

ENTOMOLOGY IDENTIFICATION CONTEST REQUIREMENTS AND STUDY MATERIALS

Effective 2010 and later

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FFA/4-H ENTOMOLOGY CONTESTS

The entomology contest will be divided into two parts. The first part will be spot identification of insects or other arthropods using the list of species on the following pages. Contestants will be expected to know the insects, their scientific order or family names, their food, and their ordinal characteristics as given in the list.

The second part of the contest will be identification using pictorial keys. The students will be graded on their ability to use the keys and are not expected to memorize them. Necessary keys will be supplied to the contestants, but each will be expected to furnish their own hand lens (preferably at least of 10x magnification). All necessary collection information (i.e., host, location on host, etc.) will be furnished with the contest specimens for this portion of the contest. Copies of the pictorial field keys for classroom study can be obtained through the Entomology and Plant Pathology office at Oklahoma State University. A list of field keys and other reference material is provided at the end of this guide.

NUMBER ALLOWED TO PARTICIPATE: Each county can enter as many teams as they wish. A team can consist of three or four members with the highest three scores used for the team score. Junior teams must have no member more than 13 years old as of January 1 of the year in which they are participating. Senior teams may have one or more members of junior age.

FFA/4-H members may also enter as individuals if there are not enough members from a county to make up a team. Both team and individual awards will be given at the junior and senior levels. See the state fair catalogs for specific awards.

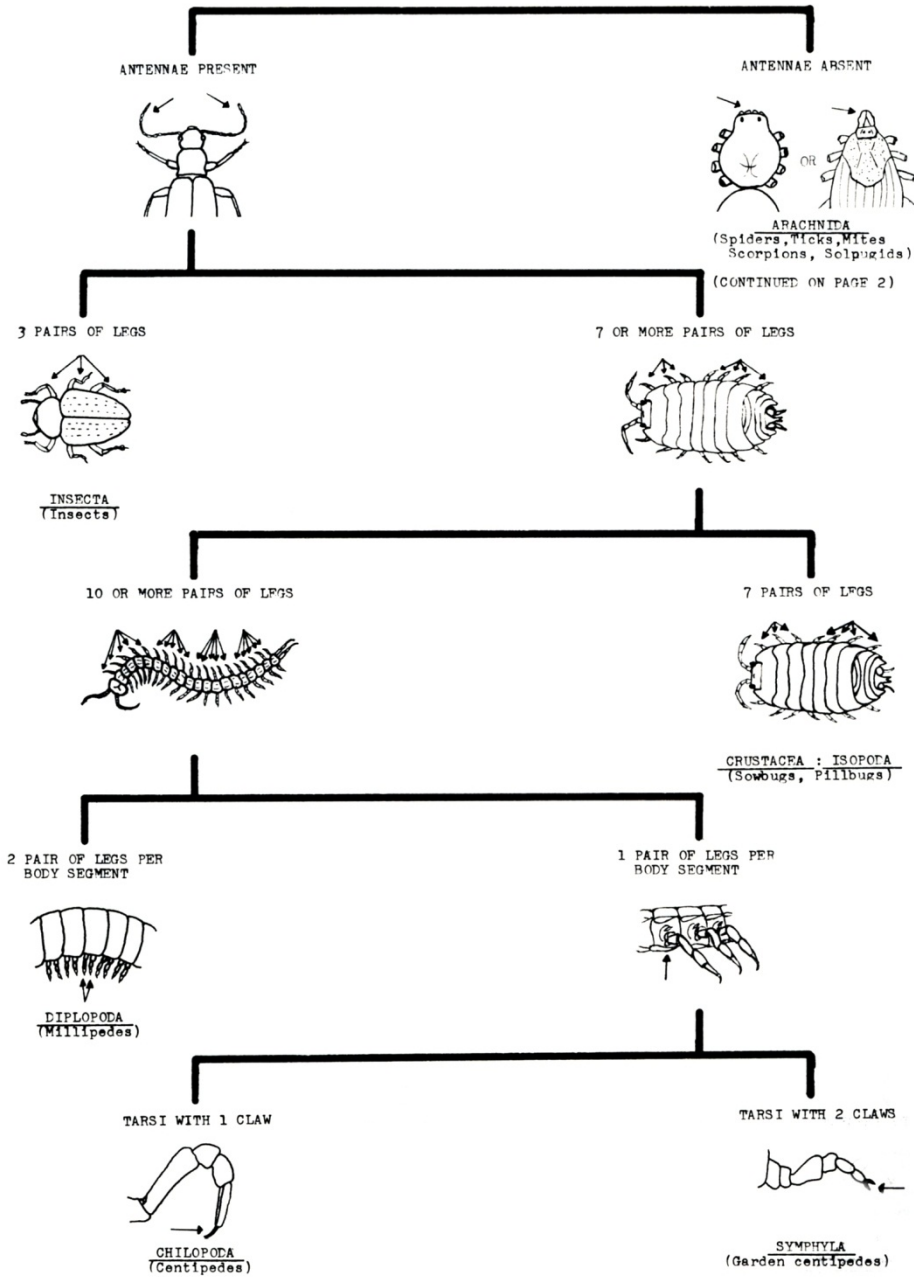
HOW TO RECOGNIZE AN INSECT

The insects belong to a class of animals known as **Arthropoda**. They are the largest group in the class but not the only one. Since the Entomology Contest List includes some of these other arthropods, you should know how to recognize the different groups.

The most important characters used in separating the arthropod groups are the presence or absence of antennae and the number of legs. Adult insects **have antennae** and **three pairs of legs**. Larval insects, such as caterpillars, have three pairs of true legs near the front end but may also have several pairs of prolegs (false legs) on the abdomen. All other groups of arthropods have four or more pairs of legs as adults and several groups do not have antennae. Another characteristic of insects is the presence of **three distinct body regions** (head, thorax, and abdomen). The other groups of arthropods have only two body regions.

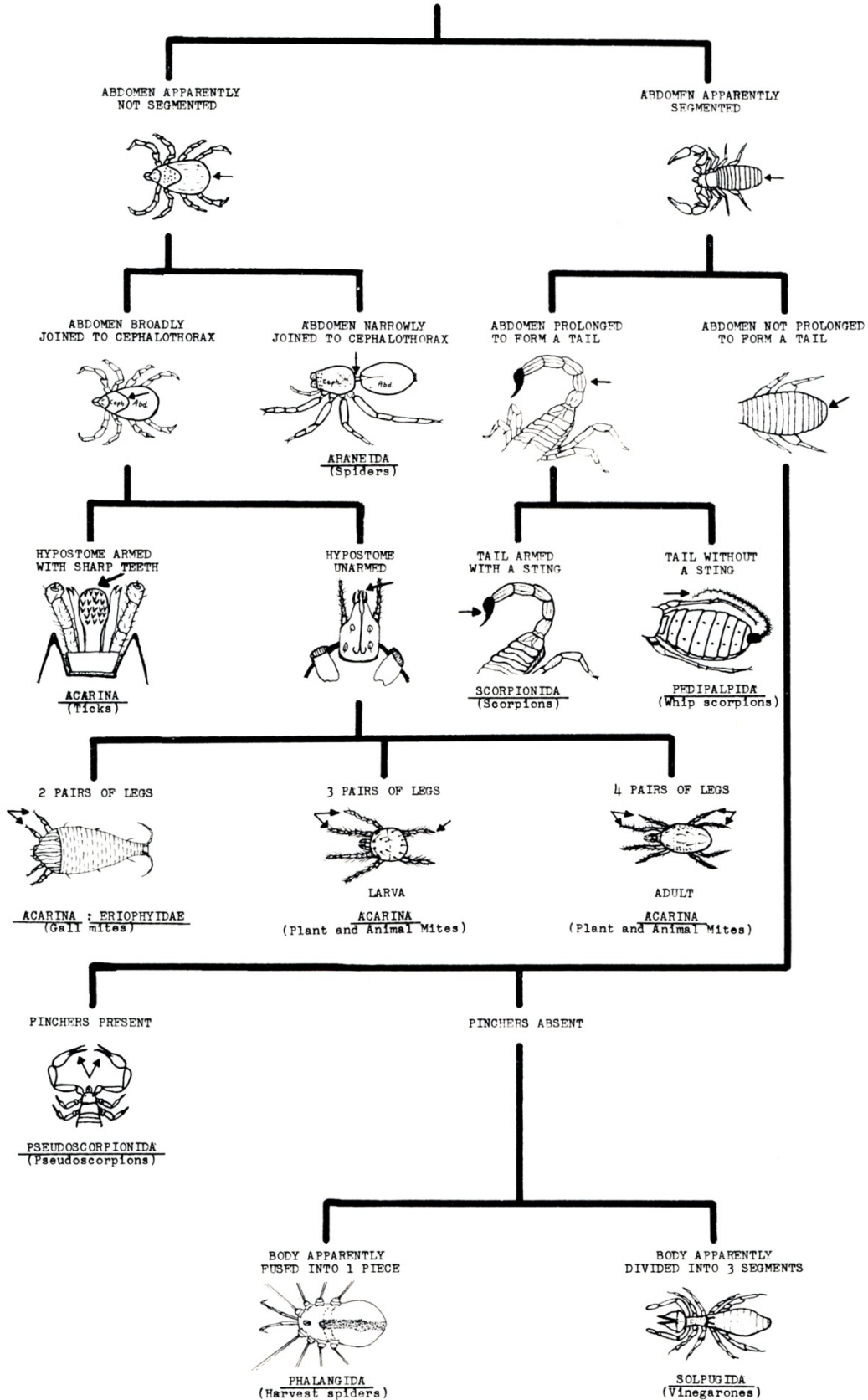
The Key to arthropod groups on the next two pages should help you separate the insects from the other groups you need to know (spiders, ticks, scorpions, etc.).

A KEY TO THE COMMON GROUPS OF ARTHROPODS



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ARACHNIDA
(Continued from page 1)



HOW TO KNOW THE INSECT ORDERS AND FAMILIES

There are over a million kinds (or species) of insects in the world and no one can learn them all. But all of these insects are divided into about 31 similar groups called orders which are easy to recognize. You are asked to learn 20 order names and here's how you can remember them.

MOST ORDERS END IN "PTERA" WHICH MEANS "WING"

**** Remember: ptera = wing ****

Orthoptera = Ortho "wing". Since you know that you go to the orthodontist to get braces or something to "straighten" your teeth, the "Orth" means "straight". **Orthoptera means "straight wing"** and sure enough grasshoppers and crickets have straight wings.

While we are on the subject of orthodontists, the "odon" means "tooth". Dragonflies and damselflies belong to the order **Odonata which means "dragons tooth"**. This is one of the orders which do not end in "ptera".

Hemiptera = Hemi "wing". In your geography class you study the Western Hemisphere or the Western "1/2" sphere. Therefore, **Hemiptera means "1/2 wing"**. All true bugs (suborder Heteroptera), such as stink bugs, have the first 1/2 of their front wings tough and leathery and the outer 1/2 thin and membranous. Cicadas, leafhoppers, and treehoppers (suborder Auchenorrhyncha), and aphids (suborder Sternorrhyncha) are similar to the Heteroptera except that their front wings are not 1/2 and 1/2 but all the same (membranous).

Neuroptera = Neuro "wing". You may remember that a neurologist is a doctor who works with nerve diseases or a neuron is a nerve. Therefore, **Neuroptera means "nerve wing"**. Lacewings and antlions do have wings with many veins that look like nerves.

Coleoptera = Coleo "wing". The front wings of beetles are thickened or hardened and serve as a protective "sheath" for the hind wings. **Coleoptera means "sheath wing"**.

Lepidoptera = Lepid "wing". You may remember the disease leprosy was so called because it was a "scaly" disease. Therefore, **Lepidoptera means "scale wing"**. When touched, butterflies, skippers, and moths usually leave dust on your fingers. If you looked at this dust under the microscope, you would see many small scales.

Diptera = Di "wing". You use "di" in many words such as divide and dice and it means "two". So **Diptera means "two wings"**. Almost all flying insects have four wings except flies, mosquitoes, gnats, and other true flies which belong to the order Diptera.

Hymenoptera = Hymen "wing". Hymen means "membrane" and refers to the membranous wings with relatively few veins. Therefore, **Hymenoptera means "membrane wing"**.

FAMILY NAMES

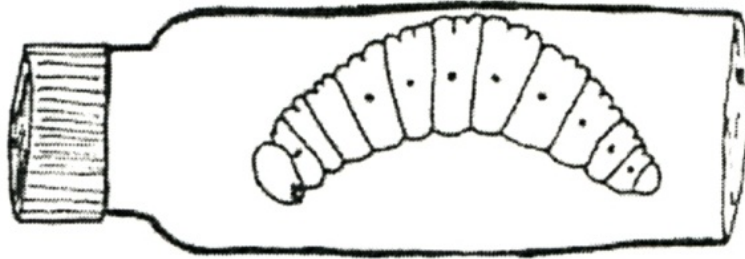
Each order of insects is divided into smaller groups called families. The species within a family are more similar and more closely related to each other than species in another family in the same order.

All insect family names end in "idae". Some family names are easy to remember after you get to know them. For example, ants (family Formicidae) are "Formic + idae" because the ants' sting injects formic acid.

HOW TO USE INSECT KEYS

Keys are used to open doors to find what's inside. With insect keys you may have to go through several double doors to find the name for an unknown insect. Here's how the game is played: take an unknown insect and look for its name by reading at the top of the page. You will find that you have to read, look at the insect and make a decision. The insect looks like this (one door) or the insect looks like this (another door). Occasionally you may have more than two choices in a key. The keys will have pictures to illustrate what is asked so be sure to compare your insect with each picture. When you decide which door to take follow a line drawn to another double door where again you will have to decide if the insect looks like this or the insect looks like this. Finally you come to the name of an insect. If you chose only correct doors, then the insect name is correct. Many keys also have short descriptions of the included insects. Be sure to check these descriptions after you have made your final choice (page 13).

PRACTICE IN USING A KEY



Here's an insect larva. What is it? Use the key on the next few pages to see if you can choose the correct doors. Then check the description on the following page. You should find that this is "Weevil Larvae (Family Curculionidae)".



Field Key to Larvae in Alfalfa

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Area Entomologist

Don C. Arnold
Survey Entomologist

Oklahoma Cooperative Extension Fact Sheets
are also available on our website at:
<http://osufacts.okstate.edu>

This key is designed to serve as a guide to identification of the more typical larvae of the common insect species found in the alfalfa fields of Oklahoma during the mid to late season. A 10 to 15 power hand lens will be most helpful in using this key. The identifying characters used are based upon those found on full-grown or nearly full-grown larvae and may not necessarily occur on newly hatched larvae. If the larva in question does not fit the proper identification furnished, recheck the specimen with the key. If it continues to key out improperly or is not one of the species listed, and proper identification is desired, place the larva in a small bottle containing 70 percent, alcohol and mail to: Department of Entomology, Oklahoma State University, Stillwater, Oklahoma. Please do not send specimens for identification unless they are causing or suspected of causing damage to the crop. Please include information as to the type and amount of damage noted as well as the date and community where the larvae were collected. This information will assist in getting a more accurate and rapid reply to your questions.

Some insects found in alfalfa fields cannot be identified with this key. This would include adult insects, arthropods other than insects, and such insects as aphids and lygus bugs that do not have a larval stage. Be sure you have an insect larvae before attempting to use this key.

Occasional early season pests, such as cutworms, have not been included in the key as they are not normally serious in Oklahoma. If found, they should run to the last couplet, species not included in the key. If found causing serious damage, please send in specimens for identification.

This key should not be used for larvae occurring in crops other than alfalfa. Other keys are available for other crops and can be obtained from the local county extension center.

Survey Methods

Insect counts in alfalfa are taken on a per 10 sweep basis during the actively growing season. Using a standard 15-inch sweep net, a sweep consists of a half circle or a 180 degree arc allowing the net to sweep into the foliage as the surveyor walks across the field. A sweep is taken with every one or two steps. To get a good overall count, 10 sweeps should be taken in at least 5 well spaced places in the field. Numbers for each species should be averaged and reported as the number per

10 sweeps. Larger populations (aphids, etc.) can be reported as the number per sweep.

Newly cut or overwintering alfalfa infestations are recorded as the number per square foot of crown. A wire form containing 1 square foot can be used as a measurement gauge. All insects within this area are counted and recorded as the number of insects per square foot. Depending on the size of the field, 3 to 5 counts should be taken in each field.

Newly planted alfalfa should be checked on a per linear foot basis. Count and report the number of insects present on the plants in a foot of drill row. Counts should be made in at least 5 locations throughout the field.

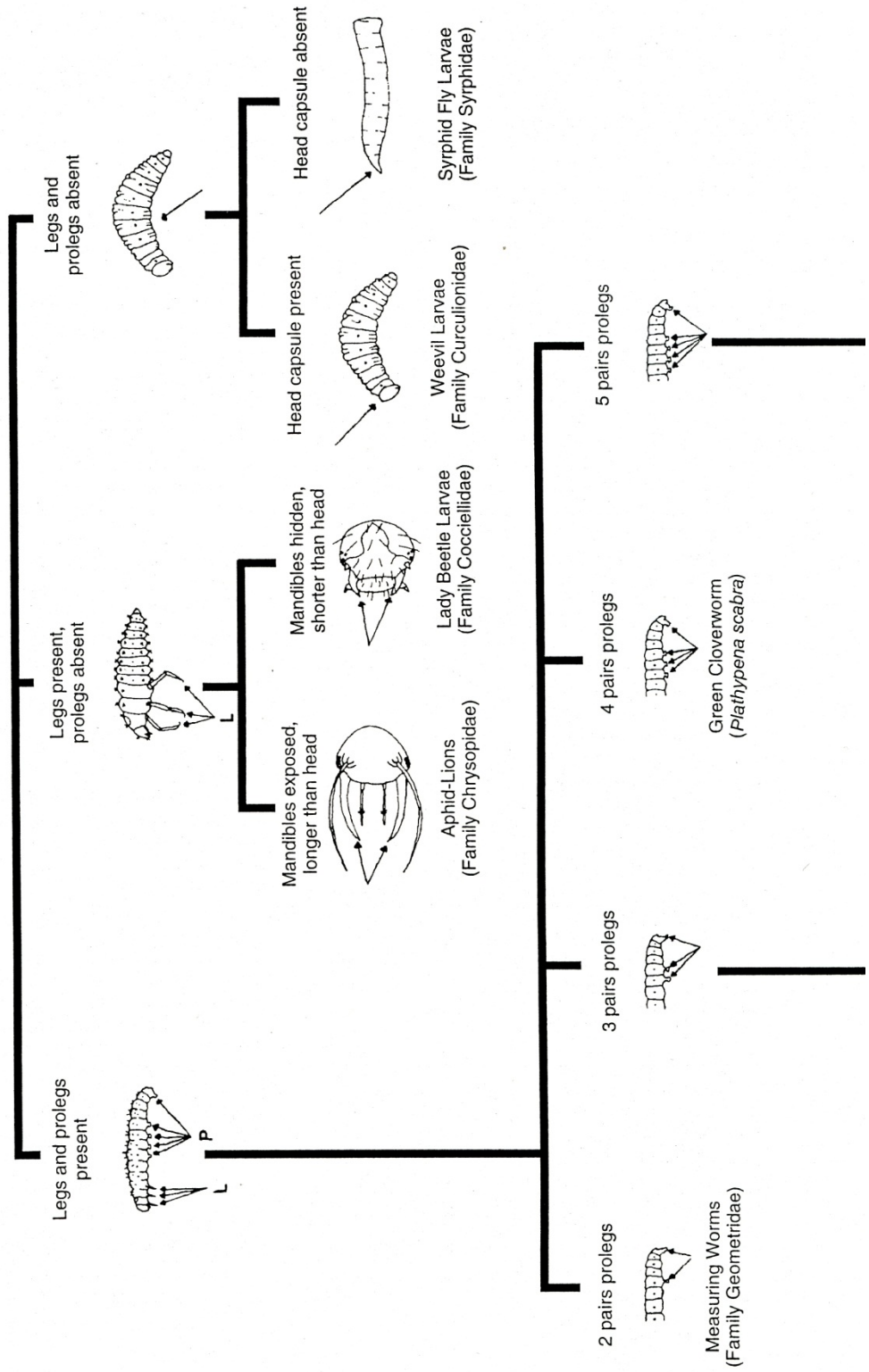
Descriptions of Larvae

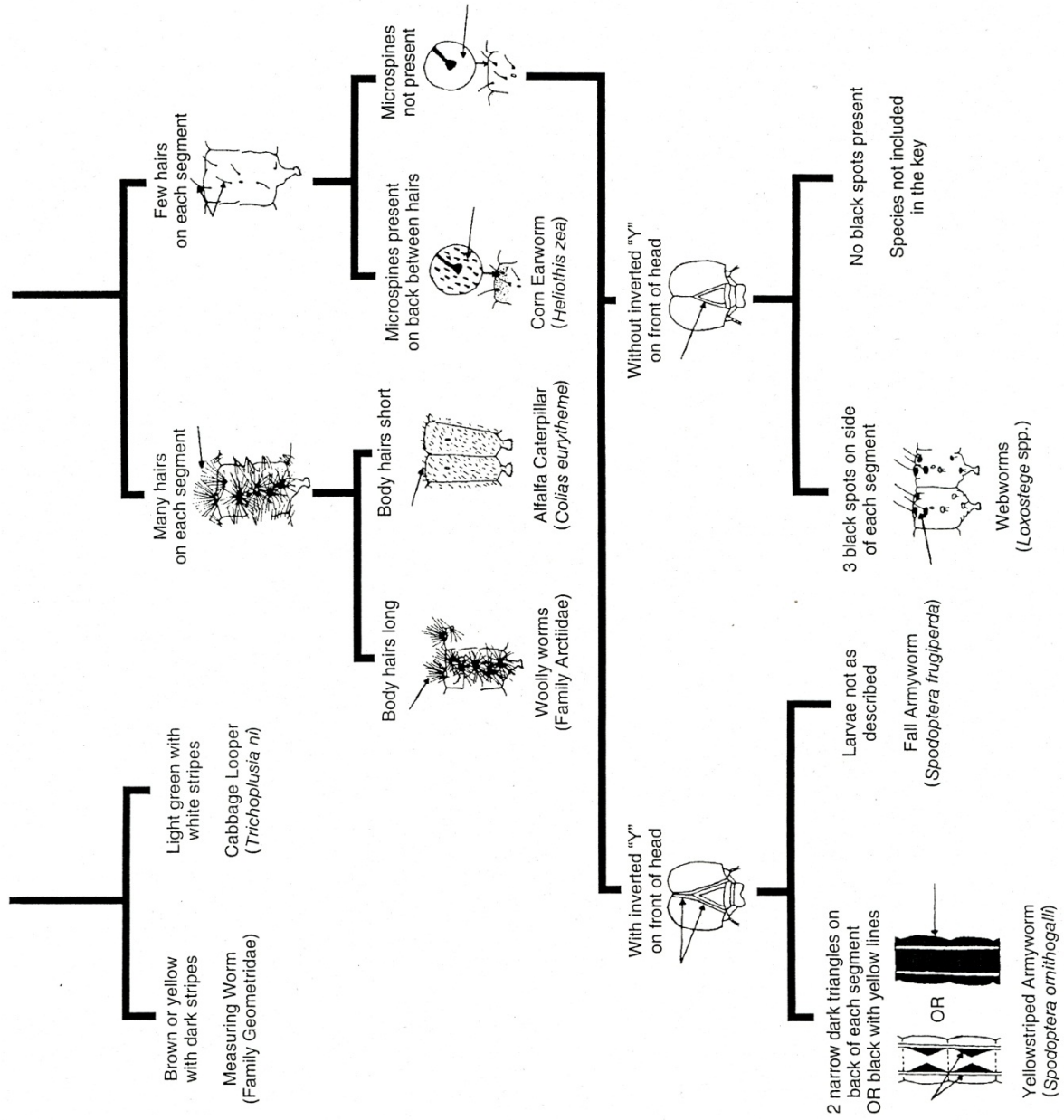
Corn Earworm (*Heliothis zea*) The main distinguishing characteristic of this species is the distinct, short, sharp microspines, resembling whiskers, which are present between the longer hairs on the back. This gives the larva an "unshaven" appearance when viewed with a 10 to 15 power hand lens. (Do not confuse the pebbled or granular skin of other larvae with the microspines.) The body color varies greatly from light to dark green, pink, or brownish-yellow. When fully grown, the larvae measure up to 1½ inches in length. This destructive pest causes damage by feeding on the foliage.

Webworms (Several spp.) This may be one of three closely related species, the garden webworm (*Achyra rantalis*), the alfalfa webworm (*Loxostege commixtalis*), or the beet webworm (*Loxostege sticticalis*), which **can not** be easily separated in the field. Although the control is the same, please send in specimens for identification to insure accurate reporting. All of these larvae are greenish-yellow in color with three distinct, elongate, black spots arranged in a triangle on the upper portion of the side of each segment with the exception of the front three. The fully grown larvae measure about 1 inch in length. These larvae are foliage feeders and may move into alfalfa fields from other nearby crops or weeds. They usually spin webs over the leaves upon which they are feeding, hence the common name "webworms."

Green Cloverworm (*Plathypena scabra*) This is the only species commonly found in alfalfa that has four pairs of prolegs. The body color is green. The younger larvae have two

A Field Key to Some Common Larvae Found in Alfalfa in Oklahoma





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longitudinal white stripes on each side, but these are absent in the last instar. They may be up to 1 inch long when fully grown. They are primarily foliage feeders.

Alfalfa Caterpillar (*Colius eurythema*) These larvae are covered with many short hairs. The body color is green with a narrow white stripe down each side. Inside each stripe is a very fine red line. They measure up to $1\frac{1}{2}$ inches in length when fully grown. They are foliage feeders.

Cabbage Looper (*Trichoplusia ni*) These larvae move in a characteristic “looping” manner. They are larger at the back end and taper toward the head. The body is green with narrow white lines running the length of the body and is without black spots. These larvae are up to $1\frac{2}{3}$ inches in length when fully grown. They are usually found feeding on leaves, giving the foliage a ragged appearance.

Fall Armyworm (*Spodoptera frugiperda*) These larvae usually have a distinct, broad, white inverted “Y” present on the front of the head (not to be confused with a narrow inverted “V” found on a few other species). The body varies from light tan to green to dark brown or nearly black in color with three widely separated narrow yellowish-white stripes down the back. On each side are three more broad longitudinal lines side by side with the top, brown; the middle, reddish; and the bottom, yellow with reddish mottlings. These larvae measure up to $1\frac{1}{3}$ inches in length when fully grown. They are primarily foliage feeders.

Woolly Worms (Family Arctiidae) This may be one of several members of this family. The most common one in the state is the salt-marsh caterpillar (*Estigmene acaea*), which is covered with long black, brown, or yellowish hairs. The larvae of this species may become almost 2 inches in length when fully grown. The pests in this family are primarily foliage feeders. If found causing serious damage, send in specimens for identification.

Measuring Worms (Family Geometridae) These larvae may have two or three pairs of prolegs. Those with three pairs are usually brown or yellowish brown with dark stripes. They may

measure 1 inch or more when fully grown. They are foliage feeders.

Yellowstriped Armyworm (*Spodoptera ornithogalli*) These larvae vary in color from pale gray to jet black, but all will have two yellow stripes down the back. The gray individuals have two narrow dark triangles on the back of each segment, but these cannot be distinguished in the darker forms. The head is mostly brown. These larvae measure up to $1\frac{1}{3}$ inches in length when fully grown. They are primarily foliage feeders.

Weevil Larvae (Family Curculionidae) These larvae are whitish or yellowish, C-shaped, more or less cylindrical, and legless.

Lady Beetle Larvae (Family Coccinellidae) The body color is generally dark with bright yellow, orange, or red markings. The body is covered with numerous spines. In a few species, the body is covered with a waxy secretion and resemble mealybugs, but a check of the mouthparts will clear up the confusion (mealybugs have piercing-sucking mouthparts while lady beetle larvae have biting mouthparts). This group is highly beneficial with both the larvae and adults feeding on aphids, spider mites, eggs, and young of many other pests.

Syrphid Fly Larvae (Family Syrphidae) This may be one of several members of this family. They are cylindrical and somewhat peg-shaped with protuberances on most segments. They usually are light green in color and the entire body is covered with short, colorless microspines. They are found crawling about on the plants feeding on aphids.

Aphid-Lions (Family Chrysopidae) These small, active, light brown larvae measure up to $\frac{1}{2}$ inch in length when full grown. Both the larvae (aphid-lions) and adults (lacewing flies) are beneficial since they feed upon aphids or plant lice and other small pests. Be sure that the specimen suspected of being in this group have biting mouthparts. There are several other groups, such as true bugs, Order Hemiptera, which are similar in body shape, but differ from them by having piercing-sucking mouthparts.

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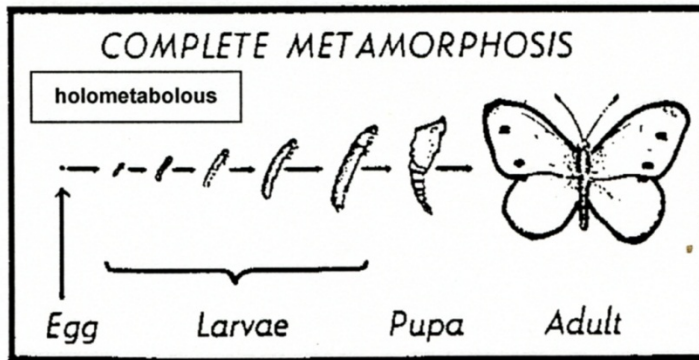
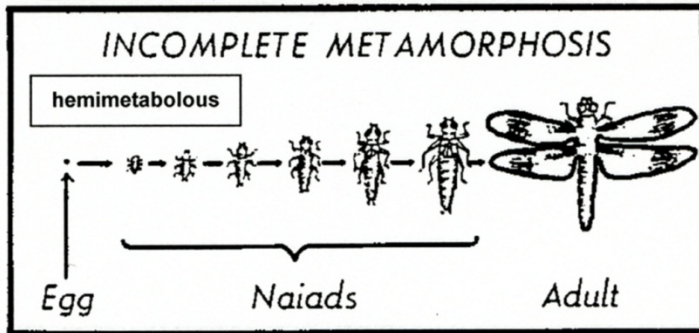
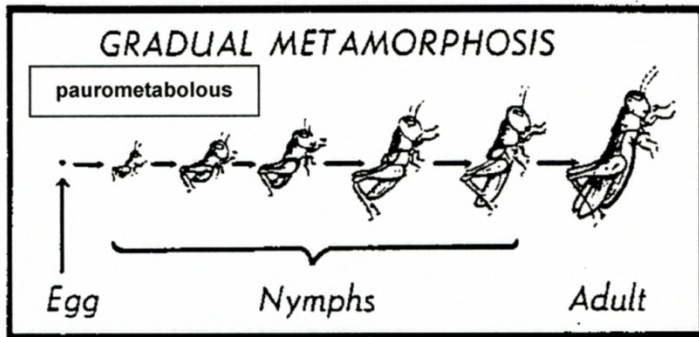
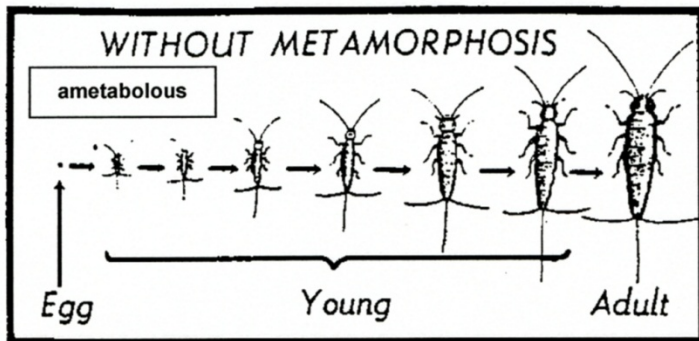
HOW INSECTS GROW AND CHANGE (METAMORPHOSIS)

Many young or immature insects don't look anything like their parents. The butterfly, for example, hatches from an egg into a caterpillar which becomes a pupa before it changes into a butterfly. This is called **complete** "change" or metamorphosis. Other insects, like the grasshopper, look much like their parents except for being smaller and not having wings. This kind of change is called **gradual** metamorphosis. The other type of change you need to remember is **incomplete** metamorphosis for the Odonata.

The illustrations below explain how different insects change as they grow. Notice that all insects in the same order have the same kind of change (metamorphosis).

Occasionally you may find books which describe only two kinds of metamorphosis, **complete metamorphosis** and **simple metamorphosis**. In this case complete metamorphosis means the same thing as described here. But simple metamorphosis means all the other kinds together (without metamorphosis, gradual metamorphosis, and incomplete metamorphosis).

You may even find books which describe only two kinds of metamorphosis, **complete metamorphosis** and **incomplete metamorphosis**. Here "incomplete metamorphosis" means all the other kinds together.



Ordinal
Characteristics
Required
for Contests

Other Orders-
Ordinal
Characteristics
Not Required

None

Thysanura

Orthoptera

Phasmatodea

Blattodea

Dermaptera

Hemiptera

Isoptera

Mantodea

Phthiraptera

Odonata

Ephemeroptera

Plecoptera

Lepidoptera

Megaloptera

Coleoptera

Siphonaptera

Neuroptera

Hymenoptera

Diptera

FOOD OF INSECTS

Knowing what an insect eats is very important. Most insects are important to man because of what they eat.

Notice that in many orders all the insects listed feed on one kind of food. If you remember that an insect belongs to the order Hemiptera (suborders Auchenorrhyncha and Sternorrhyncha), then it must be a sap feeder. If an insect belongs to Odonata or Neuroptera, it feeds on insects. All butterflies and moths feed on nectar and/or pollen, while caterpillars (larvae) feed either on "foliage" or "fruit of plant". Many of the Coleoptera and Orthoptera feed on "foliage".

There are a few "tricky" things to notice about insect foods. Notice that the bagworm case "does not feed". This is because in the contests only the bagworm case is shown and there may not be a worm inside. The spotted cucumber beetle feeds on the "foliage" of many plants and "cucumbers" would be incorrect. Likewise, Colorado potato beetles would not feed on "potatoes" but on "foliage" and horse flies don't feed on "horses" but "animal blood".

ENTOMOLOGY CONTEST LIST

An * indicates common names of groups of similar insects that make up only part of a family or sometimes more than one family.

A — indicates that information from that specific column is not required of the contestant.

Order ODONATA: (Dragonflies, damselflies)

Ordinal characteristics: (1) chewing mouthparts; (2) incomplete metamorphosis; (3) two pairs of similar wings.

Species Common Name (for one kind of insect)	Family or Group (Common Name)	Scientific Family Name	Food
----	*Dragonfly	----	Insects
----	*Damselfly	----	Insects

Order ORTHOPTERA: (Grasshoppers, crickets)

Ordinal characteristics: (1) chewing mouthparts; (2) gradual metamorphosis; (3) two pairs of wings, the first pair thickened, the second pair membranous.

Species Common Name (for one kind of insect)	Family or Group (Common Name)	Scientific Family Name	Food
Differential grasshopper	Shorthorned grasshopper	Acrididae	Foliage
Two-striped grasshopper	Shorthorned grasshopper	Acrididae	Foliage
----	Longhorned grasshopper	----	Foliage
----	*Field cricket	Gryllidae	Foliage, Insects
----	*Tree cricket	Gryllidae	Foliage
----	Mole cricket	----	Foliage

Order BLATTODEA: (Cockroaches)

Ordinal characteristics: (1) chewing mouthparts; (2) gradual metamorphosis; (3) two pairs of wings, the first pair thickened, the second pair membranous.

Species Common Name (for one kind of insect)	Family or Group (Common Name)	Scientific Family Name	Food
American cockroach	Cockroach	Blattidae	Virtually anything
Oriental cockroach	Cockroach	Blattidae	Virtually anything
German cockroach	Cockroach	Blattellidae	Virtually anything
Brownbanded cockroach	Cockroach	Blattellidae	Virtually anything

Order HEMIPTERA

In recent years the classification of this order has changed quite a bit. What used to be the separate orders HEMIPTERA and HOMOPTERA are now all grouped under Order HEMIPTERA with three suborders HETEROPTERA (True bugs), AUCHENORRHYNCHA (Cicadas, leafhoppers, treehoppers), and STERNORRHYNCHA (Aphids, scales).

Suborder HETEROPTERA: (True bugs)

Subordinal characteristics: (1) sucking mouthparts; (2) gradual metamorphosis; (3) two pairs of wings, the first pair half-thickened, the second pair membranous.

Species Common Name (for one kind of insect)	Family or Group (Common Name)	Scientific Family Name	Food
Green stink bug	Stink bug	Pentatomidae	Plant sap
Brown stink bug	Stink bug	Pentatomidae	Plant sap
Harlequin bug	Stink bug	Pentatomidae	Plant sap
Spined soldier bug	Stink bug	Pentatomidae	Insects
Chinch bug	-----	Lygaeidae	Plant sap
-----	*Milkweed bug	Lygaeidae	Plant sap
Squash bug	-----	Coreidae	Plant sap
-----	*Leaffooted plant bug	Coreidae	Plant sap
Tarnished plant bug	Plant bug	Miridae	Plant sap
Wheel bug	Assassin bug	Reduviidae	Insects, blood of vertebrates
-----	Nabid	-----	Insects
-----	Backswimmer	-----	Insects, small fish
-----	Giant water bug	-----	Insects, small fish
-----	Water strider	-----	Live & dead insects

Suborder AUCHENORRHYNCHA: (Cicadas, leafhoppers, treehoppers)

Subordinal characteristics: (1) sucking mouthparts or none; (2) gradual metamorphosis; (3) two pairs of wings, usually membranous, or none.

Species Common Name (for one kind of insect)	Family or Group (Common Name)	Scientific Family Name	Food
-----	Cicada	Cicadidae	Plant sap
-----	Leafhopper	Cicadellidae	Plant sap
-----	Treehopper	Membracidae	Plant sap

Suborder STERNORRHYNCHA: (Aphids, scales)

Subordinal characteristics: (1) sucking mouthparts or none; (2) gradual metamorphosis; (3) two pairs of wings, usually membranous, or none.

Species Common Name (for one kind of insect)	Family or Group (Common Name)	Scientific Family Name	Food
Greenbug	Aphid	Aphididae	Plant sap
Spotted alfalfa aphid	Aphid	Aphididae	Plant sap
Pea aphid	Aphid	Aphididae	Plant sap
San Jose scale	Armored scale	Diaspididae	Plant sap
Euonymus scale	Armored scale	Diaspididae	Plant sap
Brown elm scale	Soft scale	Coccidae	Plant sap

Order NEUROPTERA: (Nerve winged insects)

Ordinal characteristics: (1) chewing mouthparts; (2) complete metamorphosis; (3) two pairs of wings, with many cross veins.

Species Common Name (for one kind of insect)	Family or Group (Common Name)	Scientific Family Name	Food
----	*Green lacewing (adult)	----	Insects
----	*Green lacewing (larva)	----	Insects
----	*Antlion (adult)	----	Insects
----	*Antlion (larva)	----	Insects

Order COLEOPTERA: (Beetles)

Ordinal characteristics: (1) chewing mouthparts; (2) complete metamorphosis; (3) two pairs of wings, the first pair hardened, the second pair membranous.

Species Common Name (for one kind of insect)	Family or Group (Common Name)	Scientific Family Name	Food
----	Ground beetle	Carabidae	Insects
Colorado potato beetle	Leaf beetle	Chrysomelidae	Foliage
Spotted cucumber beetle	Leaf beetle	Chrysomelidae	Foliage
Elm leaf beetle	Leaf beetle	Chrysomelidae	Foliage
----	*Flea beetle	Chrysomelidae	Foliage
Green June beetle	Scarab beetle	Scarabaeidae	Foliage
----	*May beetle (adult)	Scarabaeidae	Foliage
----	*White grub (larva)	Scarabaeidae	Plant roots
----	*Dung beetle	Scarabaeidae	Dung
----	Click beetle	Elateridae	Foliage

Order COLEOPTERA: (cont'd)

Ordinal characteristics: (1) chewing mouthparts; (2) complete metamorphosis; (3) two pairs of wings, the first pair hardened, the second pair membranous.

Species Common Name (for one kind of insect)	Family or Group (Common Name)	Scientific Family Name	Food
Striped blister beetle	Blister beetle	Meloidae	Foliage
Black blister beetle	Blister beetle	Meloidae	Foliage
Gray blister beetle	Blister beetle	Meloidae	Foliage
----	Metallic wood borer (adult)	Buprestidae	Foliage, nectar
----	Flatheaded wood borer (larva)	Buprestidae	Wood
----	Longhorned beetle (adult)	Cerambycidae	Foliage, nectar
----	Roundheaded wood borer (larva)	Cerambycidae	Wood
Cottonwood borer	Longhorned beetle	Cerambycidae	Foliage, nectar
Alfalfa weevil	Weevil	Curculionidae	Foliage
Boll weevil	Weevil	Curculionidae	Fruit of plant
Pecan weevil	Weevil	Curculionidae	Fruit of plant
Plum curculio	Weevil	Curculionidae	Fruit of plant
----	Tiger beetle	Cicindelidae	Insects
----	Lady beetle	Coccinellidae	Insects
----	Rove beetle	Staphylinidae	Decomposing organic matter and insects
Smaller European elm bark beetle	Bark beetle	----	Wood
----	Carrion beetle	----	Carrion
----	Whirligig beetle	----	Insects
----	Diving beetle	----	Insects
----	Water scavenger beetle	----	Insects
----	Firefly	----	Insects

Order LEPIDOPTERA: (Butterflies, moths, skippers)

Ordinal characteristics: (1) adults have sucking, larvae have chewing mouthparts; (2) complete metamorphosis; (3) adults have two pairs of wings covered with scales, larvae none.

Species Common Name (for one kind of insect)	Family or Group (Common Name)	Scientific Family Name	Food
Garden webworm (larva)	----	----	Foliage
Southwestern corn borer moth	----	----	Nectar/pollen
Corn earworm (bollworm) (moth)	----	Noctuidae	Nectar/pollen
Corn earworm (bollworm) (larva)	----	Noctuidae	Fruit of plant
Whitelined sphinx moth	Sphinx moth	Sphingidae	Nectar/pollen
Tomato hornworm moth	Sphinx moth	Sphingidae	Nectar/pollen
Tomato hornworm (larva)	Sphinx moth	Sphingidae	Foliage
Tobacco hornworm (larva)	Sphinx moth	Sphingidae	Foliage

Order LEPIDOPTERA: (cont'd)

Ordinal characteristics: (1) adults have sucking, larvae have chewing mouthparts; (2) complete metamorphosis; (3) adults have two pairs of wings covered with scales, larvae none.

Species Common Name (for one kind of insect)	Family or Group (Common Name)	Scientific Family Name	Food
Mimosa webworm (larva)	----	----	Foliage
Bagworm case	----	----	Does not feed
-----	Skipper	Hesperiidae	Nectar/pollen
Monarch butterfly	----	----	Nectar/pollen
Viceroy butterfly	----	----	Nectar/pollen
Red admiral butterfly	----	----	Nectar/pollen
-----	Swallowtail butterfly	Papilionidae	Nectar/pollen
-----	Sulphur butterfly	Pieridae	Nectar/pollen

Order DIPTERA: (Flies)

Ordinal characteristics: (1) mouthparts often piercing-sucking, sometimes sponging or lapping, sometimes not functional; (2) complete metamorphosis; (3) adults have one pair of membranous wings.

Species Common Name (for one kind of insect)	Family or Group (Common Name)	Scientific Family Name	Food
-----	Mosquito	Culicidae	Blood of animals
-----	*Horse fly	Tabanidae	Blood of animals
-----	*Deer fly	Tabanidae	Blood of animals
House fly	-----	Muscidae	Virtually anything
Stable fly	-----	Muscidae	Blood of animals
Horn fly	-----	Muscidae	Blood of animals
-----	Robber fly	Asilidae	Insects
-----	Crane fly	-----	Nectar/pollen
-----	Bee fly	-----	Nectar/pollen
-----	Syrphid fly	-----	Nectar/pollen
-----	*Bluebottle fly	-----	Waste, plant juices
Horse bot fly	Bot fly	-----	Does not feed
Cattle grub (larva)	-----	-----	Internal parasite

Order HYMENOPTERA: (Bees, ants, wasps)

Ordinal characteristics: (1) chewing mouthparts but the bees also suck nectar; (2) complete metamorphosis; (3) adults have two pairs of membranous wings or none.

Species Common Name (for one kind of insect)	Family or Group (Common Name)	Scientific Family Name	Food
-----	Carpenter ant	Formicidae	Insects, sweets, plant sap
Red harvester ant	-----	Formicidae	Seeds
-----	Velvet ant	Mutillidae	Parasites of insects
Cicada killer	-----	-----	Insects
-----	*Paper wasp	-----	Insects, nectar
-----	*Mud dauber	-----	Spiders, nectar
-----	*Blue mud dauber	-----	Spiders, nectar
-----	Ichneumon wasp	-----	Parasites of insects
Honey bee	-----	Apidae	Nectar/pollen
-----	*Bumble bee	Apidae	Nectar/pollen
Carpenter bee	-----	Apidae	Nectar/pollen

Other Orders

Ordinal characteristics: Not required.

Species Order Name Suborder Name	Common Name	Food
THYSANURA	Silverfish	Starchy substances
EPHEMEROPTERA	Mayfly	Does not feed
PHASMATODEA	Walkingstick	Foliage
DERMAPTERA	Earwig	Waste, plants
ISOPTERA	Termite (worker & reproductive)	Wood
MANTODEA	Praying mantid	Insects
PLECOPTERA	Stonefly	Does not feed
PHTHIRAPTERA	Lice	
Suborder: AMBLYCERA	Chicken louse	Feathers & skin
Suborder: ANOPLURA	Hog louse	Blood of animals
MEGALOPTERA	Dobsonfly (adult)	Insects
	Hellgrammite (Dobsonfly larva)	Insects
SIPHONAPTERA	Cat flea	Blood of animals

Other Arthropods

Ordinal characteristics: Not required.

The following are not insects but are commonly studied by entomologists and should be recognized by students of entomology.

Common Name	Food
Black widow spider	Insects
Brown recluse spider	Insects
Ear tick	Blood of animals
Brown dog tick	Blood of animals
American dog tick	Blood of animals
Gulf Coast tick	Blood of animals
Lone star tick	Blood of animals
Scorpion	Insects
Centipede	Insects
Millipede	Decomposing organic matter
Spider mite	Plant sap
Pillbug	Decomposing organic matter
Harvestman	Plant juices, dead insects

ENTOMOLOGY CONTEST
OSU Entomology and Plant Pathology

NAME (Print) _____ **AGE** _____
(as of Jan 1 this year)

ADDRESS _____

4-H CLUB _____ **COUNTY** _____

FFA TEACHER _____ **SCHOOL** _____

TEAM ENTRY (#) _____ **INDIVIDUAL ENTRY** _____

I. (Section I, 3 pts per station)

**COMMON NAME (SPECIES OR FAMILY GROUP - 2
pts each)**

FOOD (1 pt each)

1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
8	_____	_____
9	_____	_____
10	_____	_____
11	_____	_____
12	_____	_____

Questions 13-25 on reverse side.

II. (Section II, 5 pts per station)

SCIENTIFIC FAMILY NAME OR ORDER NAME OR SUBORDER NAME

(Read question carefully to see which is required)

- 13 _____
- 14 _____
- 15 _____
- 16 _____
- 17 _____
- 18 _____
- 19 _____
- 20 _____

III. (Section III, 5 pts per station)

IDENTIFICATION KEYS (Key out specimens using keys provided)

- 21 _____
- 22 _____
- 23 _____

IV. (Section IV, 6 pts)

ORDINAL CHARACTERISTICS (Provide three ordinal characteristics of this specimen - 2 pts each)

- 24 _____
-

V. (Section V, 3 pts)

SCIENTIFIC ORDER NAME (1 pt)

COMMON NAME (1 pt)

FOOD (1 pt)

- 25 _____

SUGGESTED STUDY MATERIALS

1. **Insects** by H.S. Zim and C. Cottam, Golden Nature Guide, Simon and Schuster, NY
2. **Insect Pests** by G.S. Fichter and H. S. Zim, Golden Nature Guide, Golden Press, NY
3. **Butterflies and Moths** by R.T. Mitchell and H.S. Zim, Golden Nature Guide, Golden Press, NY
4. **Spiders and their Kin** by H.W. Levi, L.R. Levi and H.S. Zim, Golden Nature Guide, Golden Press, NY.

These four books contain color photographs which aid in the identification of insects and other arthropods; however, identification by this method often leads to error and confusion. The common names given may differ in various parts of the country; also, some of the names given are common names for a group of similar species or even for an entire family.

5. **Destructive and Useful Insects** by Metcalf, Flint and Metcalf, McGraw-Hill, NY.

This book is aimed primarily for those interested in economic entomology. It fills this function extremely well and should be in the library if anyone is interested in practical insect controls.

6. **How to Know the Insects** by H.E. Jacques, Wm. C. Brown Co., Dubuque, Iowa.

This book is a simplified key to insect families. It serves this purpose well, although it does not include all the families of insects of North America. It also contains worthwhile information concerning the collecting and preservation of insects. The illustrations are helpful, but at times misleading. One must remember that the key is to families, not to species; therefore, the specimen you have will not always be like the species illustrated and described.

7. **A Field Guide to the Insects** by D.J. Borner and R.E. White, Peterson Field Guide Series, Houghton Mifflin Co., Boston, MA.

This book is rather basic, but it is excellent in that it contains a number of drawings of insects, their identification characters, and simple keys to the families.

8. **Borror and DeLong's Introduction to the Study of Insects** by C.A. Triplehorn and N.F. Johnson, Thomson, Brooks/Cole, Belmont, CA.

This is a very satisfactory book on general entomology. Its keys are fairly complete, and the information on collecting, preserving, etc. is satisfactory. It is a little advanced for most beginners, but it should be in the library of anyone who plans serious study of insect identification.

9. **Insects in Kansas**, Kansas State University Extension Service, Manhattan, Kansas.

This book is rather basic, but it is excellent in that it contains a number of photographs of insects that also occur in Oklahoma.

10. 4-H Entomology Members Guides (1-6) and Entomology Leaders Manual

These are available through your local county Extension offices or the Entomology and Plant Pathology Department, Oklahoma State University.

11. Entomology and Plant Pathology website: <http://entopl.okstate.edu/4H-FFA/index.htm>

12. Pictorial Field Keys.

Some are OSU Extension Fact Sheets and others are mimeographed sheets. Most are available through your local county Extension offices or the Department of Entomology and Plant Pathology at OSU (<http://entopl.okstate.edu/factshts.htm>). Fact Sheets that may be useful include the following:

- EPP-7001... Common Ticks of Oklahoma and Tick-Borne Diseases
- EPP-7008... Human Lice and Scabies
- EPP-7019... External Parasites of Goats
- EPP-7079... Biology and Control of the Pecan Weevil in Oklahoma
- EPP-7150... Alfalfa Forage Insect Control
- EPP-7156... Field Key to Larvae in Soybeans
- EPP-7157... Field Key to Larvae in Sorghums
- EPP-7158... Field Key to Larvae in Peanuts
- EPP-7159... Field Key to Larvae in Alfalfa
- EPP-7160... Field Key to Larvae in Corn
- EPP-7161... Field Key to Larvae in Cotton

- EPP-7163... Field Key to Larvae in Pecans
- EPP-7164... Field Key to Beetles in Pines
- EPP-7167... Soybean Insect Survey and Control
- EPP-7168... Plant Galls Caused by Insects
- EPP-7174... Peanut Insect Control in Oklahoma
- EPP-7176... Insects on Small Grain and Their Control
- EPP-7184... Alfalfa Aphids in Oklahoma
- EPP-7196... Grasshopper Management in Rangeland, Pastures, and Crops
- EPP-7301... Spiders: Brown Recluse, Black Widow, and Other Common Spiders
- EPP-7303... Scorpions
- EPP-7305... Paper Wasps, Yellowjackets, and Other Stinging Wasps
- EPP-7306... Ornamental and Lawn Pest Control
- EPP-7307... Beneficial Insects
- EPP-7312... Household Pest Control
- EPP-7313... Home Garden Insect Control
- EPP-7315... Shade Tree Borers
- EPP-7316... Centipedes and Millipedes
- EPP-7317... Honey Bees, Bumble Bees, Carpenter Bees, and Sweat Bees