

Reading Preview

Key Concepts

- What are the main characteristics of insects?
- What is one way insects are adapted to obtain particular types of food?
- What are two types of metamorphosis that insects undergo?

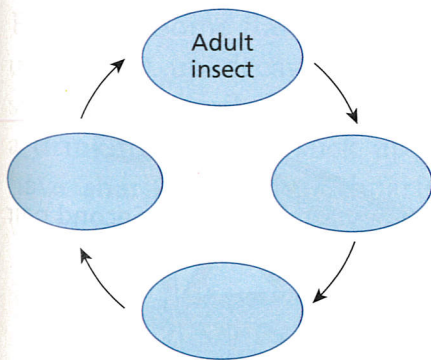
Key Terms

- insect • thorax
- complete metamorphosis
- pupa
- gradual metamorphosis
- nymph

Target Reading Skill

Sequencing A sequence is the order in which a series of events or steps in a process occurs. As you read, make a cycle diagram that shows the steps in the complete metamorphosis of an insect. Write each step in a separate circle.

Complete Metamorphosis




Thorn insect ►

Lab
zone

Discover Activity

What Characteristics Do Insects Share?

1.  Your teacher will give you a collection of insects. Observe the insects carefully.
2. Note the physical characteristics of each insect's body covering. Count the number of body sections.
3. Count the number of legs, wings, and antennae on each insect. Then return the insects to your teacher and wash your hands.



Think It Over

Inferring Compare the legs and the wings of two different species of insect. How is each insect adapted to move?

What do you do if you want to avoid being noticed? You keep perfectly quiet and you don't do anything that will attract attention. You might even wear clothes that help you to blend into the environment—a tactic called camouflage. The thorn insect is a master of camouflage. Not only does it look like a thorn, but it acts like one, too, staying quite still unless a predator like a bird comes too close. Then it springs away to safety.

Other kinds of insects have different camouflage tactics. For example, some caterpillars look like bird droppings, and others look and act like twigs. Plant hoppers may gather in clusters that look like yellow blossoms. And many kinds of moths resemble dead leaves.



Graphing

Use the data to make a circle graph that shows the percentage of total insect species in each group. (See the Skills Handbook.)

Insect Groups	
Group	Number of Species
Ants, bees, and wasps	115,000
Beetles and weevils	350,000
Butterflies and moths	178,000
Flies and mosquitoes	110,000
Other insect groups	147,000

Body Structure

Moths are **insects**, as are caterpillars, plant hoppers, dragonflies, cockroaches, and bees. You can identify insects, like other arthropods, by counting their body sections and legs. **Insects are arthropods with three body sections, six legs, one pair of antennae, and usually one or two pairs of wings.** The three body sections are the head, thorax, and abdomen, as you can see in Figure 17.

Head Most of an insect's sense organs, such as the eyes and antennae, are located on the head. Insects usually have two large compound eyes. These eyes contain many lenses, which are structures that focus light to form images. Compound eyes are especially keen at seeing movement. Most insects also have small simple eyes that can distinguish between light and darkness.

Thorax An insect's midsection, or **thorax**, is the section to which wings and legs are attached. Most species of insects can fly once they are adults. Insects are the only invertebrates that can fly. By flying, insects can travel long distances to find mates, food, and new places to live. Being able to fly also enables insects to escape from many predators.

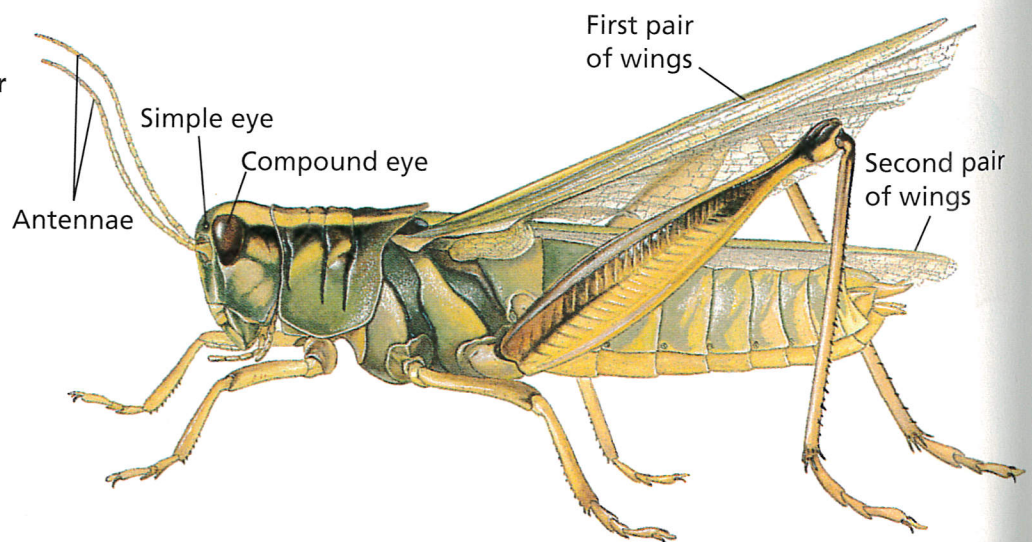
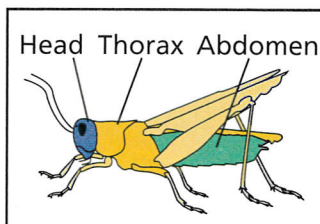
Abdomen Inside the abdomen are many of the insect's internal organs. Small holes on the outside of the abdomen lead to a system of tubes inside the insect. These tubes allow air, which contains oxygen, to enter the body. The oxygen in the air travels directly to the insect's cells.



Reading
Checkpoint

What are the three sections of an insect's body?

FIGURE 17
Structure of a Grasshopper
A grasshopper's body, like that of every insect, has three sections.

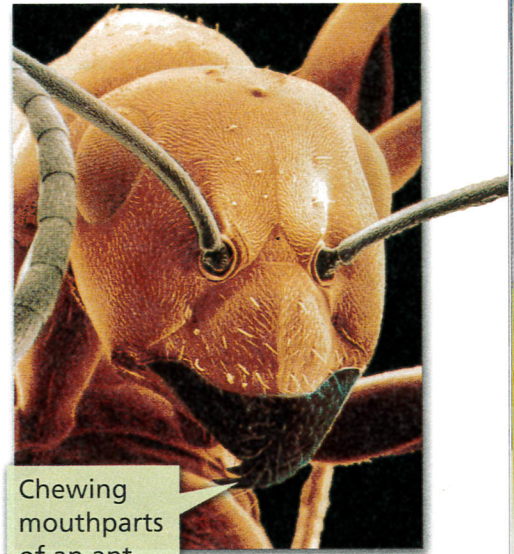




Lapping mouthparts of a fly



Sucking mouthparts of a butterfly



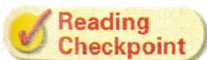
Chewing mouthparts of an ant

Obtaining Food

The rule seems to be this: If it is living, or if it once was living, some kind of insect will eat it. You probably know that many insects eat parts of plants, such as leaves or nectar. But insects also eat products that are made from plants, such as paper. If you open a very old book, watch for book lice. These tiny insects live in old books, chewing crooked tunnels through the pages.

Insects may feed on animals, too. Some, like fleas and mosquitoes, feed on the blood of living animals. Others, like dung beetles, feed on animal droppings. Still others, like burying beetles, feed on the decaying bodies of dead animals.

An insect's mouthparts are adapted for a highly specific way of getting food. You can see some of these adaptations in Figure 18. Some flies have a sponge-like mouthpart that they use to lap up decaying flesh. A butterfly's mouthparts are shaped like a coiled tube, which can be uncoiled and used like a drinking straw to suck up nectar from flowers. Most ants have sharp-edged mouthparts that can cut through seeds, wood, and other foods.



Reading
Checkpoint

How does a butterfly obtain food?

Life Cycle

Insects begin life as tiny, hard-shelled, fertilized eggs. After they hatch, insects begin a process of metamorphosis that eventually produces an adult insect. **Each insect species undergoes either complete metamorphosis or gradual metamorphosis.**

FIGURE 18

Diversity of Mouthparts

The mouthparts of this fly, butterfly, and wood ant are very different in their structure.

Inferring Could a butterfly eat an ant's food? Explain.

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PHSchool.com

For: More on insect metamorphosis

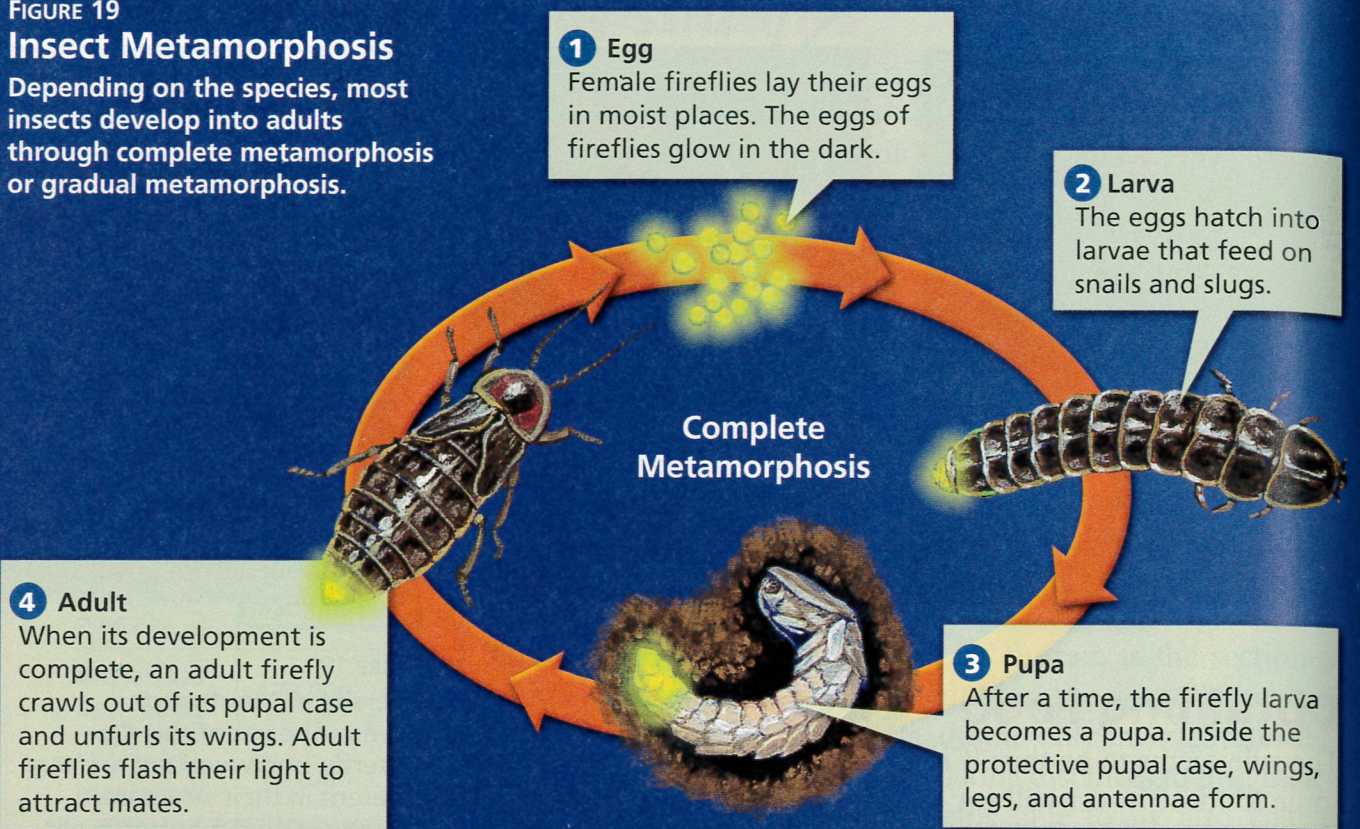
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FIGURE 19

Insect Metamorphosis

Depending on the species, most insects develop into adults through complete metamorphosis or gradual metamorphosis.



Complete Metamorphosis In Figure 19 you can see that an insect with **complete metamorphosis** has four different stages: egg, larva, pupa, and adult. Eggs hatch into larvae. The larvae, such as the caterpillars of butterflies and the grubs of beetles, usually look something like worms. Larvae are specialized for eating and growing. After a time, a larva enters the next stage of the process and becomes a **pupa** (PYOO puh). As a pupa, the insect is enclosed in a protective covering.

Although the pupa does not eat and moves very little, it is not resting. Major changes in body structure are taking place in this stage, as the pupa becomes an adult insect. Beetles, butterflies, flies, and ants all undergo complete metamorphosis.

Gradual Metamorphosis In contrast, the second type of metamorphosis, called **gradual metamorphosis**, has no distinct larval stage. An egg hatches into a stage called a **nymph** (nimf), which usually looks like the adult insect without wings. A nymph may molt several times before becoming an adult. Grasshoppers, termites, cockroaches, and dragonflies go through gradual metamorphosis.



Reading
Checkpoint

What is gradual metamorphosis?

4 Adult

The adult grasshopper emerges from the final molt equipped with full-sized wings. Once its wings have hardened, the adult flies off to mate and begin the cycle again.

1 Egg

A female grasshopper uses the tip of her abdomen to jab holes in the soil where she lays her eggs.

2 Nymph

Eggs hatch into nymphs that look much like miniature adults, except that they have no wings, or only small ones.

3 Larger Nymph

A nymph feeds until its exoskeleton becomes too tight, and then it molts. The nymph molts four or five times before becoming an adult.

Gradual Metamorphosis

Section 3 Assessment

Target Reading Skill Sequencing Refer to your cycle diagram about complete metamorphosis as you answer Question 3.


Reviewing Key Concepts

- Identifying** What characteristics do insects share?
 - Interpreting Diagrams** Look at Figure 17. To which body section are a grasshopper's wings attached?
 - Making Generalizations** Suppose the adaptation of wings was suddenly lost in all insects. Predict what would happen to the number and diversity of insects.
- Naming** Name a type of insect that has chewing mouthparts.
 - Reviewing** What are three ways that the mouthparts of insects are adapted for obtaining food?

- Listing** List the stages of gradual metamorphosis and the stages of complete metamorphosis.
 - Interpreting Diagrams** Look at Figure 19. How are complete metamorphosis and gradual metamorphosis different?
 - Applying Concepts** Why is a nymph more likely than a larva to eat the same food as its parents?

Lab zone

At-Home Activity

Bug Hunt  Walk with a family member in your backyard or neighborhood. Search the undersides of leaves, under woodchips or rocks, and other likely places for insects. Show your family member what distinguishes an insect from other kinds of arthropods.

M

making models The process of creating representations of complex objects or processes. (p. 11)

hacer modelos Proceso de crear representaciones de objetos o procesos complejos.

mammal An endothermic vertebrate with a four-chambered heart, skin covered with fur or hair, and young fed with milk from the mother's body. (p. 420)

mamífero Vertebrado endotérmico con un corazón de cuatro cámaras y piel cubierta de pelaje o pelo, que alimenta a sus crías con leche materna.

mammary gland An organ in female mammals that produces milk for the mammal's young. (p. 421)

glándula mamaria Órgano en los mamíferos hembra que produce leche para alimentar a las crías.

manipulated variable The one factor that a scientist changes during an experiment; also called independent variable. (p. 16)

variable manipulada Único factor que un científico cambia durante un experimento; también llamada variable independiente.

marrow The soft connective tissue that fills the internal spaces in bone. (p. 478)

médula ósea Tejido conectivo suave que rellena los espacios internos de un hueso.

marsupial A mammal whose young are born alive at an early stage of development, and which usually continue to develop in a pouch on their mother's body. (p. 424)

marsupial Mamífero cuyas crías nacen vivas en una etapa muy temprana del desarrollo, y que normalmente sigue su desarrollo en una bolsa en el cuerpo de la madre.

medusa The cnidarian body plan having a bowl shape and adapted for a free-swimming life.

medusa Cnidario cuyo cuerpo se caracteriza por tener forma de cuenco, y que está adaptado para nadar libremente en el agua. (p. 307)

meiosis The process that occurs in the formation of sex cells (sperm and egg) by which the number of chromosomes is reduced by half. (p. 128)

meiosis Proceso que ocurre en la formación de las células sexuales (espermatozoide y óvulo) por el cual el número de cromosomas se reduce a la mitad.

melanin A pigment that gives skin its color. (p. 491)

melanina Pigmento que da color a la piel.

menstrual cycle The cycle of changes that occurs in the female reproductive system, during which an egg develops and the uterus prepares for the arrival of a fertilized egg. (p. 679)

ciclo menstrual Ciclo de cambios que ocurre en el sistema reproductor femenino, durante el cual se desarrolla un óvulo, y el útero se prepara para la llegada del óvulo fecundado.

menstruation The process in which the thickened lining of the uterus breaks down, and blood and tissue then pass out of the female body. (p. 680)

menstruación Proceso en el cual el grueso recubrimiento del útero se descompone la sangre y el tejido salen del cuerpo femenino.

messenger RNA RNA that copies the coded message from DNA in the nucleus and carries the message into the cytoplasm. (p. 133)

ARN mensajero ARN que copia el mensaje codificado del ADN en el núcleo y lo lleva al citoplasma.

metamorphosis A process in which an animal's body undergoes dramatic changes in form during its life cycle. (p. 339)

metamorfosis Proceso por el cual el cuerpo de un animal cambia de manera drástica durante su ciclo de vida.

microscope An instrument that makes small objects look larger. (p. 51)

microscopio Instrumento que hace que los objetos pequeños se vean más grandes.

migration The regular, periodic journey of an animal from one place to another and back again for feeding or reproduction. (p. 450)

migración Viaje regular y periódico de un animal de un lugar a otro y de regreso al mismo lugar con el propósito de alimentarse o reproducirse.

minerals Nutrients that are needed by the body in small amounts and are not made by living things.

minerales Nutrientes que el cuerpo necesita en pequeñas cantidades y que no producen los seres vivos. (p. 510)



mitochondria Rod-shaped cell structures that convert energy in food molecules to energy the cell can use to carry out its functions. (p. 63)

mitocondria Estructura celular con forma de bastón que transforma la energía de las moléculas de alimentos en energía que la célula puede usar para llevar a cabo sus funciones.