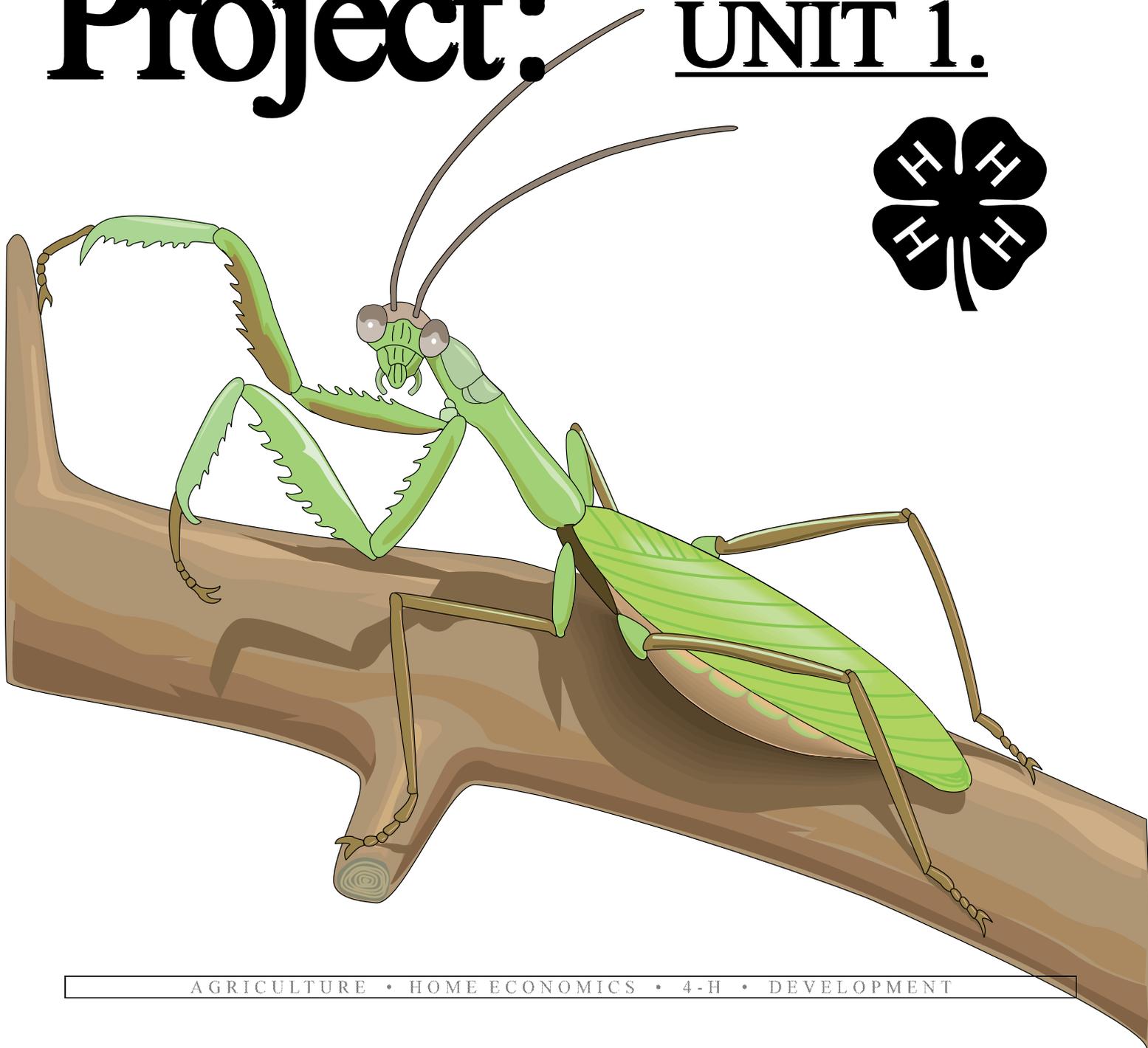
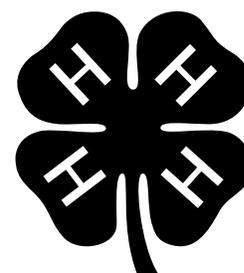
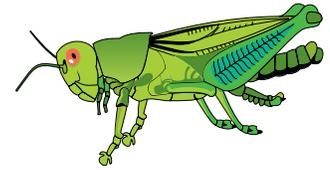




COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY • COLLEGE OF AGRICULTURE

4-H Entomology Project: UNIT 1.





Objectives

Welcome to Unit I of 4-H Entomology. We hope that this unit and the activities it contains will help you to become more interested in insects and the different ways they live. The objectives of 4-H Entomology Unit I are to:

- Learn what insects are and how they fit into the scientific classification system.
- Identify the main parts of a grasshopper.
- Make a killing jar to use when collecting insects for your insect display.
- Learn the correct way to label insect specimens.
- Collect, pin, and label 25 different kinds of insects.
- Keep records of the activities you complete in this project.
- Do three of the optional activities listed on page 12.
- Help other 4-H club members by giving entomology talks and demonstrations.

4-H Entomology Project

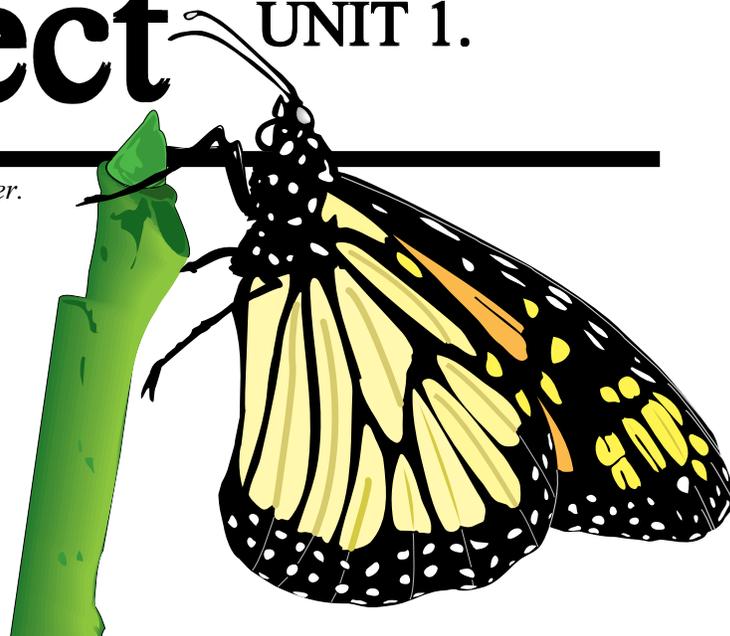
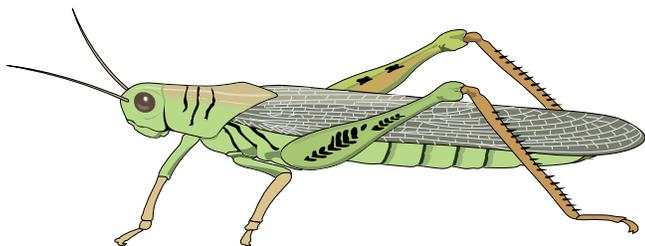
UNIT 1.

*This publication was originally prepared by R.A. Scheibner.
Revised by Stephanie Bailey and Lee Townsend*

Why Study Insects?

Insects are the most abundant animals on earth. More than one million different types of insects have been identified. They live in just about every situation or habitat on earth. Insects have lived on earth for more than 300 million years. As you will see, insects are just about everywhere! If you take the time to observe them carefully, you will find them very interesting.

No matter where you live or what you do, you will be able to find insects. They can live in just about any situation or climate. Nearly everybody will have some type of problem with insects at some time in their life. Some insects eat our crops or food in storage; others can bite or sting us, our livestock, or our pets. A few insects spread diseases. Some eat our clothing and other household furnishings, and some even eat the wood in our homes. Certain insects are helpful to us by producing products we can use (for example, honey), by pollinating our crops, or by attacking pest insects. However, most insects have no importance to our well-being except that they are interesting creatures to observe.



Congress is in the process of approving the monarch butterfly as our national insect. The monarch butterfly was chosen because it is a native insect, it has a wide distribution throughout most of the United States, and it is large and showy. Several states also have chosen a state insect. Can you name an insect that might be a good representative for Kentucky? Why do you think it is appropriate?

Entomologists are people who make careers of studying insects or of protecting us and our crops and other goods from insects. Because there is no end to finding new kinds of insects and learning more facts about them, many people collect and study insects as a hobby. You can become a young entomologist by working to achieve the objectives of this unit.

If your curiosity has been aroused about insects and how they affect our lives, there are several activities in this unit that will help you learn more about the subject of entomology.

An Introduction to Insects and Their Relatives

What is an insect?

All living things can be divided into two main groups: the Animal Kingdom and the Plant Kingdom. There are many different kinds of creatures in the Animal Kingdom, and there is a scientific system for grouping animals into smaller and smaller groups that are more and more similar.

The Animal Kingdom is first subdivided into groups called phyla (singular: phylum). The phyla are divided into “classes,” the classes into “orders,” and so on until we get to the smallest division called “species.”

The ranking of the different subdivisions is shown in the examples of four different animals in the following chart. This method of classifying animals is used by scientists. The genus and species names are italicized, and the two names together are the scientific name of the animal. For example, the scientific name of the house fly is *Musca domestica*.

There are 15 phyla of animals, and each

phylum contains animals that have a combination of characteristics that animals in other phyla do not have. The phylum Arthropoda are the animals with jointed legs, segmented bodies, and a tough or hard outer covering that also serves as their skeleton (exoskeleton). Insects have these characteristics, so they belong to Phylum Arthropoda, but so do millipedes, spiders, ticks, crabs, lobsters, and crayfish, which are not insects.

The class Insecta, or insects, are the Arthropoda that have three pairs of legs, a segmented body divided into three regions (head, thorax, and abdomen), one pair of antennae and, usually, wings.

Other Arthropoda classes have more than three pairs of legs and only one or two body regions, and they never have wings. Other common classes of Arthropoda are Crustacea (such as sowbugs, crayfish, crabs), Diplopoda (millipedes), Chilopoda (centipedes), and Arachnida (such as spiders, ticks, mites, scorpions).

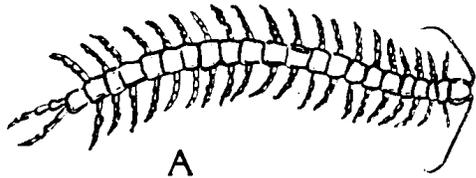
Examples of the Scientific Classification System

Kingdom	Animal	Animal	Animal	Animal
Phylum	Arthropoda	Arthropoda	Chordata	Mollusca
Class	Insecta	Arachnida	Mammalia	Gastropoda
Order	Diptera	Acarina	Carnivora	Pulmonata
Family	Muscidae	Ixodidae	Felidae	Limacidae
Genus	<i>Musca</i>	<i>Dermacentor</i>	<i>Felis</i>	<i>Argiolimax</i>
Species	<i>domestica</i>	<i>variabilis</i>	<i>domestica</i>	<i>reticulatus</i>
Common Name	(house fly)	(dog tick)	(house cat)	(gray garden slug)

Insects and their relatives

Can you pick out the animals that are insects? List by letter each one that is an insect, and tell the main characteristic or characteristics that helped you identify it. There are five insects in the group. (You can find the answers on page 17, but do not look at them until you have tried to figure out the answers for yourself.)

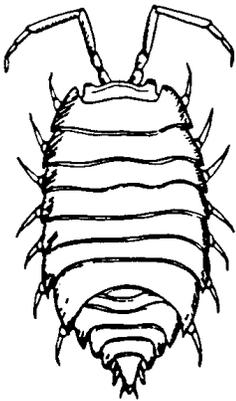
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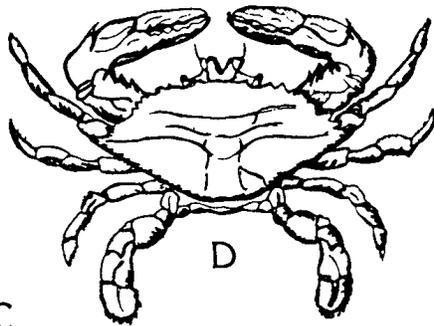
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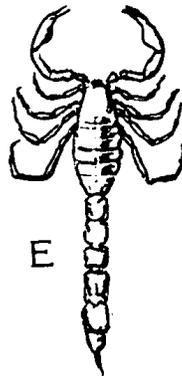
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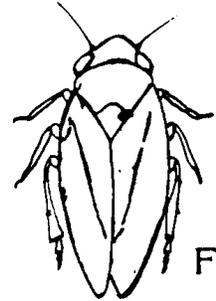
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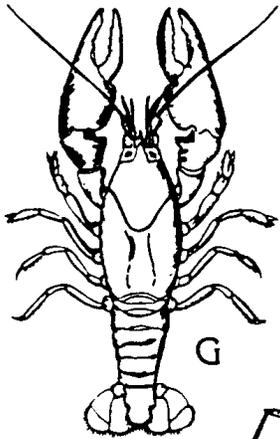
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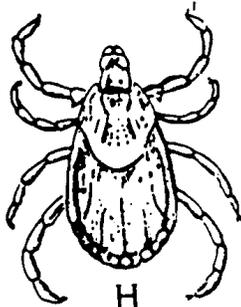
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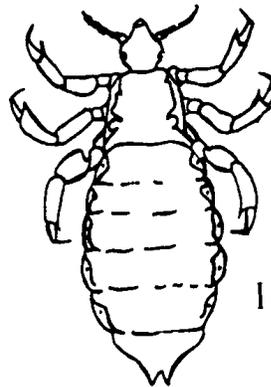
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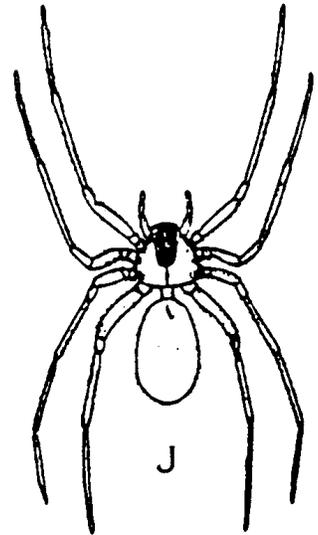
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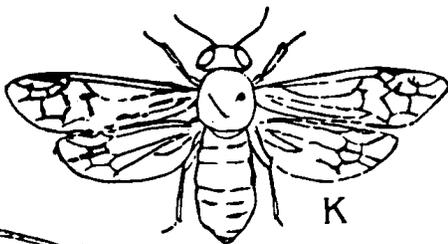
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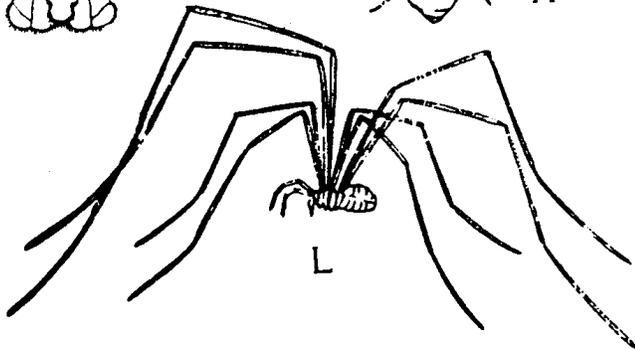
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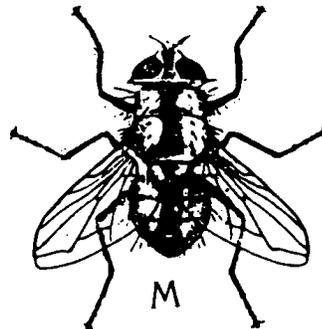
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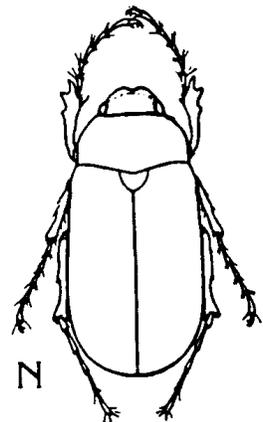
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20

Insect Body Parts

Scientists — and you! — can identify insects by noticing differences in their body parts. Body parts are also used to describe how insects function and behave.

This exercise will give you some practice in locating parts of a typical insect. First, read the following information about insect body parts. Then name the numbered parts of the grasshopper drawing below. There are a few parts that look different or are not present on other insects. If you have a grasshopper specimen, try to find the described parts on it.

All insects have three main body regions: the head, the thorax, and the abdomen.

The Head

The main visible parts on the head are the large compound eyes, the antenna (feelers), and the mouthparts. On the grasshopper, the antennae are long and thread-like. Grasshoppers have chewing-type mouthparts, but other insects may have sucking, rasping, or undeveloped mouthparts.

The Thorax

The thorax is the middle region of the body, and it bears the legs and wings— if wings are present. The front wing is long, narrow and somewhat leathery on the grasshopper. The hind wing is membranous and folds like a fan under the front wing when the grasshopper is not flying.

Almost all insects have a pronotum covering the top of the first segment of the thorax, but it is usually not as big as on a grasshopper. On the grasshopper it looks like a saddle behind the head. Near the base of the middle leg, there is a small breathing hole called the thoracic spiracle. Insects breathe through spiracles and not through their mouths.

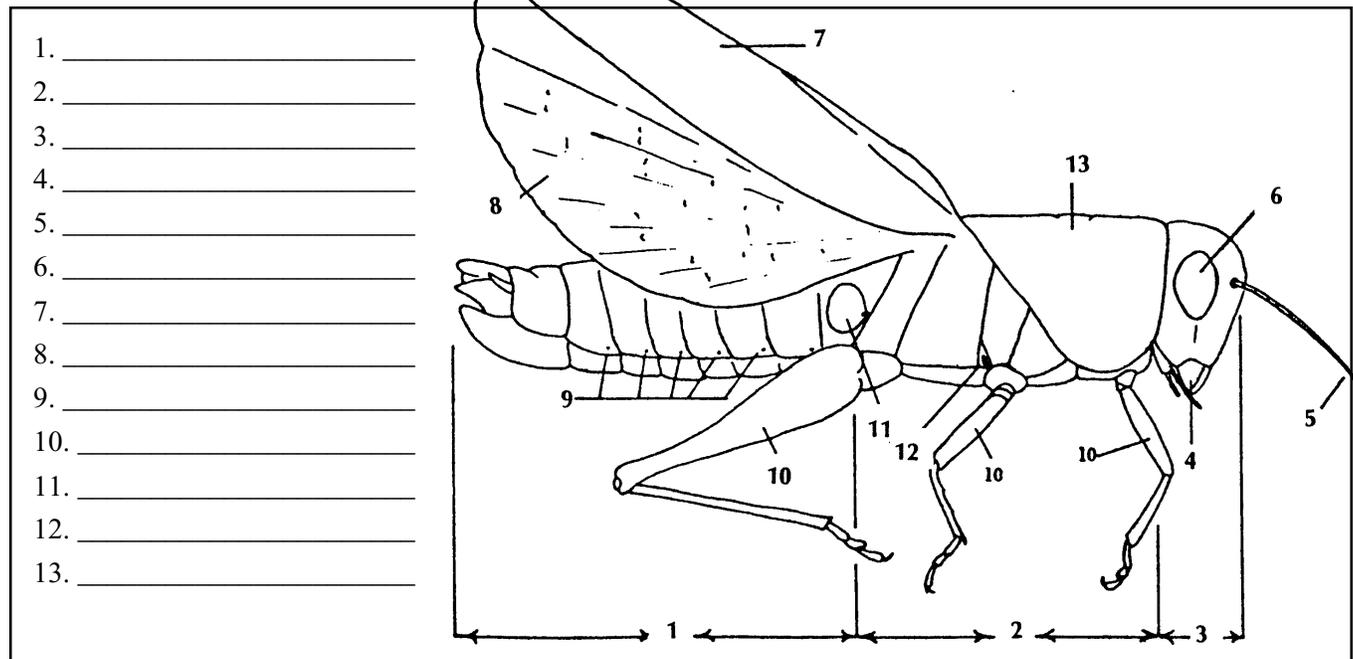
The legs of different insects are adapted to do different things. The legs of some insects are adapted for swimming, burrowing, jumping, or grasping. From looking at the form of the grasshopper's hind leg, how do you suppose they are used?

The Abdomen

The abdomen does not have many outstanding features on most insects. It just looks like a series of similar-looking segments. On some grasshoppers, there is a large round disc on the first segment next to the thorax. It is called a tympanum and is the grasshopper's ear. If you look closely at the other abdominal segments, you can find a pin-hole on the side of each segment. They are abdominal spiracles and are also used for breathing just like the spiracle on the thorax.

Label the parts of the grasshopper below.

(You can find the answers on page 17, but do not look at them until you have tried to figure out the answers for yourself.)



Making an Insect Collection

Making a collection is the best way to learn about what insects look like, where they live, and what they do. A collection also helps you tell others what you have learned about insects.

Your collection for this unit will be relatively small—only 25 different insects. The only limits are that the collection must contain insects from at least four different orders and no more than 10 insects in the same order. This means searching different places to find a variety of insects.

To get an insect into your collection, you will have to find it, capture it, kill it, pin it, and make out labels for it.

Making a killing jar and killing insects

You will need to kill the live insects you capture before putting them into your collection. The killing method should be quick and as painless as possible. Also, the killing method should not ruin the insect's appearance. A killing jar that can be carried with you is handy for doing this. You should prepare one before going out to collect.

Any clear, wide-mouthed, plastic jar with a tight screw-cap lid can be used to make a killing jar. A pint-size jar (a peanut butter jar works well) is easy to carry and will be big enough to hold large insects. You can make larger or smaller killing jars to suit yourself.

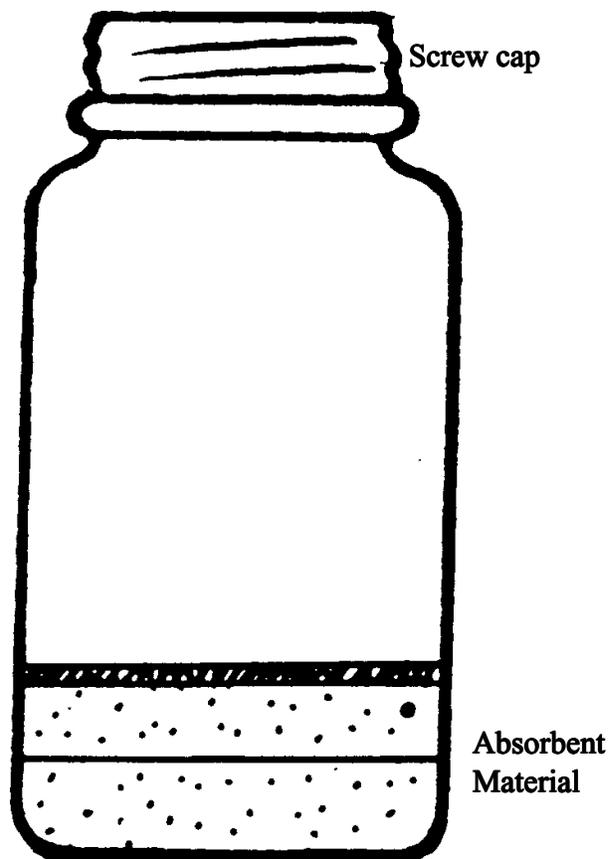
After selecting a jar, cut discs of blotter or newspaper to fit snugly into the bottom of the jar. A stack of discs 1/2-inch high is enough.

When you want to use the killing jar, pour fingernail polish remover or rubbing alcohol onto the paper discs. Pour off any fluid that is not absorbed by the paper. Then put a few narrow strips of tissue paper in the jar. The tissue paper helps absorb moisture and gives the insects a place to hide. When insects are hiding, they do not thrash around and damage themselves so much.

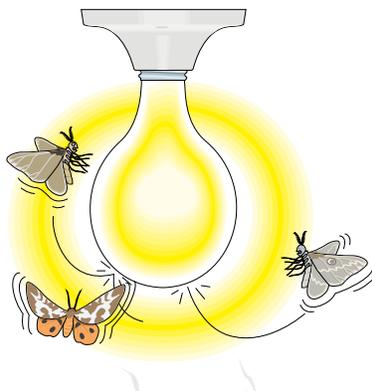
Killing jars containing cyanide, carbon tetrachloride, gasoline, or ether are too flammable or poisonous to be used safely. Even though fingernail polish remover is relatively safe, **the killing jar should be labeled KILLING JAR — POISON.**

If you are near home, you can collect insects in a plain jar and then put the jar in the freezer to kill the insects. They will be knocked out after a few minutes, but keep them in the freezer for at least an hour. If you take them out too soon they may revive after you have pinned them.

Some insects, like beetles and grasshoppers, can be drowned in four or five seconds in warm soapy water without spoiling their appearance. This is not a good killing method for hairy or scaly insects or small, delicate ones because they will still look soggy even after they have dried.



Where to collect insects



- In the air for flying insects on warm days from early spring to late fall.
- On a wide variety of vegetation, both day and night.
- Around street lights, porch lights, and study lamps.
- In woodpiles, especially in spring and early summer.
- In the soil.
- On (or in) fresh or decaying fruit.
- On domestic animals for parasitic insects, such as fleas and lice.
- Along the edges of rivers, streams, lakes, or ponds and in the water.
- In buildings— windows, flour bins, cereal packages, closets, or boxes where clothing and old papers are stored.

How to collect insects

As you can see, insects live in all kinds of places. Some are a real challenge to capture while others move slowly enough to be picked up by hand and put directly into a killing jar. If you think the insect may bite or sting, gently tap it into the jar with a twig, or use tweezers to pick it up. You will need an insect net for fast-moving insects.

An insect net, one of the optional things to make for this project, can be used in a variety of ways. You can use the net to scoop insects out of the air as they fly by, or you can sweep the net through weeds and flowers to catch whatever is hidden there. Some insects “play possum” when disturbed. To catch them, hold your net under plants and shake the insects off into the net.

Be very careful when catching *stinging or biting insects*. Try this special technique. Sweep the insect into the net and, with a quick jerk, force it to the bottom of the bag. Then grasp one hand around the bag just above the captured insect. Put the end of the bag with the insect into the killing jar. Place the jar lid over the mouth of the jar as tightly as you can,

and wait until the insect becomes still. Then take the end of the bag out of the killing jar, quickly remove the stunned insect, and put it back into the killing jar.

Collecting *moths and butterflies* without damaging them requires special care. To keep these insects from escaping after being netted, whip the net so the insect goes to the bottom of the bag. Keep the insect trapped in the bottom of the bag by giving the net a flip so the bag bottom rests across the loop. Then pinch the thorax of the insect while it is still in the net. This will stun the moth or butterfly and keep it from beating the scales off its wings when it is put in the killing jar.

Pinning your insects

After you have finished collecting for the day, it is wise to go ahead and prepare the specimens to put in your collection. This means putting them on insect pins. Don't wait until the next day, because the insects may become dry and brittle, and parts of the insect may break off when you try to pin them.

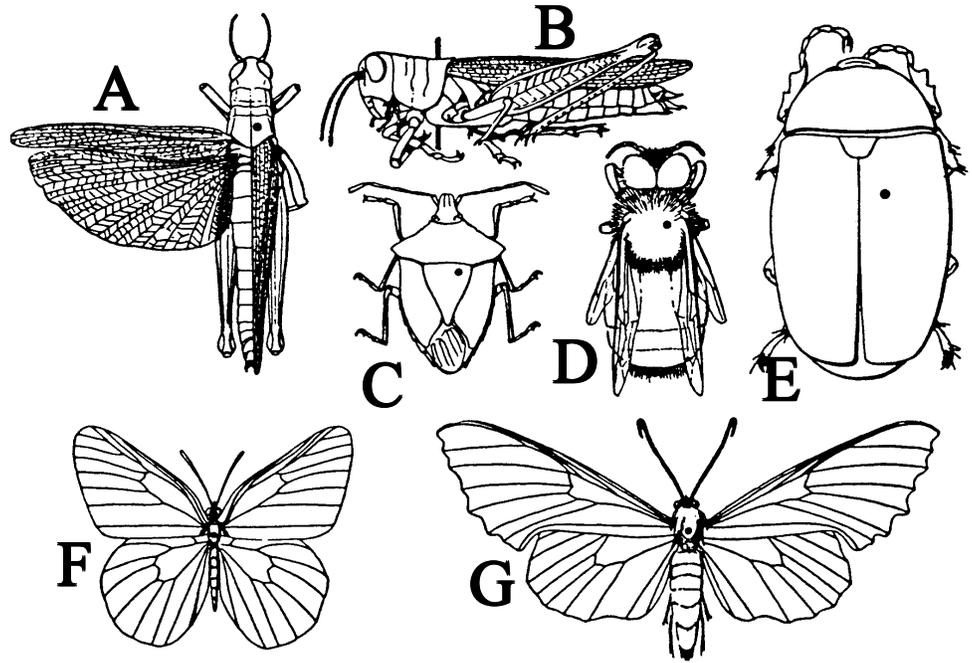
You can begin pinning the insects after they have been in the killing jar for about 20 minutes. If you take them out of the killing jar too soon they may revive after you have pinned them.

Use special insect pins that can be bought through your county Extension agent or 4-H project leader. Gently run the pin through the thorax of the insect a little to the right of the midline of the body. The following illustration shows examples of the correct spot to insert the pin. Leave about 1/4-inch of the pin visible above the specimen. This will be enough of a handle to pick up the specimen without touching the insect. There will be enough room on the pin below the insect to add labels. Work carefully and try to get the insect level on the pin so it is not tipped from front to back or from side to side.

To properly pin *butterflies and moths*, follow these additional steps. Once the insect is pinned through the body, position the wings as shown with a spreading board (purchased from a supply store) or with two blocks of Styrofoam™, each twice as long as the butterfly or moth and about the same height as the insect on the pin, placed on either side of the insect. The wings should be gently pulled into place with an insect pin placed behind a large wing vein. The back margins of the front wings should be perpendicular to the insect's body, with just a slight notch between the front and back wings. Narrow strips of paper placed over the wings will hold the wings in place (the strips

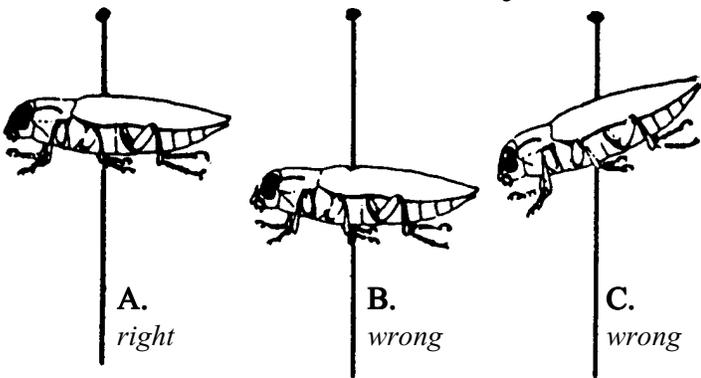
of paper should be pinned to the spreading board as well). Depending on the moisture in the air, it may take up to a week for the wings to completely dry in place.

Examples of correct pinning methods for common insects: the black spots show where the pins should go.

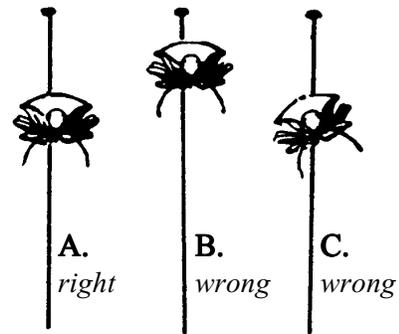


- A. Grasshopper and related Orthoptera, showing how wings should be spread;
- B. side view of a grasshopper showing position of legs and antennae;
- C. a stinkbug, an example of the order Hemiptera, showing method of pinning large bugs;
- D. a bee, order Hymenoptera, to show where bees, wasps, and flies should be pinned;
- E. a May beetle, order Coleoptera, showing method of pinning beetles;
- F., G. butterfly and moth, order Lepidoptera, showing location of pin and position of wings and antennae.

The illustrations below show some correctly and incorrectly pinned insects.



- Illustration of right and wrong methods of pinning:**
- A. correct height and position for specimen;
 - B. insect too low on the pin;
 - C. insect tilted on pin.



- Illustration of right and wrong methods of pinning:**
- A. correct height and position for specimen;
 - B. insect too high on the pin;
 - C. insect tilted on the pin.

Labeling your insects

After you have pinned an insect, make out a date-locality-collector label to put with the insect. You can get blank labels, which are printed on cardboard, from your 4-H project leader or county Extension agent. The following example shows you how the labels are to be filled out. If the insect was not collected in Kentucky, use the back of a printed label to record the date-locality-collector information.

Use a fine-pointed pen, called a crow quill pen, and India ink to fill in the labels. Ball-point pens and pencils are too coarse or smeary to do a neat job, but a micro-point roller ball pen might be acceptable.

It is usually a good idea to fill in a label while it is still attached to the label sheet. If you cut the label out first, it is harder to hold in place while you write on it because it is so small.

After you have completed a label and cut it out, attach it to the pinned insect. The dot at the center of the label shows where the insect pin is inserted. Line the label up so it is parallel to the insect's body and can be read from the left side of the insect. Lining up the date-locality-collector label in this way better protects the insect from damage and also takes up less space. It will also allow the "Common Name" label to be read more easily when it is put on the pin.

Identifying Your Insects

People experienced with insects may be able to tell you what some of your insects are, but you should try to identify as many of your insects as possible on your own. Here are some ways to do that:

You can identify the insects you have killed by matching them with pictures in books. *Handbook of the Insect World*, available as part of the entomology project, contains many pictures of common insects.

If you don't find a picture to match an insect you have, you can use a key to identify it. An insect "key" is a step-by-step system which leads you to the proper identification of an insect. *A Key to the Orders of Insects* will help you identify orders of insects, and also has descriptions of the insect orders to supplement the information in the key. The booklet is available with this project.

There are also field guide booklets available at book stores that are helpful for identification. See the booklist on page 11 of this project book.

Storing and Displaying Your Collection

After you have pinned and labeled your insects, keep them in a safe place (such as a cigar box, covered shoe box, or insect box from a hobby store) where they will not get broken or eaten by carpet beetles. Placing moth balls in the insect boxes will also help repel carpet beetles. See the *Optional Activities* of this unit for instructions on how to make your own storage box.

If you enter your collection in the display competition at fairs, you will have to use a regulation display box. Plans for making a standard display box are given on pages 15-16. A cardboard display box acceptable for exhibiting at fairs can be purchased by writing to:

Entomology Department
S-225 Agricultural Science Building, North
University of Kentucky
Lexington, KY 40546-0091.

Your 4-H project leader or county Extension agent can tell you the price. Checks for these boxes should be made payable to "Friends of Kentucky 4-H."

Giving Entomology Talks and Demonstrations

Now that you have learned some ways to collect, identify, and display insects, you should try to share your knowledge with others. You can do this by giving a talk or demonstration to other 4-H members, your school class, or other interested groups.

Suggestions for Talks or Demonstrations:

- How to make and use collecting equipment
- How to pin, spread, and prepare insects for a collection
- How to prepare and arrange an insect collection for display
- How to make a display box

- How insects differ from their near relatives
- Techniques for capturing and preparing special types of insects
- How to recognize some orders of insects by their wing characteristics
- Where to find special types of insects

A trip to your school or public library will help you gather more information for your talk or demonstration. Many popular books on entomology can be found in bookstores. Your county Extension agent for agriculture also has free publications on entomology subjects that may be helpful. **Here are some books you can find in libraries or bookstores.**

Borror, DJ. and R.E. White. *A Field Guide to the Insects*. Boston: Houghton Mifflin Co.

Covell, C.V. *Peterson Field Guide to Eastern Moths*. Boston: Houghton Mifflin Co.

Dunkle, S.W. *Dragonflies of the Florida Peninsula, Bermuda, and the Bahamas*. Gainesville, FL: Scientific Publishers.

Farrand, J., Jr. *The Audobon Society Pocket Guide to Familiar Insects and Spiders*. New York: Knopf.

Feltwell, J. *Butterflies of North America*. New York: Smithmark Publishers.

Klots, A.B. *A Field Guide to Butterflies*. Boston: Houghton Mifflin Co.

Milne, L. and M. Milne. *Audobon Society Pocket Guide to North American Insects and Spiders*. New York: Knopf.

Walton, R.K. *The Audobon Society Pocket Guide to Familiar Butterflies of North America*. New York: Knopf.

White, R.E. *Peterson Field Guide to Beetles*. Boston: Houghton Mifflin Co.

Exhibiting Your Collection

1. All exhibits are to be standard size — 18" x 24" — and not more than 3 1/2" thick with plexiglass cover and cellotex-type false pinning bottoms. Entomology boxes ordered through the State 4-H office as indicated in “Storing and Displaying Your Collection” will also be acceptable.
2. Specimens are to be arranged so the box can be exhibited horizontally. See 4DC-02PO, Entomology Project—Unit II, p. 18, for example.
3. Identification labels available from your county Extension office must be used. Follow instructions for pinning and labeling included in this Unit.
4. Use insect pins for pinning insects.
5. Use the 4-H Entomology identification labels.
6. The first-year project consists of one box with a minimum of 25 insects from at least four orders. Identification beyond the order is not necessary. All specimens must have the date-locality label.
7. Make a catalog list of insects in the collection. See 4DC-02PO, Unit II, p. 12, for example.

Unit I: Optional Activities

To complete Unit 1, you must finish at least three of the following optional activities. This part of Unit I will expand your basic knowledge of entomology, while giving you as much free choice as possible. These activities should be done with the knowledge and approval of your 4-H project leader.

■ **Make an insect-collecting net.** An insect-collecting net will allow you to collect flying and jumping insects without damaging their parts. Materials and methods for constructing a collecting net are on page 13.

■ **Construct an insect storage box.** An insect storage box provides a safe place to keep a long-term insect collection in usable form. Materials and methods for constructing a storage box are on page 15.

■ **Construct an insect display box.** This activity will help you learn the parts of a display box suitable for exhibiting an insect collection. The box can also be used as a storage box. Materials and methods for constructing a display box are on pages 15-16.

■ **Rear a wild insect.** Rearing a wild insect will help you learn some things about insect life cycles. Collect a young worm or bug from a natural host plant. Keep that insect in a quart glass jar and add new host plant material as needed. The jar can be covered with a paper towel held in place by a rubber band. Observe the insect feeding and the changes it goes through until it becomes an adult.

■ **Make an arthropod collection.** Insects are a class in the Phylum Arthropoda. They are close relatives of the animals which are similar to, but not exactly like, insects. These animals make up the other classes of the Phylum Arthropoda. These classes are:

a. Arachnida — spiders, mites, ticks, daddy long legs, scorpions and tarantulas.

b. Chilopoda — centipedes — one pair of legs per segment.

c. Diplopoda — millipedes — two pairs of legs per segment.

d. Symphyla — tiny centipede-like organisms but only 11-12 pairs of legs.

e. Crustacea — crayfish, sowbugs, waterfleas, lobsters, etc.

You may have as many different specimens as you wish, but you must have one specimen from four of the classes. Symphyla are very small and hard to find, so it is not necessary to have them in your collection.

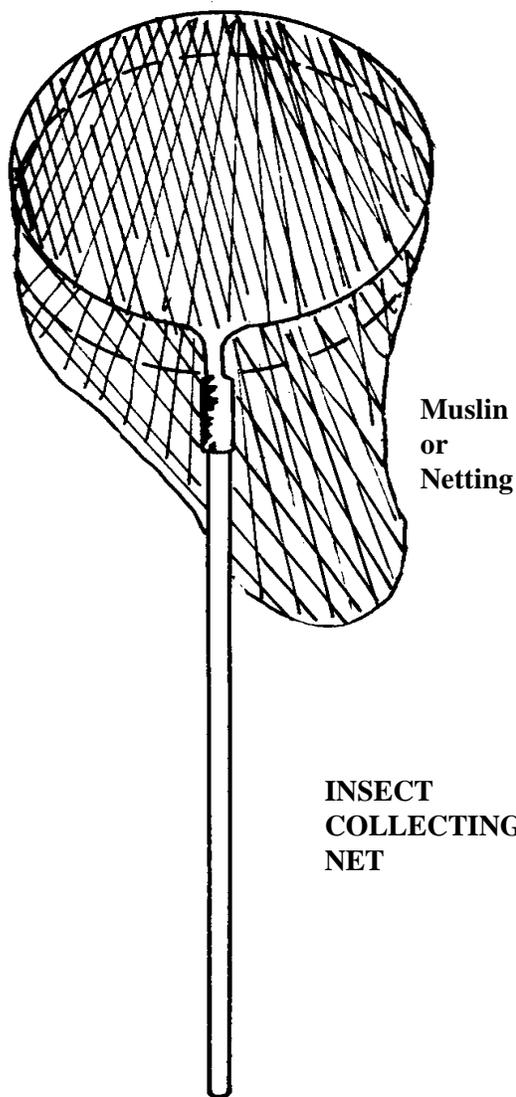
How to Make a Collecting Net

Materials Needed:

- Small wooden handle, 3 feet long (broom handle or dowel)
- About 5 feet of heavy wire (No. 9) for hoop or a standard wire hanger
- Piece of unbleached muslin or netting, 3 x 5 feet or an old pillowcase
- Soft wire, heavy string or metal sleeve for net handle to hold hoop wire or duct tape
- Needle and heavy thread

Steps:

1. Bend heavy wire into a circle (about 12 inches) to form a hoop. Bend arms 2 1/2 inches and 3 1/2 inches for fitting in net handle.
2. Bore holes in the net handle for arm hooks. If you want a smooth fit, groove handle as shown.
3. Make a net bag by following the instructions on the next page.
4. Thread the wire hoop through the hem of the bag, and insert the wire arms into the handle. Slip the metal sleeve over the net handle to hold the wire arms in place. You can also attach the hoop arms to the net handle by wrapping them with soft wire, heavy string, or duct tape.



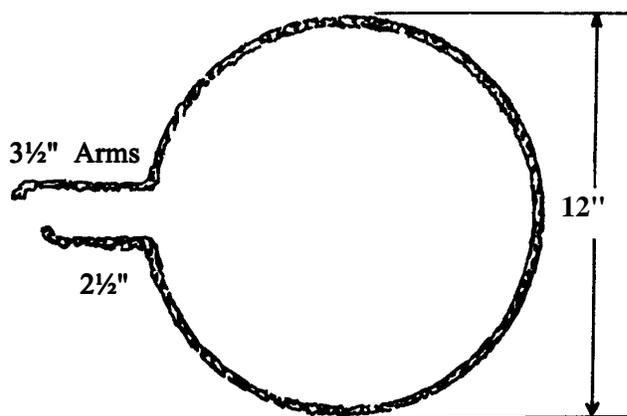
Groove



Wire or String



Metal Sleeve



How to Make a Net Bag

To make the net bag, fold two pieces of 20 x 30-inch net material (muslin or netting) to 10 x 30 inches (A and B). Cut the material from the bottom folded corner diagonally up and across to a point 10 inches below the top unfolded corner (C). After you have finished cutting, the net bag will be in two roughly triangular pieces (D).

Stitch the two halves of the net together making the seam about 1/2 inch from the cut edge; leave 10 inches free on one side at the top where the net hoop will be inserted (E). Turn the cut edges inside and stitch the seam down flat (flat-felled seam).

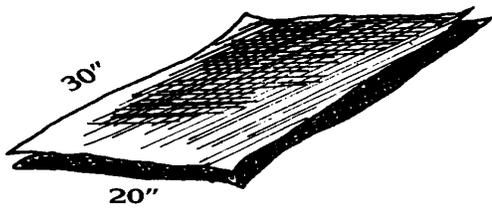


figure A.

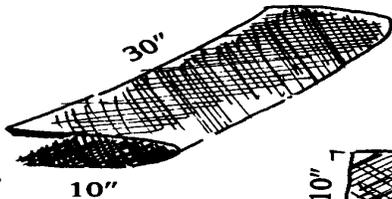


figure B.

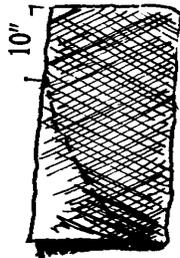


figure C.

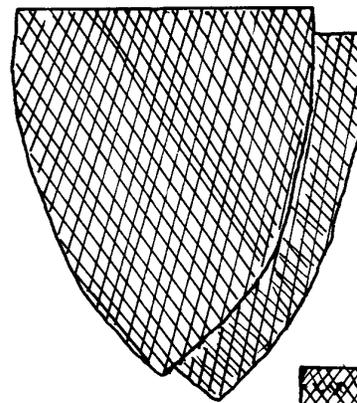


figure D.

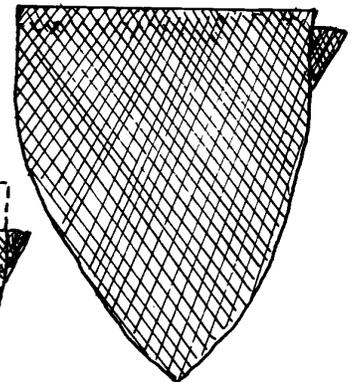


figure E.

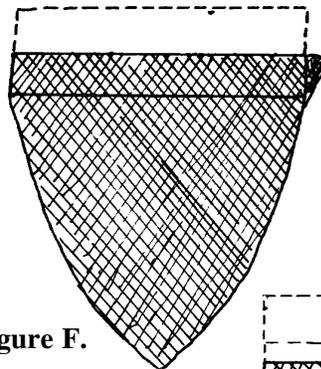


figure F.

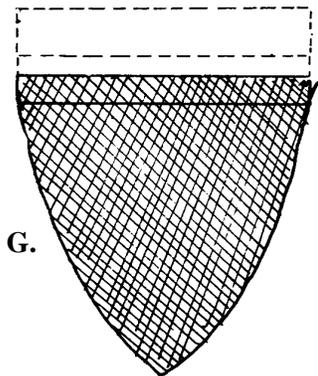
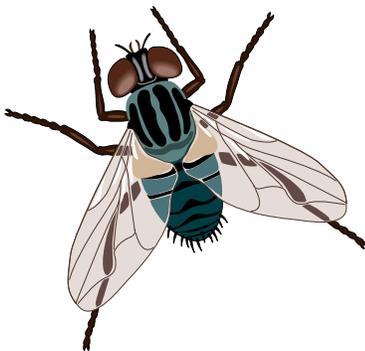


figure G.

To make a loop for the wire hoop, fold the top edge down 5 inches (F). Then turn the folded edge down 2 1/2 inches and stitch the hem (G). If you need to reinforce the hem, make only one fold and cover the fold with a strip of muslin 5 x 10 inches. Then fold again and stitch. The muslin will protect the netting around the wire hoop.

If you use an old pillow case to make a net bag, you won't be able to "see through" your net; however, it will not snag. The hem of the pillowcase is a ready-made loop for the wire hoop. Just cut a small slit on either side of the pillowcase seam, and then feed the wire through the hem.



How to Make a Storage Box

Materials Needed:

- Cigar box, 2 x 6 x 8 inches or any other similar sized sturdy box
- Piece of soft fiberboard or Styrofoam™
- Glue
- White paper
- Moth crystals (to keep pests out of collections)
- Pill box or safety match box (to hold moth crystals)
- Insect pins— No. 2 or No. 3 size
- Insect labels

Steps:

1. Cut the fiberboard to fit the bottom of the box.
2. Cover the bottom of the box with glue, insert the cardboard, and press firmly until it adheres. Wipe off any excess glue.
3. Line the box with white paper.
4. Fill the match box or small pill box with moth crystals.
5. If the pill box is air tight, punch some holes in the lid.
6. Pin the box in a corner of the cigar box.



How to Make a Display Box

Equipment and Materials Needed:

- Parts cut to specifications listed in “size” column
- Nails and screws
- 1/2" brads
- Glue
- Hammer
- Screwdriver
- Sandpaper
- Varnish or paint

Part	Quantity	Size	Material
A	2	3/4 x 3 1/2 x 24	pine
B	1	3/4 x 3 1/2 x 16 1/2	pine
C	1	3/4 x 3 1/8 x 16 1/2	pine
D	1	3/4 x 3/8 x 16 1/2	pine
E	1	1/8 x 18 x 24	plywood
F	1	1/2 x 16 1/2 x 22 1/2	cellotex
G	1	17 x 23	Plexiglas™

Steps for making a display box:

1. Make the grooves in Parts A, B and D. You will need to have an adult do this for you or help you do it. (See the plans below for making grooves.)

2. Align parts A and B so the grooves for the Plexiglas™ match. You can do this by putting part B in place so the other edge of the square fits into its groove.

3. Nail or screw the two parts together. Do not pound the nails all the way in yet.

4. Put part C in place so its top edge is even with the bottom of the grooves of the two A parts; fasten part C in place.

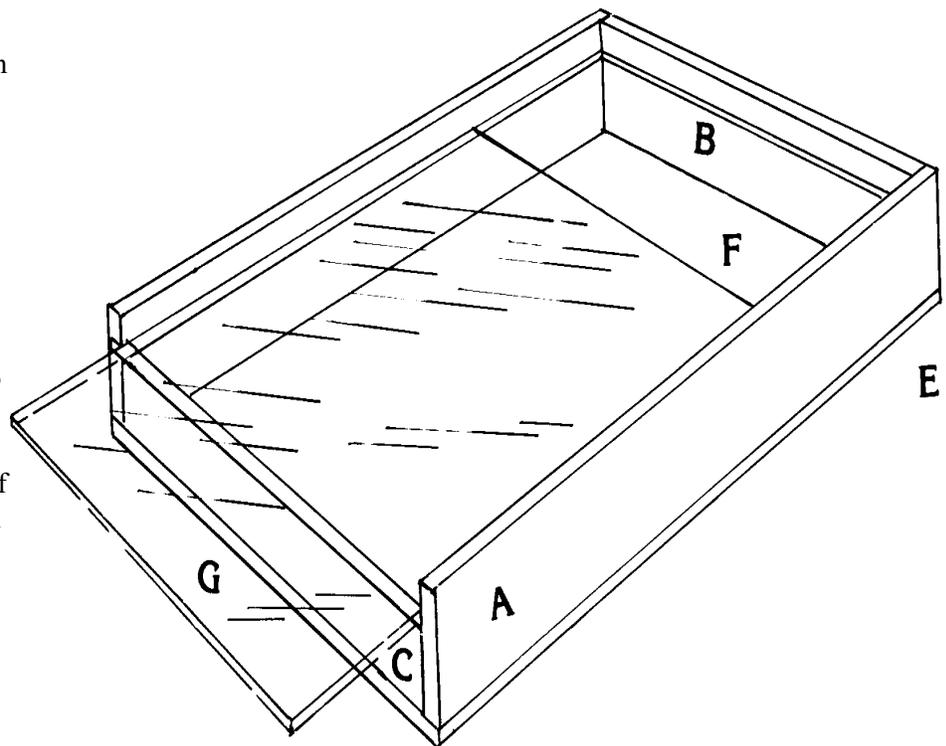
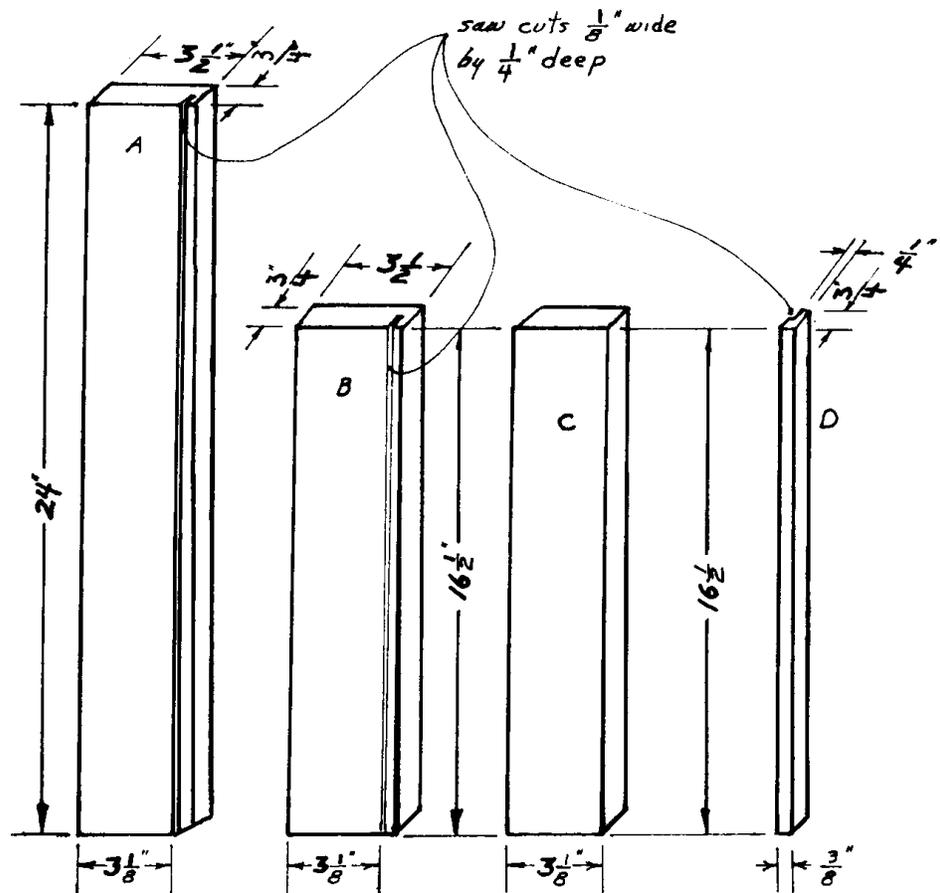
5. Fasten on the plywood bottom, part E, using 1/2-inch brads. There will be enough give in the side pieces already assembled so they can be forced, if necessary, to square up with the plywood bottom.

6. Now slip the Plexiglas™ into place from the part C end of the box. If the Plexiglas™ fits well, you can then finish pounding the nails all the way in.

7. Remove the Plexiglas™ and glue the cellotex pinning bottom, part F, into place.

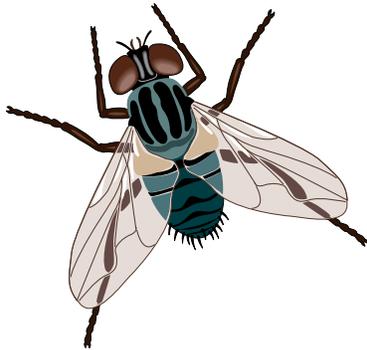
8. Do not nail part D in place. Use a screw instead. You will need to be able to take part D off whenever you want to get into the collection.

9. Sand and varnish or paint your box, if you want. Do not get paint or varnish in the grooves cut out for the Plexiglas™.



ANSWERS

to Exercises



Answers to exercise on page 5.
Here's how the Class Insecta in the drawing can be recognized as insects:

- F.** Has six legs and wings (wings may not be obvious in the drawing).
- I.** Wingless, but has three body regions and three pairs of legs.
- K.** Three body regions and obviously winged (one pair of legs not visible in the drawing).
- M.** Three body regions, obvious wings, and three pairs of legs.
- N.** Three pairs of legs.

All the other arthropods shown have too many legs to be insects. They are:

- A.** Centipede (Class Chilopoda)
- B.** Millipede (Class Diplopoda)
- C.** Sowbug (Class Crustacea)
- D.** Crab (Class Crustacea)
- E.** Scorpion (Class Arachnida)
- G.** Crayfish (Class Crustacea)
- H.** Tick (Class Arachnida)
- J.** Spider (Class Arachnida)
- L.** Daddy-Long Legs (Class Arachnida)

Answers to exercise on page 6.
The grasshopper's hind legs are adapted for jumping.

- 1.** abdomen
- 2.** thorax
- 3.** head
- 4.** mouthparts
- 5.** antenna
- 6.** compound eye
- 7.** front wing
- 8.** hind wing
- 9.** abdominal spiracles
- 10.** legs
- 11.** tympanum
- 12.** thoracic spiracles
- 13.** pronotum

Records

The recognition you get for your work in 4-H depends on what you do. To help keep track of your project-related activities, record them as you do them. Then when you are ready to complete your project record, you will have the information you need.

Part of your entomology record includes project-related activities you participated in during the year. There is a place to record these activities on your project record. Examples of activities you might want to record are given below.

4-H Club meeting participation:

- Number of club meetings you attended
- Committees you served on (such as clean-up, membership drive, fund raising)
- Committee reports you gave
- Demonstrations or talks you gave
- Exhibits you displayed
- Offices you held (such as president, treasurer, secretary, committee chairman)

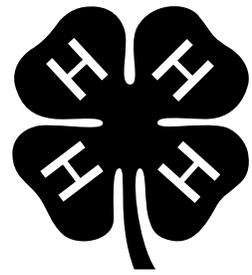
Other activities not at club meeting:

- Helped another club member with his or her project
- Exhibited your project in competition at local, county, or state fair
- Exhibited your project at school, store, civic club, etc.
- Gave a demonstration at school or at an adult organization
- Went on a group field trip
- Enrolled in an adult entomology club or society (Lepidopterists' Club, for example)
- Took photographs of entomology activities

Awards and Recognition for Entomology participation include:

- Ribbons received at fairs
- Pins, trophies, or certificates of accomplishment received
- Newspaper articles in which you are mentioned (save the clippings, along with the newspaper title and date)
- Radio or television appearances

4-H Entomology



Project Record — Unit 1.

Name of Member _____ Year _____

Parent or Guardian _____

Mailing Address _____ Zip _____

County _____ Name of Club _____

Grade in School _____ Name of School _____

Birth Date _____ Years in this Project _____ Years in 4-H _____

1. I participated in the following entomology activities. (If the activity relates to club participation, record “club” in the “where” column. Otherwise, record the place where the activity occurred.)

DATE	KIND OF ACTIVITY (TITLE)	WHERE

2. I helped _____ other 4-H’ers with their entomology project. I helped them by:

3. I participated in the following community service activities through my 4-H club:

4. I read the following articles, pamphlets, or books to prepare for my demonstrations or to help me to learn more about entomology (list titles, authors and, if available, dates):

5. I used the following equipment in completing my project this year (list each item, whether you bought or made the item, and how much it cost):

6. I received the following awards and recognition (list activity, date of activity, where it took place, and award or recognition received):

7. I completed the following Optional Activities for Unit 1:

8. In your own words, write a summary of your entomology project. Tell what you did, what you learned from the project, and how you could have improved your project. Write your story on a separate sheet of paper, and attach it to this record sheet.