston (Peterson Field Guide Series).

MX328: National Pesticide Applicator Certification Core Manual, Units 1, 4, 5, & 12. (a.k.a. the "White" book). Available at: http://extension.missouri.edu/p/MX328

Color slides. A complete set of slides (99) showing all the insects to be identified in the Entomology CDE.

Entomology Unit for Ag. Science II (Instructor and Student Reference).IML available via MCCE website: http://www.missouricareereducation.org/home.php

The Practical Entomologist, Rick Imes, A Fireside Book. Published by Simon & Schuster, New York.

Good Bug Bad Bug: Who's Who, What They Do, and How to Manage Them Organically by Jessica Walliser.

Destructive and Useful Insects: Their Habitat and Control by Robert Metcalf. 5th Edition, McGraw-Hill.

Forms

See following Form 50A, Form 50B, Form 50C. The scantron used at the state contest, provided by www.judgingcard.com can be found at the link: http://dass.missouri.edu/aged/resources/ .

FFA INSECT CHECKLIST

	Insect	Order	Metamorphosis	Mouth Parts
001.	Alfalfa butterfly	Lepidoptera	Complete	Sucking
002.	Alfalfa weevil	Coleoptera	Complete	Chewing
003.	American cockroach	Blattodea	Simple	Chewing
004.	Ant	Hymenoptera	Complete	Chewing
005.	Aphid	Hemiptera	Simple	Sucking
006.	Assassin bug	Hemiptera	Simple	Sucking
007.	Bagworm larvae (in bag)	Lepidoptera	Complete	Chewing
008.	Bald-faced hornet	Hymenoptera	Complete	Chewing
009.	Bean leaf beetle	Coleoptera	Complete	Chewing
010.	Bed bug	Hemiptera	Simple	Sucking
011.	Black cutworm moth (adult)	Lepidoptera	Complete	Sucking
012.	Blister beetle	Coleoptera	Complete	Chewing
013.	Boll weevil	Coleoptera	Complete	Chewing
014.	Boxelder bug	Hemiptera	Simple	Sucking
015.	Brown stink bug	Hemiptera	Simple	Sucking
016.	Brown-banded cockroach	Blattodea	Simple	Chewing
017.	Buckeye butterfly	Lepidoptera	Complete	Sucking
018.	Bumble bee	Hymenoptera	Complete	Chewing
019.	Cabbage butterfly	Lepidoptera	Complete	Sucking
020.	Cabbage looper	Lepidoptera	Complete	Sucking
021.	Caddisfly	Trichoptera	Complete	Chewing
022.	Camel cricket	Orthoptera	Simple	Chewing
023.	Carpenter bee	Hymenoptera	Complete	Chewing
024.	Carpet beetle	Coleoptera	Complete	Chewing
025.	Carrion beetle	Coleoptera	Complete	Chewing
026.	Chinch bug	Hemiptera	Simple	Sucking
027.	Cicada	Hemiptera	Simple	Sucking
028.	Click beetle	Coleoptera	Complete	Chewing
029.	Codling moth	Lepidoptera	Complete	Sucking

	Insect	Order	Metamorphosis	Mouth Parts
030.	Colorado potato beetle	Coleoptera	Complete	Chewing
031.	Corn earworm moth (adult)	Lepidoptera	Complete	Sucking
032.	Damsel bug	Hemiptera	Simple	Sucking
033.	Damselfly	Odonata	Simple	Chewing
034.	Differential grasshopper (short-horned)	Orthoptera	Simple	Chewing
035.	Dobsonfly	Neuroptera	Complete	Chewing
036.	Dragonfly	Odonata	Simple	Chewing
037.	Earwig	Dermaptera	Simple	Chewing
038.	European corn borer moth	Lepidoptera	Complete	Sucking
039.	European Hornet	Hymenoptera	Complete	Chewing
040.	Field cricket	Orthoptera	Simple	Chewing
041.	Flea	Siphonaptera	Complete	Sucking
042.	Flea beetle	Coleoptera	Complete	Chewing
043.	Flour beetle	Coleoptera	Complete	Chewing
044.	Forage Looper moth (adult)	Lepidoptera	Complete	Sucking
045.	German cockroach	Blattodea	Simple	Chewing
046.	Giant water bug	Hemiptera	Simple	Sucking
047.	Green bottle fly	Diptera	Complete	Sucking
048.	Green June beetle	Coleoptera	Complete	Chewing
049.	Green lacewing	Neuroptera	Complete	Chewing
050.	Green stink bug	Hemiptera	Simple	Sucking
051.	Ground beetle	Coleoptera	Complete	Chewing
052.	Harlequin bug	Hemiptera	Simple	Sucking
053.	Hog louse	Anoplura	Simple	Sucking
054.	Honey bee	Hymenoptera	Complete	Chewing
055.	Horse fly	Diptera	Complete	Sucking
056.	House Cricket	Orthoptera	Simple	Chewing
057.	House fly	Diptera	Complete	Sucking

	Insect	Order	Metamorphosis	Mouth Parts
058.	Ichneumon wasp	Hymenoptera	Complete	Chewing
059.	Indian meal moth (adult)	Lepidoptera	Complete	Sucking
060.	Japanese beetle	Coleoptera	Complete	Chewing
061.	June beetle	Coleoptera	Complete	Chewing
062.	Lace bug	Hemiptera	Simple	Sucking
063.	Ladybird beetle	Coleoptera	Complete	Chewing
064.	Leafhopper	Hemiptera	Simple	Sucking
065.	Lightningbug (firefly)	Coleoptera	Complete	Chewing
066.	Long-horned beetle	Coleoptera	Complete	Chewing
067.	Long-horned grasshopper	Orthoptera	Simple	Chewing
068.	Luna moth	Lepidoptera	Complete	Sucking
069.	Mayfly	Ephemeroptera	Simple	Chewing
070.	Mealybug	Hemiptera	Simple	Sucking
071.	Metallic wood-boring beetle	Coleoptera	Complete	Chewing
072.	Mexican bean beetle	Coleoptera	Complete	Chewing
073.	Minute pirate bug	Hemiptera	Simple	Sucking
074.	Mole cricket	Orthoptera	Simple	Chewing
075.	Monarch butterfly	Lepidoptera	Complete	Sucking
076.	Mosquito	Diptera	Complete	Sucking
077.	Moth fly	Diptera	Complete	Sucking
078.	Mud dauber wasp	Hymenoptera	Complete	Chewing
079.	Northern corn rootworm (adult)	Coleoptera	Complete	Chewing
080.	Oriental cockroach	Blattodea	Simple	Chewing
081.	Paper Wasp	Hymenoptera	Complete	Chewing
082.	Peachtree borer moth	Lepidoptera	Complete	Sucking
083.	Pennsylvania wood cockroach	Blattodea	Simple	Chewing
084.	Praying mantis	Mantodea	Simple	Chewing
085.	Red-legged grasshopper	Orthoptera	Simple	Chewing

Insect		Order	Metamorphosis	Mouth Parts
086.	Rice weevil	Coleoptera	Complete	Chewing
087.	Robber fly	Diptera	Complete	Sucking
088.	Rove bettle	Coleoptera	Complete	Chewing
089.	Saw-toothed grain beetle	Coleoptera	Complete	Chewing
090.	Scorpionfly	Mecoptera	Complete	Chewing
091.	Soldier beetle	Coleoptera	Complete	Chewing
092.	Southern corn rootworm (adult) (Spotted cucumber beetle)	Coleoptera	Complete	Chewing
093.	Squash bug	Hemiptera	Simple	Sucking
094.	Stonefly	Plecoptera	Simple	Chewing
095.	Syrphid fly (Flower fly)	Diptera	Complete	Sucking
096.	Tachinid fly	Diptera	Complete	Sucking
097.	Tarnished plant bug	Hemiptera	Simple	Sucking
098.	Tent caterpillar moth	Lepidoptera	Complete	Sucking
099.	Termite	Isoptera	Simple	Chewing
100.	Tiger beetle	Coleoptera	Complete	Chewing
101.	Tiger moth	Lepidoptera	Complete	Sucking
102.	Tiger swallowtail butterfly	Lepidoptera	Complete	Sucking
103.	Tobacco hornworm moth (adult)	Lepidoptera	Complete	Sucking
104.	Treehopper	Hemiptera	Simple	Sucking
105.	True armyworm moth (adult)	Lepidoptera	Complete	Sucking
106.	Underwing moth	Lepidoptera	Complete	Sucking
107.	Velvet ant	Hymenoptera	Complete	Chewing
108.	Viceroy butterfly	Lepidoptera	Complete	Sucking
109.	Walking stick	Phasmatodea	Simple	Chewing
110.	Water strider	Hemiptera	Simple	Sucking
111.	Western corn rootworm	Coleoptera	Complete	Chewing
112.	White-lined sphinx	Lepidoptera	Complete	Sucking
113.	Yellowjacket	Hymenoptera	Complete	Chewing

FFA Entomology CDE
Insect Identification List

COMMON NAME

001. Alfalfa butterfly
002. Alfalfa weevil
003. American cockroach
004. Ant
005. Aphid
006. Assassin bug
007. Bagworm larvae (in bag)
008. Bald-faced hornet
009. Bean leaf beetle
010. Bed bug
011. Black cutworm moth (adult)
012. Blister beetle
013. Boll weevil
014. Boxelder bug
015. Brown stink bug
016. Brown-banded cockroach
017. Buckeye butterfly
018. Bumble bee
019. Cabbage butterfly
020. Cabbage looper
021. Caddisfly
022. Camel cricket
023. Carpenter bee
024. Carpet beetle
025. Carrion beetle
026. Chinch bug
027. Cicada
028. Click beetle
029. Codling moth
030. Colorado potato beetle
031. Corn earworm moth (adult)
032. Damsel bug
033. Damselfly
034. Differential grasshopper
         (Short-horned)
035. Dobsonfly
036. Dragonfly
037. Earwig
038. European corn borer moth (adult)

039. European Hornet
040. Field cricket
041. Flea
042. Flea beetle
043. Flour beetle
044. Forage Looper moth (adult)
045. German cockroach
046. Giant water bug
047. Green bottle fly
048. Green June beetle
049. Green lacewing
050. Green stink bug
051. Ground beetle
052. Harlequin bug
053. Hog louse
054. Honey bee
055. Horse fly
056. House Cricket
057. House fly
058. Ichneumon wasp
059. Indian meal moth (adult)
060. Japanese beetle
061. June beetle
062. Lace bug
063. Ladybird beetle
064. Leafhopper
065. Lightningbug (Firefly)
066. Long-horned beetle
067. Long-horned grasshopper
068. Luna moth
069. Mayfly
070. Mealybug
071. Metallic wood-boring beetle
072. Mexican bean beetle
073. Minute pirate bug
074. Mole cricket
075. Monarch butterfly
076. Mosquito
077. Moth fly

078. Mud dauber wasp
079. Northern corn rootworm (adult)
080. Oriental cockroach
081. Paper Wasp
082. Peachtree borer moth
083. Pennsylvania wood cockroach
084. Praying mantis
085. Red-legged grasshopper
086. Rice weevil
087. Robber fly
088. Rove beetle
089. Saw-toothed grain beetle
090. Scorpionfly
091. Soldier beetle
092. Southern corn rootworm (adult)
         (Spotted cucumber beetle)
093. Squash bug
094. Stonefly
095. Syrphid fly (Flower fly)
096. Tachinid fly
097. Tarnished plant bug
098. Tent caterpillar moth
099. Termite
100. Tiger beetle
101. Tiger moth
102. Tiger swallowtail butterfly
103. Tobacco hornworm moth (adult)
104. Treehopper
105. True armyworm moth (adult)
106. Underwing moth
107. Velvet ant
108. Viceroy butterfly
109. Walkingstick
110. Water strider
111. Western corn rootworm (adult)
112. White-lined sphinx
113. Yellowjacket

INSECT ORDERS			METAMORPHOSIS
01. Anoplura 02. Blattodea 03. Coleoptera 04. Dermaptera 05. Diptera 06. Ephemeroptera 07. Hemiptera	08. Hymenoptera 09. Isoptera 10. Lepidoptera 11. Mantodea 12. Mecoptera 13. Neuroptera 14. Odonata	15. Orthoptera 16. Phasmatodea 17. Plecoptera 18. Siphonaptera 19. Trichoptera	S - Simple C - Complete **MOUTH PARTS** S - Sucking C - Chewing

Rank: _____   **FFA Entomology CDE Insect Identification List**   **FORM 50A**

Name: _____ Contestant No: _____School: _____

Directions: Enter the correct Common Name number and Order letter in the appropriate column. Darken the circle of the correct Metamorphosis and Mouth Parts letter in the appropriate column (make all entries LEGIBLE).

	Common Name Number	Order	Metamorphosis Simple — S	Complete — C	Mouth Parts Sucking — S	Chewing — C		Common Name Number	Order	Metamorphosis Simple — S	Complete — C	Mouth Parts Sucking — S	Chewing — C
1.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	21.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
2.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	22.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
3.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	23.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
4.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	24.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
5.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	25.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
6.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	26.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
7.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	27.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
8.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	28.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
9.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	29.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
10.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	30.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
11.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	31.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
12.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	32.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
13.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	33.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
14.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	34.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
15.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	35.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
16.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	36.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
17.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	37.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
18.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	38.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
19.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	39.			Ⓢ	Ⓒ	Ⓢ	Ⓒ
20.			Ⓢ	Ⓒ	Ⓢ	Ⓒ	40.			Ⓢ	Ⓒ	Ⓢ	Ⓒ

FFA Entomology CDE
Insect / Plant Diagnosis Practicum

The following insects or evidence of damage / benefit caused by the following insects should be used for this practicum.

INSECTS	
Aphid	**Minute Pirate Bug**
Corn Earworm	**Sawtooth Grain Beetle**
Codling Moth	**Syrphid Fly**
Japanese Beetle	**Tent Caterpillar**
Ladybird Beetle	**Termite**
Lacewing	

There will be five (5) stations valued at ten (10) points per station. For each station the contestant must diagnose, from a multiple choice list, the insect, damage, or benefit presented (5 points) and chose, from a multiple choice list, the best-case Control Method (5 points).

If the insect is beneficial, no control method should be used. If the insect is destructive, then biological, chemical, mechanical, or cultural control methods should be identified.

Example:

Sample 1.

1. Insect/Damage
- A. Japanese Beetle
- B. Termite
- C. Ladybird Beetle
- D. Tent Caterpillar
- E. Lace Wing

2. Control Method
- A. Biological
- B. Chemical
- C. Mechanical
- D. Cultural
- E. No Treatment

Sample 2.

3. Insect/Damage
- A. Japanese Beetle
- B. Termite
- C. Ladybird Beetle
- D. Sawtooth Grain Beetle
- E. Aphid

4. Control Method
- A. Apply milky spore powder to control larvae
- B. Trap crop planting
- C. Mechanical
- D. Apply granular insecticide to infected area
- E. No Treatment