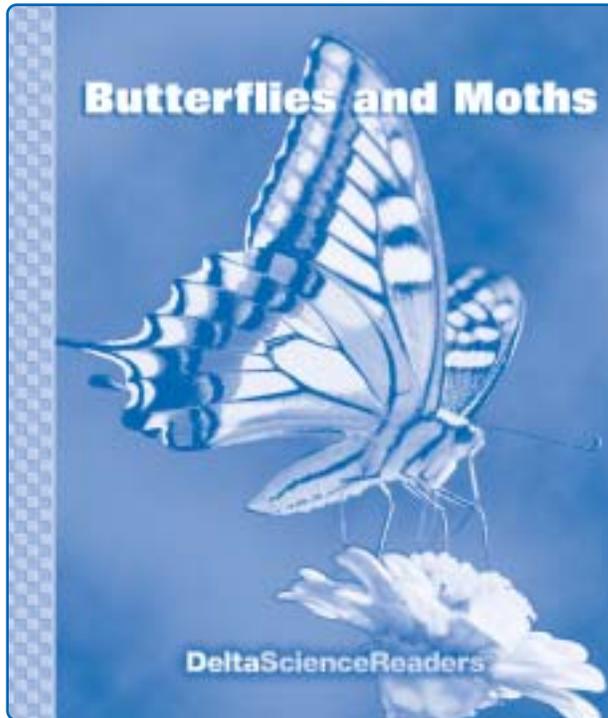


Butterflies and Moths



Delta Science Readers are nonfiction student books that provide science background and support the experiences of hands-on activities. Every **Delta Science Reader** has three main sections: *Think About . . .*, *People in Science*, and *Did You Know?*

Be sure to preview the reader Overview Chart on page 4, the reader itself, and the teaching suggestions on the following pages. This information will help you determine how to plan your schedule for reader selections and activity sessions.

Reading for information is a key literacy skill. Use the following ideas as appropriate for your teaching style and the needs of your students. The After Reading section includes an assessment and writing links.

OVERVIEW

In the Delta Science Reader *Butterflies and Moths*, students read about the life cycles of butterflies, moths, and other insects. They learn the identifying characteristics of all insects. They discover the similarities and differences between moths and butterflies. Students also read about a biologist who studies Monarch butterflies and find out about the amazing migration of the Monarch butterfly.

Students will

- ▶ identify the characteristics of insects
- ▶ compare and contrast butterflies and moths
- ▶ trace the stages of an insect's life cycle
- ▶ identify the body parts of larvae and adult butterflies and moths
- ▶ predict migration patterns of Monarch butterflies
- ▶ examine nonfiction text elements such as table of contents, headings, and glossary
- ▶ interpret photographs and diagrams to answer questions
- ▶ complete a KWL chart

READING IN THE CONTENT AREA SKILLS

- Compare and contrast
- Draw conclusions
- Sequence of events
- Critical thinking
- Make predictions
- Classify and categorize
- Summarize

NONFICTION TEXT ELEMENTS

Butterflies and Moths includes a table of contents, headings, photographs, diagrams, captions, boldfaced terms, labels, a map, and a glossary.

CONTENT VOCABULARY

The following terms are introduced in context and defined in the glossary: *abdomen, adult, antenna, chrysalis, cocoon, egg, exoskeleton, head, insects, larva, life cycle, living things, metamorphosis, migration, nectar, nonliving things, nutrients, nymph, pupa, thorax*

BEFORE READING

Build Background

Access students' prior knowledge of butterflies and moths by displaying and discussing the cover. Read aloud the title and ask, *What do you see in this photograph? (a butterfly on a flower) Is this a moth or a butterfly? How do you know? What do you think the butterfly is doing on the flower?*

Read the title aloud, and invite students to share what they know about butterflies and moths from their personal experiences and hands-on explorations in science. To stimulate discussion, ask questions such as these: *Have you ever seen a butterfly or moth? Where? What did it look like? What was it doing? Have you ever seen a caterpillar?*

How do you think a caterpillar and a butterfly or moth are related?

Begin a KWL chart by recording facts students know about butterflies and moths in the K column. You may want students to copy the KWL chart so they can maintain their own charts as they read.

K What I Know	W What I Want to Know	L What I Learned	+ What I Want to Explore Further

Preview the Book

Tell students that one way to find out what a book is about is to *preview* the book. Explain that when students preview nonfiction, they should look at the title, the table of contents, headings, boldfaced words, photographs, diagrams, and captions.

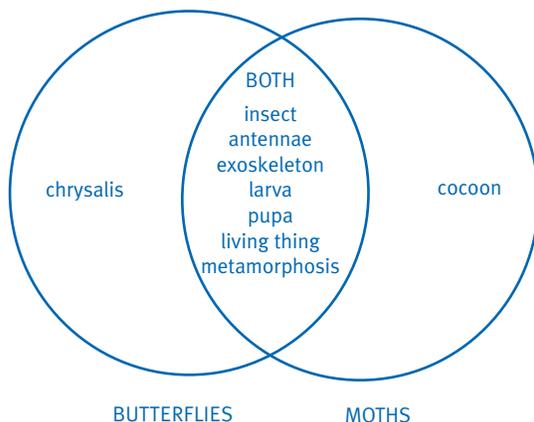
Then preview the book with students. As you flip through the pages, call attention to the various nonfiction text elements and explain how they can help students understand and organize what they read. Ask questions such as these: *What do you see in this picture? What do you think this diagram will tell us about butterflies and moths? What on this page might help you find out what this section is about? Why do you think these words are in darker type? How might these words help you predict what you will be reading about?* Explain that the words in boldface type are important words related to butterflies and moths. Point out that these words are defined in the glossary. Choose one word and have students find its definition in the glossary.

Preview the Vocabulary

You may wish to preview some of the vocabulary words before reading rather than

waiting to introduce them in the context of the book. Possibilities include creating a word wall, vocabulary cards, sentence strips, or a concept web.

For example, you might draw the following Venn diagram on the board. List several vocabulary words and have students predict whether each word is related to butterflies, to moths, or to both. Have students look up each word in the glossary or a dictionary and list it in the appropriate section of the diagram.



▲ Venn diagram for **Butterflies and Moths**

Set a Purpose

Discuss with students what they might expect to find out from the book, based on their preview. Record students' questions in the W ("Want to Know") section of the KWL chart. Encourage them to use the questions on the chart to set an overall purpose for reading.

GUIDE THE READING

Preview the book yourself to determine the amount of guidance you will need to give for each section. Depending on your schedule and the needs of your class, you may wish to consider the following options:

- **Whole Group Reading** Read the book aloud with a group or the whole class. Encourage students to ask questions and make comments. Pause as necessary to clarify and assess understanding.

- **Shared Reading** Have students work in pairs or small groups to read the book together. Ask students to pause after each text section. Clarify as needed and discuss any questions that arise or have been answered.
- **Independent Reading** Some students may be ready to read independently. Have them rejoin the class for discussion of the book. Check understanding by asking students to explain in their own words what they have read.

Tips for Reading

- If you spread out the reading over several days, begin each session by reviewing the previous day's reading and previewing what will be read in the upcoming session.
- Begin each text section by reading or having a volunteer read aloud the heading. Have students examine any illustrations or graphics and read accompanying captions and labels. Discuss what students expect to learn, based on the heading, illustrations, and captions.
- Help students locate context clues to the meanings of words in boldface type. Remind them that these words are defined in the glossary. Provide help with words that may be difficult to pronounce.
- As appropriate, model reading strategies students may find helpful for nonfiction: adjust reading rate, ask questions, paraphrase, reread, visualize.

Think About . . . (pages 2–13)

Pages 2, 3 **What Are Living Things?**

Page 2

- Help students identify the pictures on page 2. Point out that a tree, an elephant, and a butterfly are very different, yet they are alike in at least one way. Ask, *How are these three things alike?* Accept all reasonable answers. Then read aloud the caption to confirm students' predictions.

- Read aloud the heading on page 2. Point to objects in the room or name familiar objects, such as a book, a tree, a person, a rock, and a dog. Ask about each one, *Is this a living thing or a nonliving thing?*
- Read aloud page 2. Ask, *What is the difference between living and nonliving things?* (Living things can grow and change. Nonliving things cannot grow and change.) *What do plants and animals need to stay alive?* (air, water, light, nutrients or food, shelter)

Page 3

- Ask, *Do you look the same as you did when you were a baby? Do you act the same? How have you changed?* Tell students that on the next page they will learn how living things change as they grow.
- Read aloud page 3. Explain that the life cycle of a living thing includes all the stages, or changes, that it goes through from the beginning of its life to the start of the life of its young. Ask, *What do you think the stages of a human being's life cycle are?* (infant, child, teenager, adult, infant) Explain that although all animals have a life cycle, the stages in the life cycle may be different for different animals.
- Ask students to look at the life cycle diagram on page 3. Ask, *What animal's life cycle does this diagram show?* (bird) Have students point to the eggs on the life cycle diagram. Have them trace the arrow from the egg to the young bird and read aloud the label. Have them trace the arrow to the adult, read the label, and continue tracing back to the egg. Ask, *What shape did you make?* (a circle)
- Explain that the life cycle is shown in a circle because when the adult bird lays its eggs, another life cycle begins. Ask, *What do you think happens to the adult bird after it lays its eggs?* Point out that eventually the adult bird will die. However, the eggs that it lays will hatch, and the new young birds will grow into adults that lay eggs of their own. So the life cycle will continue.

Pages 4, 5 *What Is an Insect?*

- Ask students to identify the pictures on pages 4 and 5. (Students may be able to identify all three: beetle, water strider, and ladybug.) Point to and read aloud the word *insect* in the heading on page 4. Ask, *Which of these do you think is an insect?* Tell students that they will find out as they read the next two pages.
- Read aloud page 4. On the board, draw a simple outline of a ladybug. Ask, *What do we know about insects?* Record students' responses inside the outline as they summarize the information on page 4.
- Direct students' attention to the diagram of the ladybug on page 5. (Note that the ladybug is also often called a ladybird or ladybird beetle.) Ask, *What are the three main parts of an insect's body?* (head, thorax, and abdomen) Have volunteers find each label and point to each part on the diagram. Do the same for the labels *legs*, *antennae*, and *wings*.
- Point out that the beetle, water strider, and ladybug on pages 4 and 5 are all insects. With students, brainstorm a list of familiar insects, such as ants, bees, beetles, grasshoppers, butterflies, and moths. If students suggest spiders, centipedes, or other non-insects, remind them that all insects have six legs.
- If necessary, provide help with the pronunciation of *abdomen* (AB-duh-muhn), *antennae* (an-TEN-ee), *exoskeleton* (EK-so-skel-uh-tuhn), and *thorax* (THOR-ax).

Further Facts

- Based on fossil remains, scientists have determined that insects have been on Earth for at least 400 million years. Scientists discover thousands of new species of insects each year. Today, 90 percent of all animals are insects.

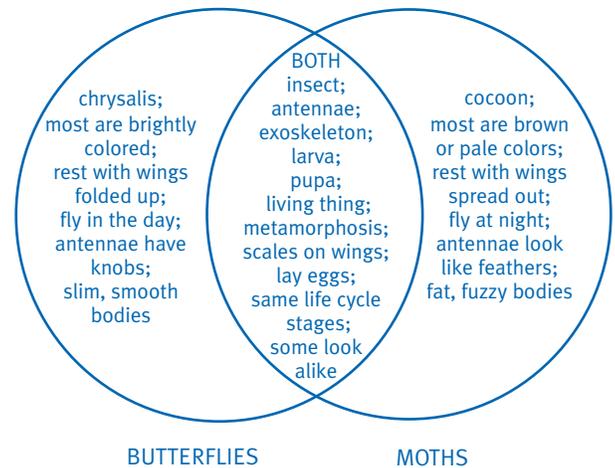
- Most insects use their antennae to smell and to feel. Some also use their antennae to taste and hear. Most insects do not have ears but rather hear by means of hairs located on their antennae or other parts of their bodies.
- Most adult insects have two large compound eyes. Others, and many in the larval stage, have several simple eyes called *ocelli*.
- Insects have no lungs. They breathe through holes in their sides called *spiracles*.

Pages 6, 7 *Butterflies and Moths*

- Have students identify the pictures on pages 6 and 7. Remind them that butterflies and moths are insects. Ask, *How many legs do you think a butterfly or moth has? (six) Why do you think that? (because butterflies and moths are insects and insects have six legs) What other body parts do you think butterflies and moths have? (head, thorax, abdomen, antennae, exoskeleton)*
- Read pages 6 and 7. Ask, *What are some ways that butterflies and moths are alike? (They have scales on their wings; they lay eggs; their life cycles have the same stages; some look alike.) How are they different? (Butterflies rest with their wings folded together; moths rest with their wings spread out. Most moths are smaller and less colorful than butterflies.)*
- As appropriate, tell students that the poet mentioned in the first sentence on page 6 is U.S. poet Robert Frost (1874–1963). He calls butterflies “flowers that fly” in a poem called “Blue-Butterfly Day.” Ask students to imagine flowers flying. Discuss whether they think it is a good way to describe butterflies. Why or why not? In the same poem, Frost calls blue butterflies “sky-flakes.”
- Tell students to look again at the pictures of the butterfly and moth, and ask volunteers to read the captions for each

picture. Ask, *What are some other ways that butterflies and moths are different? (Their antennae and bodies are different; they fly at different times of the day.)*

- If you did not start a Venn diagram before reading, you may wish to draw one on the board now. Have students suggest information to add to each section of the diagram, for example:



▲ Venn diagram for *Butterflies and Moths*

Further Facts

- Butterflies and moths belong to the scientific order *Lepidoptera*. Of the 175,000 different species of *Lepidoptera*, about 155,000 are moths.
- Adult moths and butterflies have large compound eyes, which are made up of thousands of tiny eyes called *ommatidia*. The larvae have small simple eyes called *ocelli*.
- Butterflies and moths have four wings, two on each side. They use muscles in their thorax to move their wings. The fastest butterflies can fly up to 50 km (30 mi) per hour.
- The smallest butterfly is the Pygmy Blue of the southern United States and Mexico. It measures a little more than 1 cm (0.5 in.) across. The largest is the Queen Alexandra’s Birdwing of New Guinea, which has a wingspan of about 28 cm

(11 in.) across. The smallest moth is the Nepticulid, which measures 0.25 cm (0.1 in.) across. The largest moth is the Great Owlet. Its wingspan measures up to 30 cm (12 in.) across.

Pages 8–12 *Life Cycle of Butterflies and Moths*

Page 8

- Read aloud the heading on page 8. Ask, *Who remembers what a life cycle is?* Have students turn to the glossary and read the definition to confirm their responses.
- Ask students if they have ever seen a caterpillar. Ask, *What do you think a caterpillar has to do with a butterfly's or moth's life cycle?* (Accept all answers at this time. Students might know that caterpillars turn into butterflies or moths.) Have students read page 8 to confirm their responses.
- Ask students where they have seen a diagram like the one on page 8. (the bird life cycle on page 3) Ask, *What does this diagram show?* (the life cycle of a butterfly or moth) Have students name each stage of the life cycle as they trace the arrows with their fingers.
- Write the word *metamorphosis* on the board. Track each letter as you slowly pronounce the word. Repeat the procedure, having students pronounce the word with you. Use your fingers to frame *meta* and explain that the word part means “change.” Do the same for the word part *morph*, explaining that *morph* means “shape or form.” Ask, *Does the butterfly or moth change its shape or form during its life cycle?* (yes)

Page 9 *Egg*

- Ask students if they have ever seen eggs like the ones shown in the pictures on page 9. Allow students to briefly share their experiences.

- Ask, *Why do you think butterflies and moths lay their eggs on plants?* (Accept all answers at this time.) Tell students to read page 9 to find out if their predictions are correct.
- Ask, *Why is the place where butterflies and moths lay their eggs important?* (The plant will be the larvae's food. The eggs need to be protected from sun, rain, and animals that might eat them.)

Page 10 *Larva*

- Ask students to look again at the diagram on page 8. Ask, *What is the young insect that hatches from the egg called?* (a larva) *What is another name for larva?* (caterpillar) Tell students they will find out more about larvae on page 10.
- Read page 10. Ask, *What does the larva spend most of its time doing?* (eating) *What happens when a larva gets too big for its exoskeleton?* (It sheds the skin and forms a new exoskeleton.)
- Have students look at the diagram on page 10. Have students point to each body part as you read aloud each label.
- Ask, *How is a larva like an adult moth or butterfly?* (It has a head, mouth, six legs, and an exoskeleton.) *How is it different?* (It has no wings. It has extra feet.)

Further Facts

- Like adults, moth and butterfly larvae have a head, thorax, abdomen, and an exoskeleton.
- Butterfly and moth larvae use *mandibles*, or biting mouth parts, to eat. Most have several pairs of simple eyes called *ocelli* and small antennae that contain sensory organs.
- In addition to their six true legs, butterfly and moth larvae have four to ten false legs, called *sucker feet* or *prolegs*. The false legs are short and stubby and have

tiny hooks that help the larva cling to leaves and twigs.

- The process of shedding old skins or exoskeletons is called *molting*. Most butterfly and moth larvae molt many times as they mature.
- Camouflage protects many larvae from predators. Others use bright colors to warn predators that they are poisonous or foul tasting. Still others have stiff hair or horns that keep predators at a distance.

Page 11 *Pupa*

- Have students identify the pictures on page 11. (Students may identify both pictures as cocoons. Accept these responses at this time.) Ask, *How are these two objects alike?* (They have nearly the same shape. They are attached to plants.) *How are they different?* (One looks fuzzier than the other.)
- Ask, *What is the young insect between the larva and adult stage of a butterfly's life called?* (pupa) Have students look at the diagram on page 8 to confirm their responses.
- Read page 11. Ask, *What is the difference between a chrysalis and a cocoon?* (A chrysalis is a butterfly's pupa. It is smooth and hangs from leaves or twigs. A cocoon is a moth's pupa. It looks like a web and is usually hidden in folded leaves or under tree bark.) *What comes out of a pupa when the skin breaks open?* (an adult butterfly or moth)
- Ask volunteers to add the words *pupa*, *chrysalis*, and *cocoon* in the appropriate sections of the Venn diagram on the board.
- If necessary, provide help with the pronunciation of *chrysalis* (KRIS-uh-lis), *cocoon* (kuh-KOON), and *pupa* (PEW-puh).

Further Facts

- The pupa stage of a butterfly's or moth's life is sometimes called the "resting stage." However, even though we cannot see much happening, huge changes are taking place in the insect's body inside the pupa case. Inside the pupa, parts of the larva break down and new body tissue and new adult body parts are formed. Only the heart, trachea, and nervous system remain basically the same.
- When the adult butterfly is fully formed, the pupa case splits open so it can emerge. Moths either cut an opening in one end of their cocoons or dissolve the silk of the cocoon with a special fluid.
- Adult butterflies and moths are delicate and soft when they first emerge. As the adult insect pumps fluid into the veins in its wings, the wings gradually expand to their full extension. The insect holds the wings spread out until they dry and harden. Then the butterfly or moth can fly away.

Page 12 *Adult*

- Have students identify the pictures on page 12. Ask, *What stage of their life cycle do you think these butterflies are in?* (adult)
- Have students find the word *nectar* on page 12. Ask, *Do you know what this word means?* Tell students that they can sometimes find clues to the meanings of words in the other words or sentences around that word. Have students read page 12. Then ask, *What is nectar?* (the sweet liquid found in flowers) Have a volunteer read aloud the sentence that gives the meaning of the word. Ask, *What is another way you could have found out the meaning of this word?* If necessary, remind students that the meanings of words shown in dark print are listed in the glossary at the back of the book.
- Ask, *What other things besides nectar do butterflies and moths eat?* (tree sap, juice

from fruit) *How do butterflies and moths continue the life cycle?* (Female adults lay eggs that hatch into larvae.)

Further Facts

- Butterflies and moths keep their proboscis coiled up in front of their heads until it is needed. Butterflies have taste receptors on their feet. Their proboscis automatically uncoils as soon as the receptors come in contact with a sweet solution.
- To mate, male butterflies fly toward anything that flutters and use their sense of smell to determine if it is a female of the correct species. Moths also use smell to find mates. The female releases a chemical that attracts the male—sometimes from as far as a few miles away.

Page 13 *Other Insect Life Cycles*

- Have students look at the diagram on page 13. Ask, *What do you think this diagram shows?* (a life cycle) Read aloud the title of the diagram. Then ask, *How many stages are in a grasshopper's life cycle?* (3) *How many stages are in a butterfly's or moth's life cycle?* (4) If necessary, have students refer to the diagram on page 8 to check their responses.
- Read aloud page 13. *What comes after the egg stage in the life cycle of a grasshopper?* (nymph) *What does a nymph look like?* (a small adult) *Do butterflies and moths have a nymph stage in their life cycles?* (no) *Why not?* (They change form as they grow. They have a larva stage and a pupa stage instead.) *Do grasshoppers have a larva or pupa stage?* (no) *What other kinds of insects change form as they grow?* (ants, bees, flies, beetles) This change of shape or form that some insects go through is called *complete metamorphosis*. You may wish to point out that insects with the nymph life cycle stage go through *incomplete metamorphosis*.

People in Science

A Biologist (page 14)

- Read aloud the heading on page 14. Ask, *What do you think a biologist does?* (Accept all answers at this time.)
- Tell students that a biologist is a person who studies living things. Ask, *What kind of living things do you think this biologist studies?* Tell students that they will find out by reading the page.
- Read page 14. Ask, *What does Dr. Oberhauser study?* (Monarch butterflies) *What does she find out about them?* (what their life cycles are like; where they live) *Where is the winter home of the Monarchs that Dr. Oberhauser studies?* (Mexico) Tell students that they will find out more about where Monarchs live on the next page.

Further Facts

- Students in schools all over the country help scientists like Dr. Oberhauser track the migration of Monarch butterflies. As students report the first Monarch they see in the spring, scientists gather the information and record it on a map that follows the migration as it progresses. Students also report the first milkweed that emerges as well as the first eggs and larva they see.
- Female Monarchs lay eggs only on milkweed plants. The migration route always passes over areas where milkweed grows. The Monarch larvae feed on the milkweed plants. This food builds up a poisonous substance in their bodies that is distasteful to birds. Birds recognize the distinctive Monarch coloring and avoid them.

Did You Know? (page 15)

About Migration

- Read aloud the heading on page 15. Frame the word *migration*, and ask students to

help you sound it out. Ask students to find and point to the word in another place on the page. Ask, *How might you find out the meaning of this word?* (Read to see if there are clues in the context. Look up the word in the glossary.) Point out the root word *migrate* in *migration* and ask students to infer its meaning. (to travel in a group from one area to another)

- Read aloud page 15. Then direct students' attention to the map. Ask volunteers to read aloud the map title. (fall migration) Elicit that the map shows where Monarch butterflies travel in the fall as they go from their summer homes to their winter homes. Ask *What countries are shown on this map?* Point to and read aloud the labels for Canada, United States, and Mexico. Ask, *What do you think the blue arrows show?* If necessary, explain that they show the migration route of the Monarch butterflies, or the path that the butterflies follow when they travel south for the winter. Ask, *What symbol shows where the butterflies' summer homes are?* (a butterfly)
- Point out approximately where your town is located on the map. Ask, *Are we closer to the butterflies' summer home or winter home? Are we near a Monarch butterfly's migration route?*

Further Facts

- No one knows for sure how Monarchs know when or where to migrate. Scientists believe that a combination of length of daylight, temperature, and perhaps the age of the plants they are eating might give Monarchs the signal to migrate. They may use the sun or Earth's magnetic field to guide their direction.
- Up to 100 million Monarchs make their winter homes in fir trees west of Mexico City.
- It takes a Monarch about 2 months to complete the migration from the east coast of the United States to Mexico or southern California.

- No one knows just how far the average Monarch flies in one day. However, one tagged Monarch was recaptured 265 miles from the place where it had been released the previous day.
- Monarchs can be found in Australia, South America, Hawaii, and some Pacific islands as well as in North America.

AFTER READING

Summarize

Complete the KWL chart you began with students before reading by asking them to share the answers to their questions. Call on volunteers to retell each text section. Then have students use the information in the KWL chart to write brief summary statements.

Discuss with students how using the KWL strategy helped them understand and appreciate the book. Encourage them to share any other reading strategies that helped them understand what they read. Direct attention to the fourth column of the chart and ask, *What questions do you still have about butterflies and moths? What would you like to explore further?* Record students' responses. Then ask, *Where you do think you might be able to find this information?* (Students might mention an encyclopedia, science books, and the Internet.) Encourage students to conduct further research.

Review/Assess

Use the questions that follow as the basis for a discussion of the book or for a written or oral assessment.

1. What is a life cycle? (the stages or changes that a living thing goes through in its life)
2. How can you tell if an animal is an insect? (Insects have six legs and three main body parts. They also have exoskeletons and antennae on their heads.)
3. What are two ways that butterflies and moths are alike? (Both are insects, have

