UNIT PLAN

UNIT TITLE
Metamorphosis

MONTH
March

GOAL
In this lesson, students will learn about the **life cycles** of **insects** and the differences between complete and **gradual metamorphosis**.

OBJECTIVES
Students will:

1. Rearrange a sequencing activity to demonstrate understanding of the chronological order of **metamorphosis** (NYS Learning Standard 1: Language for Information and Understanding, Elementary 2)

2. Recognize and define vocabulary relating to **insect metamorphosis** and demonstrate this understanding through the construction of both simple and complex sentences in past, present, and future tenses (NYS Learning Standard 1: Communication Skills, Checkpoints A and B)

3. Question why **insects** grow and change through **metamorphosis**, and why there are different kinds of **metamorphosis** (gradual and complete). (NYS Learning Standard 1: Analysis, Inquiry, and Design, Elementary 1)

4. Describe characteristics of ladybugs, butterflies, grasshoppers and **aphids** and explain the variations between them (NYS Learning Standard 4: Science, Elementary 1)

5. Identify the natural **life cycles** of ladybugs, butterflies, grasshoppers and **aphids**, illustrating the variations between the types of **metamorphosis** (NYS Learning Standard 4: Science, Elementary 4; Food and Fiber Systems Literacy III: Science, Technology, and Environment, A K-1)

6. Compute answers to mathematical problems using the operations of subtraction, multiplication and division for both whole numbers and fractions. (NYS Learning Standard 3: Mathematics, Elementary 3, NYS Learning Standard 3a: Universal Foundation Skills, Elementary 1)
TERMS
Vocabulary words are highlighted in bold throughout the student lesson pages.

Aphid - a small, soft-bodied insect that feeds by sucking sap from plants
Chrysalis - The cocoon of a butterfly
Cocoon - the silky case spun by the larva; it serves as a covering while the larvae develop
Complete metamorphosis - the life cycle of some insects; they change from eggs through the stages of larvae, then pupae to become adults (four stages)
Exoskeleton - a hard covering on the outside of an insect that provides structural support and protection.
Gradual metamorphosis - insects hatch from eggs looking like a small adults called nymphs. They shed their exoskeleton as they grow until they reach adult size. (three stages)
Infested - inhabited by so many organisms that it becomes a problem
Insect - an animal that has three body regions (head, thorax, and abdomen) and three pairs of jointed legs; also called an arthropod
Larva - the newly hatched form of some insects that are wingless, such as a caterpillar or a grub. This is the stage when the insect hatches from the egg and spends all its time eating before it develops into a pupa. (Plural larvae)
Life cycle - a series of stages which something passes through during its lifetime
Metamorphosis - the series of changes in shape and function that certain animals go through as they develop from an immature form to an adult. Metamorphosis can be gradual or complete
Molt - to shed an outer covering that is replaced by a new one. Birds molt feathers, snakes molt skins, and insects molt exoskeletons
Nutrient - any substance that can be used to support life
Nymph - the immature form of insects that go through gradual metamorphosis. They look like small adults that do not have fully developed wings and develop into adults without going through a pupal stage. Examples are dragonflies and grasshoppers.
Organism - a living thing that is made up of body parts which help it function.
Ornamental - used specifically to decorate or enhance
Pupa - the non-feeding stage in the insect life cycle between larva and adult during complete metamorphosis. A larva goes through a complete change inside a hard case. A chrysalis is the pupa of a butterfly encased in a cocoon. (Plural pupae)
Pupate - to become a pupa
Varied - different, not all the same

Integrated Pest Management is a specialized form of environmental management wherein scientific research and real world application work together to reduce pests such as insects, diseases or weeds.
1. Properly identify pests
2. Learn the pest/host biology
3. Sample the environment for pests
4. Determine an action threshold
5. Choose the best tactic
6. Evaluate results

SAFETY
Safety precautions with using scissors and staplers, in addition to routine classroom safety practices.
Standards Matrix for this Lesson:

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<th>Month</th>
<th>Unit</th>
<th>Math/Science/and Technology</th>
<th>English Language Arts</th>
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<th>HEALTH</th>
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<td><strong>Metamorphosis</strong></td>
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Matrix Key:
NYS Learning Standards arranged by Standard: Category, Level

- e = elementary
- i = intermediate

Categories:
1 Career Development
2 Universal Foundation Skills
3 Language for Information and Understanding
4 Language for Literary Response and Expression
5 Language for Social Interaction
6 Communication Skills
7 Analysis, Inquiry, and Design
8 Information Systems
9 Mathematics
10 Science
11 Technology
12 Interconnectedness: Common Themes
13 Interdisciplinary Problem Solving
14 History of the United States and NY
15 World History
16 Geography
17 Economics
ADDITIONAL RESOURCES

*Backyard Insects* by Milicent Selsam and Ronald Goor. ISBN# 0590422561

*Bugs* by Nancy Parker and Joan Wright. ISBN# 0688082963

*Bugs and Other Insects* by Bobbie Kalman and Tammy Everts ISBN-10: 0865057133

*Eyewitness Books: Insects* by Laurance Mound. ISBN# 0756606926


*The Life cycle of a Butterfly* by Bobbie Kalman ISBN-10: 077870680X

SUPPLIES AND EQUIPMENT

General classroom art supplies
Metamorphosis is a biological process by which an animal physically develops after birth or hatching. It is part of the life cycle of the most insects. A life cycle is a period involving one generation of an organism. The term metamorphosis refers to the way that insects develop, grow, and change form, usually (but not always) accompanied by a change of habitat or behavior. There are two types of metamorphosis: complete and gradual.

**Complete metamorphosis**

Most insects go through the four stages of complete metamorphosis, including the ladybug, housefly, and butterfly.

1. **Egg** - A female insects lays eggs.

2. **Larva - Larvae** hatch from the eggs but do not look adult insects. For instance, the larvae of butterflies are caterpillars. Larvae grow quickly enough to have to molt their exoskeletons a few times before they pupate. Sometimes, these stages of growth in larvae are called “instars.”

3. **Pupa - Larvae** make cocoons around themselves, and become busy changing into their adult forms. They do not eat during this time. This can take a few days, or in some cases months.

4. **Adult** - After a period of time, the larva is nothing like it was, and exits the cocoon or larval body as an adult. The life cycle starts over again.

**Gradual metamorphosis**

About 12% of insects go through the three stages of gradual metamorphosis, including the mayfly, cicada, grasshopper, aphid, and cockroach.

1. **Egg** - A female insect lays eggs. Sometimes the eggs are in a group and protected by a covering or case.

2. **Nymph** - The eggs hatch into nymphs. nymphs looks like small adults, but usually don’t have wings. They eat, grow, and change. nymphs molt their exoskeletons as they grow. As this occurs, they gradually begin to look more and more like the adult.

3. **Adult** - Once the nymph has grown to an adult size, they stop molting. Generally adults are the only stages in an insect’s life when it has wings. Adults’ primary interest is mating.

**QUESTIONS FOR STUDENTS**

What is a life cycle?
What is metamorphosis?
Do all insects have the same metamorphosis?
What insects have a complete metamorphosis?
What insects have a gradual metamorphosis?
INTEREST APPROACH ACTIVITIES

Butterfly Life cycle Mobile
(Estimated time to complete: 30 minutes)
http://www.enchantedlearning.com/crafts/butterfly/lifecyclemobile/

Make a mobile that shows the **complete metamorphosis** of a butterfly from egg to **larva** (caterpillar) to **pupa** to adult (the butterfly).

**Materials:**
- Many colors of construction paper, oak tag, or gift wrap
- Pencil
- Scissors
- Yarn or string
- Glue stick
- A sturdy paper plate
- Markers, crayons, or paint
- Stapler or tape

**Procedure:**
1. Draw a spiral on a paper plate. Cut along the line.
2. Decorate the paper plate using markers, crayons, or paint.
3. Using green construction paper, draw a leaf and cut it out. Either draw tiny butterfly eggs on it or glue on tiny paper circles (either cut them out or use a hole punch). A cluster of butterfly eggs are usually laid on the underside of a leaf; the eggs are white or yellow or greenish, and are circular to oval.
4. Draw and cut out a caterpillar (the egg hatches into a caterpillar, which spends its entire time eating leaves). Decorate it.
5. Draw and cut out a **pupa** (the stage during which the caterpillar makes a protective case around itself and turns into a butterfly). Decorate it.
6. To make butterfly wings, fold a small piece of paper in half, and draw half a butterfly along the fold line.
7. Using dark paper, make a body for your butterfly (it’s basically a long oval with a circular head).
8. Glue the body to the wings and decorate your butterfly.
9. Staple or tape the stages in the butterfly’s **life cycle** to string and then to the paper plate. Attach another short length of string to the center of the plate; it will be used to hang the mobile. You now have a great butterfly **life cycle** mobile.
10. Another option: Use a straw for a flower stem and make paper leaves and a tissue paper flower and attach your **life cycle** stages to it. Why are plants important in the **life cycle** of the butterfly?

*(For related activities, refer to student worksheets #3, #5, #6, & #7)*
1. If a ladybug lays 40 eggs and 32 hatch, how many did not hatch?
   ___ eggs - ___ hatched = ___ unhatched

2. What is the fraction of eggs that hatched?
   ___ (hatched) ___ (total)

3. What is the percentage of eggs that hatched? ________%

4. If 24 hatchlings make it to adults, what is the percentage of adults, out of those that hatched?
   ___ adults/___ hatchlings = ___%

5. What is the percentage of the total number of eggs that make it to adults?
   ___ adults/___ eggs = ___%

6. How many eggs (#) did not become adults?
   ___ eggs total - ___ adults = ___ eggs

7. A monarch is an egg for a period of 3-6 days. After hatching, a caterpillar will eat about 30 milkweed leaves. If it eats three leaves every day, how many days will it take until it has eaten all 30 leaves?
   ___ leaves total / ___ leaves per day = ___ days

   Eventually, the caterpillar will weigh 3000 times as much as it did when it hatched! As the caterpillar grows, it molts, or sheds its skin, four times.
   - The first time, it is about 3/16" long.
   - The second time it is about 3/8" long.
   - The third time it is 3/4" long.
   - The last time it molts, it is 1 1/4" long (5/4”).

   How much does it size increase:
   - From the first to second length? _____ - _____ = ___
   - From the second to third? _____ - _____ = ___
   - From the third to fourth? _____ - _____ = ___
SUMMARY OF CONTENT

I. **Metamorphosis**: What is it?
   A. Explains metamorphosis (complete and gradual)
   B. Discusses life cycles, such as that of the chicken.

II. **Metamorphosis**
   A. Questions to get students thinking about metamorphosis.
   B. Word activity

III. What is a life cycle?
   A. Cut and paste activity using the life cycle of the ladybug

IV. Ladybug life stages
   A. Illustration depicts the stages of the ladybug, showing how a larva will increase in size forcing it to molt.

V. Butterflies and moths
   A. Illustrates the complete life cycle of the butterfly
   B. Introduces the term chrysalis.

VI. The Painted Lady
   A. Reading and a short sequencing activity
   B. Introduces the terms molt, pupa, and chrysalis

VII. Adult Butterfly
   A. Color distribution and major body regions of the Painted Lady butterfly.

VIII. **Metamorphosis**: Complete or Gradual?
   A. Uses the sphinx moth to illustrate four stages of complete metamorphosis
      i. Egg
      ii. Larva
      iii. Pupa
      iv. Adult
   B. Uses the grasshopper to illustrate the three stages of gradual metamorphosis
      i. Egg
      ii. Nymph
      iii. Adult
   C. The aphid is mentioned as a pest which feeds on ornamentals and vegetables
   D. Introduces the term varied.

TEACHING-LEARNING ACTIVITIES

I. **Metamorphosis**: What is it?
   A. Read this page as a class to introduce the ideas of metamorphosis and the life cycle.

II. **Metamorphosis**
   A. Use the questions to stimulate class discussion.
   B. Students could work individually or in groups to create words.

III. What is a life cycle?
   A. Have students complete this lesson individually
   B. Provide scissors and glue.

IV. Ladybug life stages
   A. Have students color in the page.
   B. Use the illustration to reinforce the stages of the life cycle and complete metamorphosis.

V. Butterflies and moths
   A. This page could be used as a class discussion starter.

VI. The Painted Lady
   A. Read individually or in groups.
   B. Students should do sequencing individually.

VII. Adult Butterfly
   A. This page can be used to review the anatomy of the butterfly or as a coloring or painting activity.

VIII. **Metamorphosis**: Complete or Gradual?
   A. This page can be read aloud by students taking turns.
   B. Use metamorphosis as a starting point for comparisons (grasshopper/human, etc.)
SUMMARY OF CONTENT

IX. Aphids
A. Explains the gradual metamorphosis of aphids and their effect on the plant on which they feed.
B. Once a plant is infested with aphids, there will usually be adults and nymphs on the plant at the same time.

X. Grasshopper Life Stages
A. Basic illustrations of a grasshopper's metamorphosis.

XI. Test your knowledge
A. Label the stages of ladybug metamorphosis
B. Four yes/no questions
C. Three short answer questions.

XII. Vocabulary
A. Provided for student reference.

TEACHING- LEARNING ACTIVITIES

IX. Aphids
A. This page could be read aloud as a class.
B. It could serve as a reminder of ways to use integrated pest management.
C. Maybe students have seen aphids on the undersides of leaves in vegetable gardens, orchards, flower gardens or greenhouses.

X. Grasshopper Life Stages
A. Remind students that complete metamorphosis has four stages and gradual has three.
B. Students write in the name of the life stage of the grasshopper.
C. Nymphs resemble small adults but are not the same. Have students find one major difference between nymphs and adults (wings).

XI. Test your knowledge
A. Have students complete these pages individually and review the answers as a class.

XII. Vocabulary
A. Students can use this page for reference.
Student Lesson: Metamorphosis
What is it?

What do you know about metamorphosis? It’s a word that describes a life cycle, especially for insects.

We get the word “morph” from metamorphosis. Do you know what morph means?

Can you think of a life cycle you already know about?

One example is the chicken. During its lifetime, a chicken becomes:

1. Egg
2. Hatchling (chick)
3. Adult chicken

Life cycles are all around us.

Plants, animals, and all living things have life cycles. This lesson will help you understand the life cycle of insects, called metamorphosis. It can be complete (four stages) or gradual (three stages). Either way, it involves some big changes for the insect!
Student Lesson: **Metamorphosis**

What is a *life cycle*?

What is *metamorphosis*?

Do all *insects* have the same *metamorphosis*?

What *insects* have a *complete metamorphosis*?

What *insects* have a *gradual metamorphosis*?

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**Metamorphosis**

How many words can you make out of *metamorphosis*? List as many words as you can using the letters above. Use another sheet of paper if needed. Ask your teacher to collect all the words that your class finds that are five letters or more!

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Student Worksheet 2
Student Lesson: **Metamorphosis**

What is a **life cycle**?

Here’s a chance to start practicing what you just learned about **insect metamorphosis**. We will study the **complete metamorphosis** of the ladybug in this lesson. Cut out the adult, eggs, **larva** and **pupa** at the bottom of the page and paste them on to the correct shape in the **life cycle**. Do you notice that a **life cycle** is a circle?
Student Lesson: **Metamorphosis**:
Ladybug life stages

This drawing and those on the previous pages are provided by LHS GEMS books.
Student Lesson: **Metamorphosis:**
Butterflies and Moths

Butterflies and moths are two more insects with a complete metamorphosis. The job of a larva is to eat! If you like butterflies in your garden, remember that they will be eating your plants when they are caterpillars.

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**Egg**
- Pale green
- The size of a pin head

**Larva (Caterpillar)**
- Black to purple with yellow-green stripes and long spines
- The caterpillar eats and grows a tremendous amount

**Adult (Butterfly)**
- Adults live only for a short time
- They cannot eat solid food; they can only drink through their straw-like spiral proboscis
- They will fly, mate, and reproduce

**Pupa (Chrysalis)**
- Reddish-brown
- Inside the chrysalis, the pupa changes into a butterfly

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Student Lesson: **Metamorphosis:**
The Painted Lady

Read about the Painted Lady Butterfly and number its **complete metamorphosis** in order.

____Egg

____Larva

____Pupa

____Adult

The Painted Lady butterfly can be found on five continents because it adapts to many climates. Many in North American migrate and overwinter in Mexico!

The Painted Lady’s eggs are light green and very small. After 3 to 5 days, they hatch.

Butterfly **larvae** are called caterpillars. Painted Lady **larvae** are dark with yellowish stripes. Since they eat all the time, caterpillars and other **larvae** outgrow and shed their skin (**molt**).

After a week or so, they **pupate**. A butterfly **pupa** is called a **chrysalis**. It hangs upside-down from a leaf or branch, and attaches itself with a single silken string. Inside the **cocoon**, the **pupa** is becoming an adult in just seven to ten days.

When an adult emerges, it hangs upside down until its wings are strong enough to use. It can fly a few hours after emerging. The adult Painted Lady is mostly black, brown, and orange with some white spots; the underside is gray with white and red markings.
Student Lesson: **Metamorphosis:**

Adult Butterfly

**Painted Lady Butterfly**

- Scientific name: *Vanessa Cardui*

- Thin, white, fuzzy body
- Orange with black veins
- Black spots
- Orange-brown spots
- Two antennae
- Compound eyes
- Black
- White spots

**name______________________________**
You have learned that the ladybug and the butterfly have a complete metamorphosis. Here is an illustration of a moth life cycle. Is it the same life cycle as a butterfly?

This is a sphinx moth. Its caterpillar is large and can eat a lot of leaves in one day.

Complete metamorphosis or gradual metamorphosis?

Most insects have a complete metamorphosis, but not all. Insects are varied, aren’t they? We will now learn about two insects that have a gradual metamorphosis.

One is the grasshopper.

Grasshoppers and ladybugs both have chewing mouthparts, but they do not have the same life cycle.

Grasshoppers have three stages: egg, nymph and adult. Notice how the nymph stage shows much change in size. Also, nymphs never have wings.

We will also learn about the aphid, a pest insect that feeds on plants in our vegetable and ornamental gardens.
Student Lesson: **Metamorphosis:**

**Aphids**

*Aphids* are a favorite meal of ladybugs, and there are plenty of *aphids* to eat. There are about 4,000 species of *aphids* in the world. They reproduce rapidly. Once a plant is *infested* with *aphids*, there will usually be adults and *nymphs* on the plant at the same time.

*Aphids* have a **gradual metamorphosis:**

1. The egg hatches.
2. The *nymph* emerges and starts to eat. It looks kind of like a small adult.
3. The *nymph* becomes an adult.

Unlike the ladybug, an *aphid nymph* will not become a *pupa* or make a *cocoon* to change into its adult form. *Nymphs* often look like small versions of the adult, but they changes in more ways than just size.

*Aphids* have sucking mouthparts instead of chewing mouthparts. They use their mouth like a straw and place it directly into the plant to suck out the juices. This juice contains water, *nutrients* and vitamins that the plant needs to live.

What do you think happens when a plant does not get its nutrition?

If you guessed that *aphids* can make plants very sick, you’re right!
Student Lesson: **Metamorphosis**
Grasshopper Life Stages

Label the stages of *gradual metamorphosis*.

![Diagram of grasshopper life stages](image)
Student Lesson: **Metamorphosis**:
Test your knowledge

1. Label the stages of the complete metamorphosis of the ladybug.

   ![Ladybug Life Cycle Stages]

   ______________  ______________  ______________  ______________

2. **Metamorphosis** is how scientists describe the life cycle of insects.
   
   _____yes  _____no

3. Do all animals have a life cycle?
   
   _____yes  _____no

4. Do all insects have the same kind of metamorphosis?
   
   _____yes  _____no

5. Name an insect with a complete metamorphosis.
   
   _______________________________________________________

6. Name an insect with a gradual metamorphosis.
   
   _______________________________________________________

7. The pupal stage of the butterfly is called a chrysalis.
   
   _____yes  _____no

8. Pupae outgrow and shed their exoskeleton as they grow. What is the term for this process?
   
   _______________________________________________________
Student Lesson: Metamorphosis

Vocabulary

**Aphid** - a small, soft-bodied **insect** that feeds by sucking sap from plants

**Chrysalis** - The cocoon of a butterfly

**Cocoon** - the silky case spun by the larva; it serves as a covering while the larvae develop

**Complete metamorphosis** - the life cycle of some **insects**; they change from eggs through the stages of larvae, then pupae to become adults (four stages)

**Exoskeleton** - a hard covering on the outside of an insect that provides structural support and protection.

**Gradual metamorphosis** - insects hatch from eggs looking like a small adults called nymphs. They shed their exoskeleton as they grow until they reach adult size. (three stages)

**Infested** - inhabited by so many organisms that it becomes a problem

**Insect** - an animal that has three body regions (head, thorax, and abdomen) and three pairs of jointed legs; also called an arthropod

**Larva** - the newly hatched form of some insects that are wingless, such as a caterpillar or a grub. This is the stage when the insect hatches from the egg and spends all its time eating before it develops into a pupa. (Plural larvae)

**Life cycle** - a series of stages which something passes through during its lifetime

**Metamorphosis** - the series of changes in shape and function that certain animals go through as they develop from an immature form to an adult. Metamorphosis can be gradual or complete

**Molt** - to shed an outer covering that is replaced by a new one. Birds molt feathers, snakes molt skins, and insects molt exoskeletons

**Nutrient** - any substance that can be used to support life

**Nymph** - the immature form of insects that go through gradual metamorphosis. They look like small adults that do not have fully developed wings and develop into adults without going through a pupal stage. Examples are dragonflies and grasshoppers.

**Organism** - a living thing that is made up of body parts which help it function.

**Ornamental** - used specifically to decorate or enhance

**Pupa** - the non-feeding stage in the insect life cycle between larva and adult during complete metamorphosis. A larva goes through a complete change inside a hard case. A chrysalis is the pupa of a butterfly encased in a cocoon. (Plural pupae)

**Pupate** - to become a pupa

**Varied** - different, not all the same

*Integrated Pest Management is a specialized form of environmental management wherein scientific research and real world application work together to reduce pests such as insects, diseases or weeds.*

1. Properly identify pests
2. Learn the pest/host biology
3. Sample the environment for pests
4. Determine an action threshold
5. Choose the best tactic
6. Evaluate results
Teacher Information for Student Worksheets

Interest Approach Activity

Brainteasers
1. 40 - 32 = 8 unhatched eggs
2. 32/40 or 4/5 hatched
3. 4/5 = 80% hatched
4. 24 adults/ 32 hatchlings = 3/4 or 75%
5. 24 adults/ 40 eggs = 3/5 or 60%

Student Worksheet 1

What is it? Metamorphosis means change, especially change in shape. It is the way scientists describe the changes insects go through during their lives. First, have students consider life cycles. All living things have a life cycle. Trees and plants create seeds, which develop, grow and change into a mature form which starts the cycle again.

Student Worksheet 2

Questions and Word List

We suggest you discuss the essential questions as a class. Students will learn that all insects go through metamorphosis. They may be surprised to find out there are two types of metamorphosis: complete and gradual. As they go through the activities, discuss the life cycles of other organisms.

When using IPM, it is important to understand the life cycle of the pest in question. Understanding when the pest is most vulnerable makes treatment most efficient.

Student Worksheet 3

What is a Life cycle?

The ladybug gives a great example of a complete life cycle. We offer a complete companion lesson to raising ladybugs in the classroom. It’s easy and fun, and can be done any time of the year.

Ask students to cut out the four shapes at the bottom of the page and paste them in the appropriate areas on the page. Emphasize the fact that life cycle is indeed a circle. Ask them to consider where the beginning of the circle is. This is no easier than the classic “chicken versus egg” debate! Scientists generally use the egg as the first step.

Student Worksheet 4

Ladybug Life Stages

Students can color the four stages of the ladybug’s complete metamorphosis. Remind students there are four stages: egg, larva, pupa, and adult.

This illustration shows how a larva will increase in size, forcing it to molt. Larvae is the plural of larva, just as pupae is the plural of pupa. Ladybug larvae and pupae are black and orange or red, just like the adult. Encourage your students to look for photographs of ladybug adults and larvae before they color.
Butterflies and Moths

Butterflies and moths also have **complete metamorphosis**, and are also easy to raise in the classroom or at home. Our example of the Painted Lady butterfly shows students that the **larvae** of butterflies are called caterpillars, and the **pupa** is called a **chrysalis**.

The Painted Lady

Read about the **life cycle** of the Painted Lady butterfly and have students number the stages of its **complete metamorphosis** starting with the egg. (1: Egg, 2: **Larva**, 3: **Pupa**, 4: Adult)

It is important to be able to identify an **insect** so that you know if it is a pest or a beneficial **insect**. Many times, people forget that the **larval** stage of an **insect** may still be a beneficial **insect** in the yard, garden or field. Often, **insect larvae** are important predators of pests.

Adult Butterfly Coloring Page

The adult Painted Lady gets its name for good reason. Do you love butterflies and butterfly gardens? Remember that butterfly **larvae** (caterpillars) are voracious feeders on some of your favorite garden flowers. When choosing plants for a butterfly garden, remember that they will be eating them, not just looking at them! Many native plants which we consider weeds are important food sources for butterflies.

Complete or Gradual?

Estimates are that 88% of **insects** go through a **complete metamorphosis** (four stages), leaving 12% to undergo **gradual metamorphosis**. The term “incomplete” may be used instead of gradual, but scientists now prefer the term gradual to describe the 3 stages of change: egg, **nymph**, and adult. The grasshopper, cricket, and **aphid** are three **insects** with a **gradual metamorphosis**.

**Insect nymphs** look a bit like small adults, whereas **insect larvae** bear little resemblance to the adult **insect**. How does this compare to the human **life cycle**? Do babies, toddlers and children look like small adults?

Aphids

Ladybugs love to eat **aphids**; **aphids** love to suck sap from plants! **Aphids** can be found in large clusters, if you can see them at all. They are each about 1/16” long, and are often light-colored, so it is easy to miss them. They secrete a substance called honeydew; it is a sweet, sticky residue which encourages black sooty mold fungus. Sometimes the presence of ants on plants will lead you to **aphids**. Look on the undersides of leaves in your vegetable garden, orchard, flower garden, or greenhouse.

Grasshopper Life Stages

These illustrations of a grasshopper’s **metamorphosis** are very basic. To help students retain this information, remind them that **complete metamorphosis** has four stages, while **gradual metamorphosis** has three. In this activity, students write in the name of the life stage.

**Nymphs** resemble small adults but are not exactly the same. Have students find one major difference between **nymphs** and adults (wings).
Student Worksheet 11
Test Your Knowledge
Students can use these questions to reinforce their lesson activities.
1. Egg, Larva, Pupa, Adult
2. Yes
3. Yes
4. No
5. Ladybug, Butterfly, Moth
6. Grasshopper, Cricket, Aphid
7. Yes
8. Molt, Molting

Student Worksheet 12
Vocabulary
Provided for students to reference