

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. *“None of the Above” should not be used as a possible multiple choice answer.
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. Contestants will not be able to touch or handle insect specimens or mounts. Magnifying glasses will be allowed, but will not be provided.
3. 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.
4. Contestants will not communicate with each other while the CDE is in progress.
5. Each contestant will be provided the Insect Identification List (Student Copy 1) 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).
- National Pesticide Applicator Certification Core Manual (MX328), *Appendix C – Conversions & Calculations*
AND pages 169-171 – Calculating Areas & Calculating Application Rates.
- .
- Entomology Unit for Ag. Science II (Instructor and Student Reference).IML available via DESE website:
- 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: https://dese.mo.gov/sites/default/files/ffa-entomology-scan-sheet-14-16_0.pdf

FFA INSECT CHECKLIST

FORM 50C

<u>Insect</u>		<u>Order</u>	<u>Metamorphosis</u>	<u>Mouth Parts</u>
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	Lepidoptera	Complete	Sucking
008.	Bald-faced hornet	Hymenoptera	Complete	Chewing
009.	Bark/Tree Borer	Coleoptera	Complete	Chewing
010.	Bean leaf beetle	Coleoptera	Complete	Chewing
011.	Bed bug	Hemiptera	Simple	Sucking
012.	Black cutworm	Lepidoptera	Complete	Sucking
013.	Blister beetle	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

<u>Insect</u>		<u>Order</u>	<u>Metamorphosis</u>	<u>Mouth Parts</u>
030.	Colorado potato beetle	Coleoptera	Complete	Chewing
031.	Corn earworm	Lepidoptera	Complete	Sucking
032.	Damsel bug	Hemiptera	Simple	Sucking
033.	Damselfly	Odonata	Simple	Chewing
034.	Differential grasshopper (short-horned)	Orthoptera	Simple	Chewing
035.	Dobsonfly	Megaloptera	Complete	Chewing
036.	Dragonfly	Odonata	Simple	Chewing
037.	Earwig	Dermaptera	Simple	Chewing
038.	European corn borer	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	Lepidoptera	Complete	Sucking
045.	Fruit Fly	Diptera	Complete	Sucking
046.	German cockroach	Blattodea	Simple	Chewing
047.	Giant water bug	Hemiptera	Simple	Sucking
048.	Green bottle fly	Diptera	Complete	Sucking
049.	Green June beetle	Coleoptera	Complete	Chewing
050.	Green lacewing	Neuroptera	Complete	Chewing
051.	Green stink bug	Hemiptera	Simple	Sucking
052.	Ground beetle	Coleoptera	Complete	Chewing
053.	Harlequin bug	Hemiptera	Simple	Sucking
054.	Hog louse	Psocoptera	Simple	Sucking
055.	Honey bee	Hymenoptera	Complete	Chewing
056.	Horse fly	Diptera	Complete	Sucking
057.	House Cricket	Orthoptera	Simple	Chewing
058.	House fly	Diptera	Complete	Sucking

	<u>Insect</u>	<u>Order</u>	<u>Metamorphosis</u>	<u>Mouth Parts</u>
059.	Ichneumon wasp	Hymenoptera	Complete	Chewing
060.	Indian meal moth	Lepidoptera	Complete	Sucking
061.	Japanese beetle	Coleoptera	Complete	Chewing
062.	June beetle	Coleoptera	Complete	Chewing
063.	Lace bug	Hemiptera	Simple	Sucking
064.	Ladybird beetle	Coleoptera	Complete	Chewing
065.	Leafhopper	Hemiptera	Simple	Sucking
066.	Lightningbug (firefly)	Coleoptera	Complete	Chewing
067.	Long-horned beetle	Coleoptera	Complete	Chewing
068.	Long-horned grasshopper	Orthoptera	Simple	Chewing
069.	Luna moth	Lepidoptera	Complete	Sucking
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	Coleoptera	Complete	Chewing
080.	Oriental cockroach	Blattodea	Simple	Chewing
081.	Paper Wasp	Hymenoptera	Complete	Chewing
082.	Peachtree borer	Lepidoptera	Complete	Sucking
083.	Pennsylvania wood cockroach	Blattodea	Simple	Chewing
084.	Praying mantis	Mantodea	Simple	Chewing
085.	Red-legged grasshopper	Orthoptera	Simple	Chewing

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

FFA Entomology CDE Insect Identification List

COMMON NAME

- | | | |
|---|----------------------------------|--|
| 001. Alfalfa butterfly | 039. European Hornet | 078. Mud dauber wasp |
| 002. Alfalfa weevil | 040. Field cricket | 079. Northern corn rootworm |
| 003. American cockroach | 041. Flea | 080. Oriental cockroach |
| 004. Ant | 042. Flea beetle | 081. Paper Wasp |
| 005. Aphid | 043. Flour beetle | 082. Peachtree borer |
| 006. Assassin bug | 044. Forage Looper | 083. Pennsylvania wood cockroach |
| 007. Bagworm | 045. Fruit Fly | 084. Praying mantis |
| 008. Bald-faced hornet | 046 German cockroach | 085. Red-legged grasshopper |
| 009. Bark/Tree Borer | 047. Giant water bug | 086. Rice weevil |
| 010. Bean leaf beetle | 048. Green bottle fly | 087. Robber fly |
| 011. Bed bug | 049. Green June beetle | 088. Rove beetle |
| 012. Black cutworm | 050. Green lacewing | 089. Sawfly |
| 013. Blister beetle | 051. Green stink bug | 090. Saw-toothed grain beetle |
| 014. Boxelder bug | 052. Ground beetle | 091. Scorpionfly |
| 015. Brown stink bug | 053. Harlequin bug | 092. Soldier beetle |
| 016. Brown-banded cockroach | 054. Hog louse | 093. Southern corn rootworm
(Spotted cucumber beetle) |
| 017. Buckeye butterfly | 055. Honey bee | 094. Squash bug |
| 018. Bumble bee | 056. Horse fly | 095. Stonefly |
| 019. Cabbage butterfly | 057. House Cricket | 096. Syrphid fly (Flower fly) |
| 020. Cabbage looper | 058. House fly | 097. Tachinid fly |
| 021. Caddisfly | 059. Ichneumon wasp | 098. Tarnished plant bug |
| 022. Camel cricket | 060. Indian meal moth | 099. Tent caterpillar moth |
| 023. Carpenter bee | 061. Japanese beetle | 100. Termite |
| 024. Carpet beetle | 062. June beetle | 101. Tiger beetle |
| 025. Carrion beetle | 063. Lace bug | 102. Tiger moth |
| 026. Chinch bug | 064. Ladybird beetle | 103. Tiger swallowtail butterfly |
| 027. Cicada | 065. Leafhopper | 104. Tobacco hornworm
(Carolina Sphinx) |
| 028. Click beetle | 066. Lightningbug (Firefly) | 105. Treehopper |
| 029. Codling moth | 067. Long-horned beetle | 106. True armyworm |
| 030. Colorado potato beetle | 068. Long-horned grasshopper | 107. Underwing moth |
| 031. Corn earworm | 069. Luna moth | 108. Velvet ant |
| 032. Damsel bug | 070. Mealybug | 109. Viceroy butterfly |
| 033. Damselfly | 071. Metallic wood-boring beetle | 110. Walkingstick |
| 034. Differential grasshopper
(Short-horned) | 072. Mexican bean beetle | 111. Water strider |
| 035. Dobsonfly | 073. Minute pirate bug | 112. Western corn rootworm |
| 036. Dragonfly | 074. Mole cricket | 113. White-lined sphinx |
| 037. Earwig | 075. Monarch butterfly | 114. Yellowjacket |
| 038. European corn borer | 076. Mosquito | |
| | 077. Moth fly | |

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

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

**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
Bedbug	Robber Fly
Corn Earworm	Sawtooth Grain
Codling Moth	Syrphid Fly
Ground Beetle	Tent Caterpillar
Japanese Beetle	Termite
Ladybird Beetle	Wood Borer
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.

Examples:

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