

Course	Agricultural Science II
Unit	Entomology
Lesson	Insect Identification
Estimated Time	Two 50-minute blocks

Student Outcome

Describe the procedure for classifying insects to order.

Learning Objectives

1. Identify the distinguishing characteristics of an insect.
2. Identify the three main sections of an insect.
3. Identify the different life stages of insects.
4. Describe how insects are classified.
5. Identify the distinguishing characteristics of insect orders.

Grade Level Expectations

SC/LO/1/E/09-11/a

SC/LO/1/E/09-11/b

SC/EC/3/A/09-11/b

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. PowerPoint Slides
 - ☐ PPt 1 – Three Main Sections of an Insect
 - ☐ PPt 2 – Types of Antennae
 - ☐ PPt 3 – Types of Mouth Parts
 - ☐ PPt 4 – Types of Legs
 - ☐ PPt 5 – Examples of Wings
 - ☐ PPt 6 – Stages of Development
 - ☐ PPt 7 – Incomplete Metamorphosis
 - ☐ PPt 8 – Complete Metamorphosis
 - ☐ PPt 9 – Insect Classification
2. Handout
 - ☐ HO 1 – Systematic Method to Identify Insect Orders
3. Activity Sheets
 - ☐ AS 1 – Insect Fact Sheet
 - ☐ AS 2 – Insect Orders
4. *Entomology* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991.
5. *Entomology Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplemental Information

1. Internet Sites

- ❑ Insect Identification for the Casual Observer. Accessed December 4, 2007, from <http://www.insectidentification.org/>.
- ❑ Bug Files: Your Bug and Insect Identification Database. Dave's Garden. Accessed December 4, 2007, from <http://davesgarden.com/guides/bf/>.

Interest Approach

Students will begin completing AS 1, Insect Fact Sheet. Explain the purpose of the project to students. Each student is assigned an insect and given a blank Insect Fact Sheet to complete. Emphasize that the fact sheet needs to be kept up on a regular basis. The information compiled throughout the Entomology unit will be used to make their Insect Pest Management Plan in Lesson 7.

Communicate the Learning Objectives

1. Identify the distinguishing characteristics of an insect.
2. Identify the three main sections of an insect.
3. Identify the different life stages of insects.
4. Describe how insects are classified.
5. Identify the distinguishing characteristics of insect orders.

Instructor Directions	Content Outline
Objective 1 <i>The students now know where to look for insects, how to collect them, and how to prepare specimens for a collection. The next step is to learn the details of insect bodies, the distinguishing features of each order, and how insects are divided into groups. Discuss the particular features that identify insects and separate them from other animals.</i>	Identify the distinguishing characteristics of an insect. An insect is defined as a small animal without a backbone that has the following external characteristics as an adult: <ol style="list-style-type: none">1. A hardened external skeleton2. Three distinct body regions: head, thorax, and abdomen3. One pair of segmented antennae4. Three pairs of segmented legs on the thorax segment5. One pair of compound eyes; some insects have no eyes6. One or two pairs of wings; some adults are wingless
Objective 2 <i>The best way to study and identify insects is by looking at the three main sections of an insect. Refer to PPt 1 – PPt 5.</i> <input type="checkbox"/> PPt 1 – Three Main Sections of an Insect <input type="checkbox"/> PPt 2 – Types of Antennae <input type="checkbox"/> PPt 3 – Types of Mouth Parts <input type="checkbox"/> PPt 4 – Types of Legs	Identify the three main sections of an insect. <ol style="list-style-type: none">1. Head – the hardened region at the front of the body including the eyes, antennae, and mouth parts<ol style="list-style-type: none">a. There are two types of eyes.<ul style="list-style-type: none">– Simple eyes: small, located on the top of the head of the adult– Compound eyes: large, located on the head of the adult; made up of a few to several thousand individual eye units, which generally see only light and dark areasb. Insects have one pair of antennae.<ul style="list-style-type: none">– Long, jointed feelers– Grow from the insect’s head– Flexible– Come in a variety of shapes

Instructor Directions	Content Outline
<p>☐ PPt 5 – Examples of Wings</p>	<ul style="list-style-type: none"> - Function as sensors to detect the odor, sound, taste, and touch of the environment c. There are different types of mouth parts. <ul style="list-style-type: none"> - Chewing - Piercing-sucking - Some insects will have a modification or adaptation of these. 2. Thorax – middle section of an insect’s body <ul style="list-style-type: none"> a. Contains the nerve centers and muscles. b. The wings and legs are attached to the thorax. These come in numerous shapes and patterns depending on the species and function. 3. Abdomen – the section located at the rear of the insect’s body <ul style="list-style-type: none"> a. Visible or hidden under the wings b. Contains the insect’s internal organs (stomach and intestines) c. A place to store and carry food back to the nest d. Sexual organs located here e. Contains glands that secrete fluids for making trails or driving enemies away f. May have a needle-like projection for piercing or stinging
<p>Objective 3</p> <p><i>The development of insects refers to their growth in size and changes in form. There are three stages of development for every insect. Refer to PPt 6 – 8.</i></p> <p>☐ PPt 6 – Stages of Development</p> <p>☐ PPt 7 – Incomplete Metamorphosis</p> <p>☐ PPt 8 – Complete Metamorphosis</p>	<p>Identify the different life stages of insects.</p> <ul style="list-style-type: none"> 1. The embryo stage <ul style="list-style-type: none"> a. Insects begin life as an embryo within an egg. b. The embryo lives on a nutritious yolk. c. Hatching may take days, weeks, or months. 2. The immature stage <ul style="list-style-type: none"> a. After hatching, the insect is called an immature. b. The life of an immature is divided into growth stages called instars. c. Insects progress from one instar to the next by periodically making a new outer layer and shedding the old one. The shedding process is called molting. d. The process continues – instar growth, molting, instar growth, molting, etc. – until the insect becomes an adult. This is called metamorphosis. e. There are two systems of development, or metamorphosis.

Instructor Directions	Content Outline
	<ul style="list-style-type: none"> - Incomplete metamorphosis <ul style="list-style-type: none"> • The immature looks like a small adult. • The immature is called a nymph. • Nymphs eat the same foods as the adults. • Changes in development are mainly an increase in size, wing development, and sexual organs. • Examples include grasshoppers, thrips, stink bugs, leafhoppers, and aphids. - Complete metamorphosis <ul style="list-style-type: none"> • The immature does not look like the adult. • Immatures are called larvae. • Larvae do not eat the same foods as the adults. • There are numerous dramatic changes in development, both on the inside and the outside of the body. • They contain one additional growth stage, the pupa. • Some insects surround themselves with a cocoon. • The insect develops greatly while a pupa. • The insect breaks out of the pupa (and cocoon) when the adult body is fully formed. • Examples include lady beetles, weevils, flies, and moths. <p>3. The adult stage</p> <ol style="list-style-type: none"> a. The insect emerges from the pupa with crumpled wings and a soft body. b. The adult body dries, hardens, and develops color within minutes to hours. c. Depending on the species, adults may live from 1 hour to 20 years. In general though, adults only live a few weeks.
<p>Objective 4</p> <p><i>A system for classifying insects is important to identify each type of insect properly. Refer to PPT 9. HO 1 uses a flow chart system to help in identifying insect orders.</i></p>	<p>Describe how insects are classified.</p> <ol style="list-style-type: none"> 1. All animals, including insects, are classified by characteristics that are similar. The animal kingdom is the most general category. It is divided into groups until the insects that are most alike are classified together. 2. A scientific name is given to each insect.

Instructor Directions	Content Outline
<p>☐ PPT 9 – Insect Classification</p> <p>☐ HO 1 – Systematic Method to Identify Insect Orders</p>	<ul style="list-style-type: none"> a. Genus – first part of name, written capitalized b. Species – second part of name, written lower case 3. Field guides or insect keys are references that usually include the following information: <ul style="list-style-type: none"> a. Description of the insect b. Distinguishing features of the order c. How different insects are related to one another d. The lifestyle and environment of the insect
<p>Objective 5</p> <p><i>Discuss the differences in the insect orders and point out what features are used to distinguish each. Since there is not enough time to go through all the orders in detail, give an overview of the orders.</i></p> <p><i>Have students identify the order in which their individual insect belongs and what its characteristics are. The Information can be written on their AS 1. Also have students complete the chart in AS 2.</i></p> <p>☐ AS 1 – Insect Fact Sheet</p> <p>☐ AS 2 – Insect Orders</p>	<p>Identify the distinguishing characteristics of insect orders.</p> <p>Note: A brief summary of the distinguishing characteristics of each of the orders is given in the Student Reference. The information is presented in the following order.</p> <ul style="list-style-type: none"> 1. The scientific name of the order 2. What the name means 3. The common name, if there is one 4. The number of species 5. The type of metamorphosis 6. The type of mouth parts 7. A description of the body: wings, eyes, other distinguishing traits or activities <p>Insect wing structure and shape are important in insect identification. The following questions can be used to help students become familiar with the orders.</p> <ul style="list-style-type: none"> 1. Which orders have piercing-sucking mouth parts? 2. Which orders have complete metamorphosis? 3. Which order has a name meaning “long wing”? 4. To which order do roaches belong? 5. Which order is commonly called “beetles”? 6. Which orders have small eyes as a distinguishing feature? 7. Which orders are parasitic? 8. Which order has thick, horny wing covers?
<p>Application</p> <p>☐ AS 1 – Insect Fact Sheet</p> <p>☐ AS 2 – Insect Orders</p>	<p>Answers to AS 1: The instructor will need to determine if answers are appropriate.</p> <p>Answers to AS 2: Answers are at the end of this lesson.</p>

Instructor Directions	Content Outline
	<p>Other activities: Divide the students into small groups. Have each group look up the order and characteristics of any selected insects or insects collected so far. Have a contest where the group correctly identifying a selected insect first wins.</p>
Closure/Summary	<p>Insect characteristics commonly used to identify and classify insects are the wings, body shape, mouth parts, and type of metamorphosis. Insect identification can be done in a systematic way using guides or keys.</p>
Evaluation: Quiz	<p>Answers:</p> <ol style="list-style-type: none"> 1. c 2. d 3. d 4. a 5. c 6. a 7. c 8. b 9. b 10. a

Answers to AS 2 are in bold:

Insect Orders

Insect Order	Meaning of Name	Common Name	Type of Metamorphosis	Type of Mouth Part
Phasmida	<i>phantom</i>	walking stick or leaf	incomplete	chewing
<i>Isoptera</i>	equal wings	termites	<i>incomplete</i>	chewing
<i>Embioptera</i>	lively wings	<i>web spinners</i>	incomplete	<i>chewing</i>
Thysanura	<i>tassel tail</i>	<i>bristletails, silverfish</i>	none	<i>chewing</i>
<i>Collembola</i>	<i>glue peg</i>	springtails	none	<i>chewing</i>
<i>Coleoptera</i>	<i>sheath wings</i>	beetles	<i>complete</i>	chewing or chewing-lapping
Zoraptera	<i>pure, wingless</i>	Zorapterans	<i>incomplete</i>	<i>chewing</i>
<i>Orthoptera</i>	straight wings	<i>grasshoppers, crickets, locusts</i>	incomplete	<i>chewing</i>
<i>Lepidoptera</i>	<i>scale wings</i>	butterflies, moths	complete	<i>piercing-sucking</i>
<i>Mecoptera</i>	long wings	<i>scorpion flies</i>	<i>complete</i>	chewing
Neuroptera	nerve wings	<i>lacewings, dobson flies, ant lions, alderflies</i>	<i>complete</i>	<i>piercing-sucking</i>
<i>Diplura</i>	double tail	campodeids, japygids	<i>none</i>	<i>chewing</i>
<i>Hymenoptera</i>	<i>membrane wings</i>	ants, bees, wasps	complete	chewing or chewing-sucking
Anoplura	<i>unarmed tail</i>	<i>sucking lice</i>	incomplete	<i>piercing-sucking</i>
Siphonaptera	<i>tube, wingless</i>	<i>fleas</i>	<i>complete</i>	reduced chewing
<i>Dermaptera</i>	<i>skin wings</i>	earwigs	incomplete	<i>chewing</i>
<i>Odonata</i>	<i>toothed</i>	dragonflies, damselflies	incomplete	<i>chewing</i>
Protura	<i>first tail</i>	Proturans	<i>none</i>	<i>piercing-sucking or chewing</i>
<i>Grylloblattodea</i>	cricket cockroach	rock crawlers, icebugs	<i>incomplete</i>	chewing