

A close-up photograph of a grasshopper resting on a person's hand. The grasshopper is green and brown with long antennae and large hind legs. The background is a blurred green field.

# How Do Insects Grow?

*Observing insect life cycles  
in the garden*

Grades 2-3

*Vetted by Riverside County Office of Education-STEM*

UCCE Master Gardeners of Riverside County



# Why Is This Important?

“...an awareness of an insect’s metamorphosis provides important information on the life cycle of an insect.

Whether an insect is considered a pest or beneficial, understanding its life cycle can help us learn how to attract/maintain beneficial insects and control/manage insect pests!”

*--Galveston County Master Gardeners*



# Learning Goal

Students will learn the insect life cycle stages from egg to adult:

- Simple Metamorphosis
- Complete Metamorphosis

# Anchor Phenomena: Orchid Mantis Growth







# Develop a Model To Describe the Phenomena

**Draw a diagram showing how insects grow. Include both observable and unobservable details.**

- Label all important parts of the diagram.
- Use arrows to show how all parts interact.
- Write an explanation describing how insects grow.

---

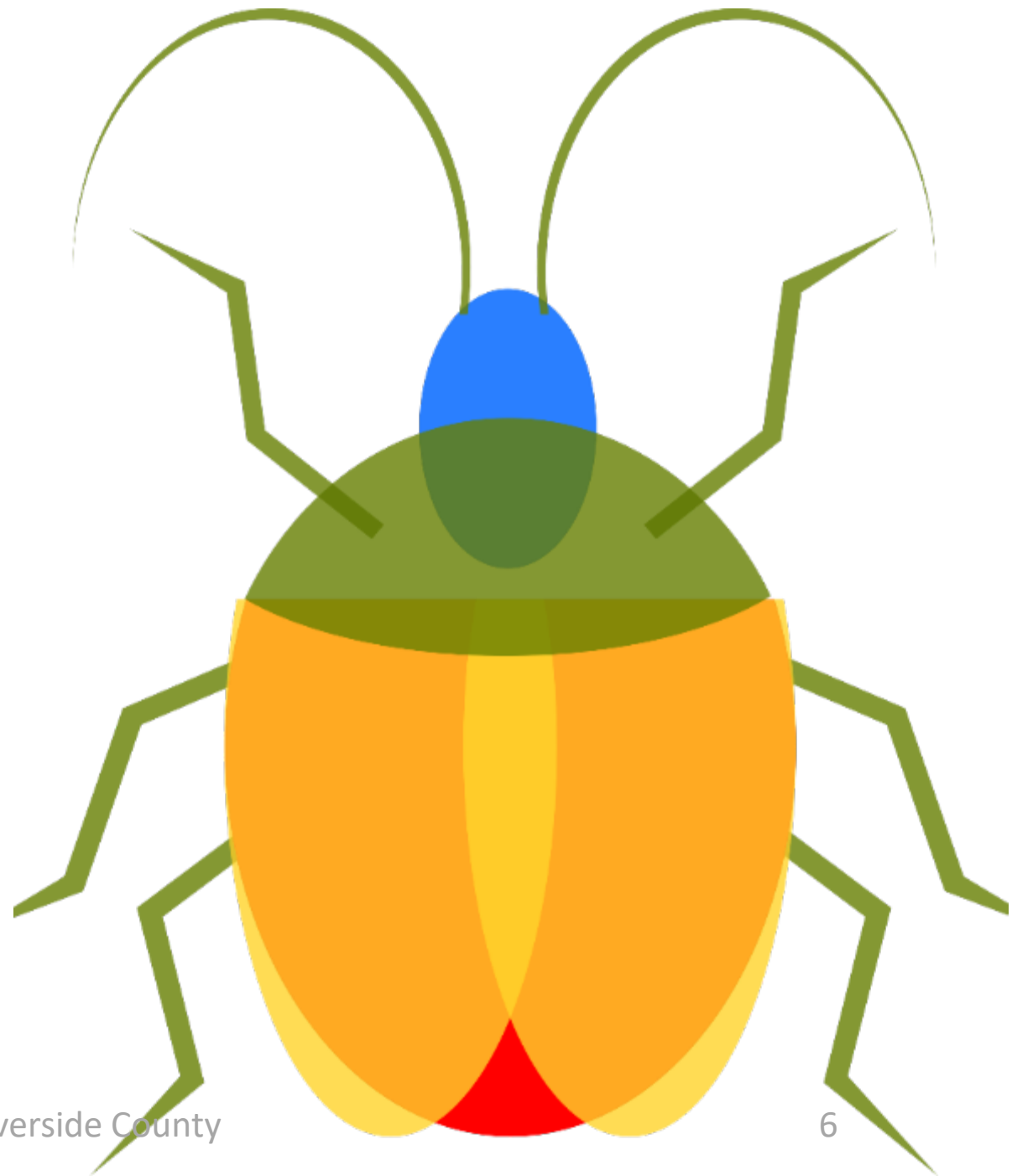
# What is an insect?

**Insects are the largest group of animals on Earth.**

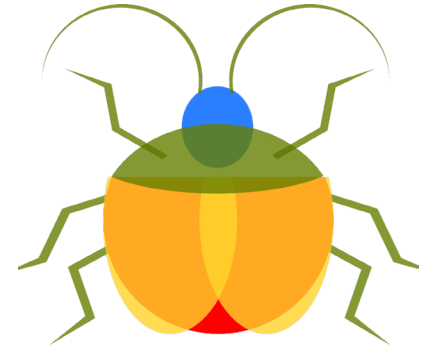
All adult insects have:

- Three main body sections
- Six jointed legs
- Two antennae
- Most have wings

**All insect bodies also have a hard outer covering called an exoskeleton.**

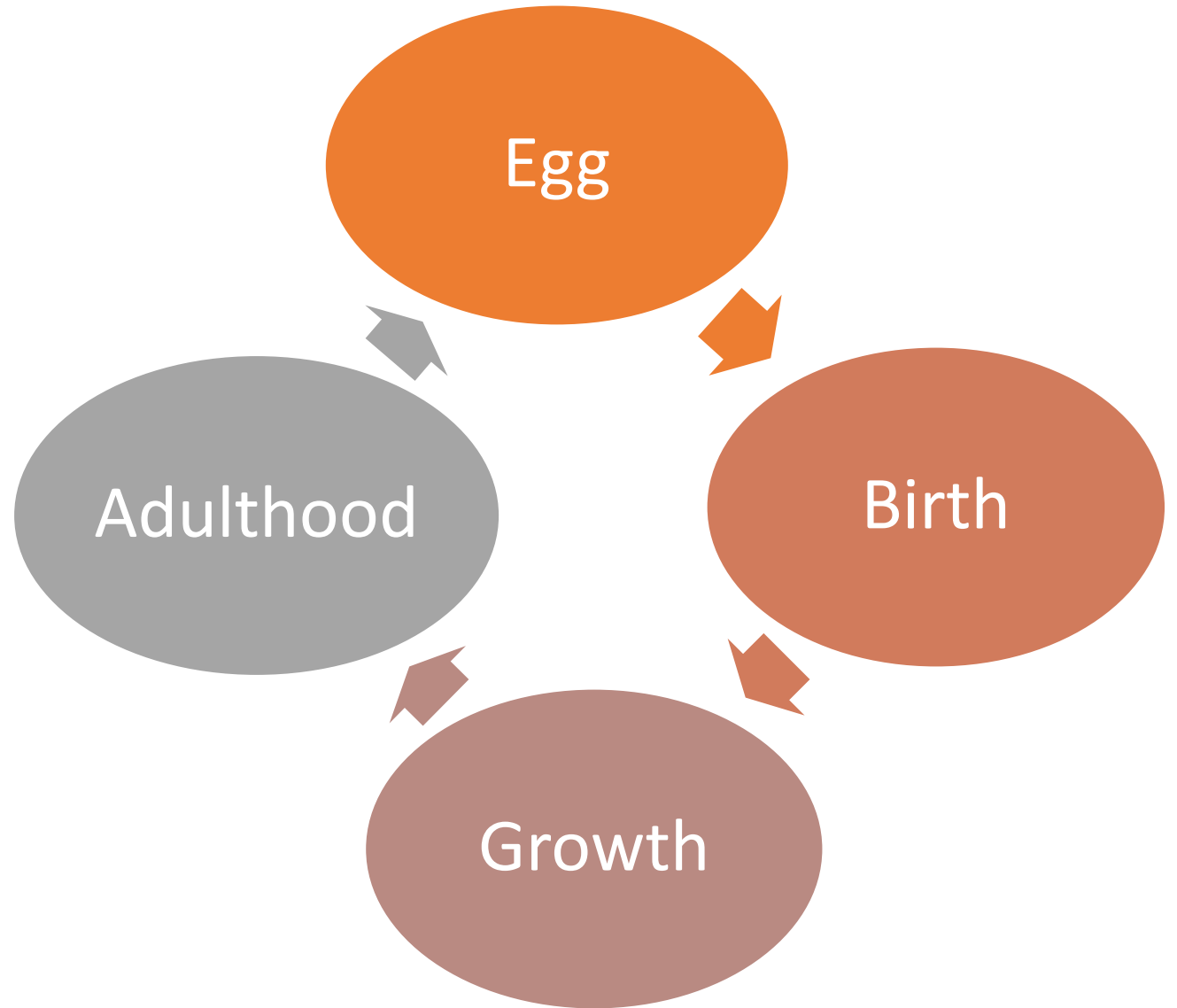


Can you identify any of these insects?  
How are they alike? How are they different?





All living things,  
*including insects,*  
have a life cycle





## Egg

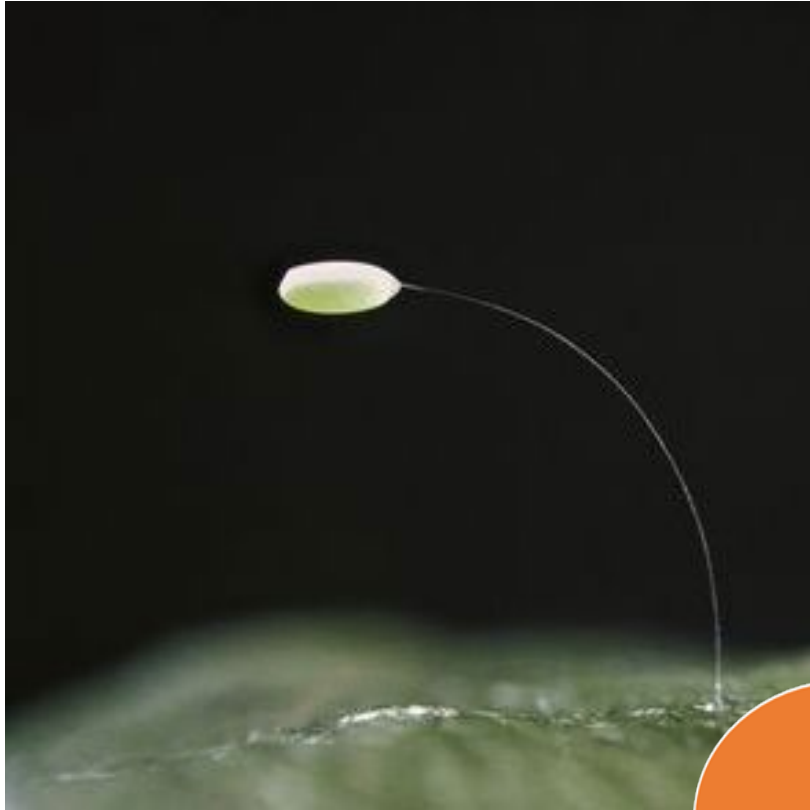
# Most insects begin their life cycle in eggs

Insects lay eggs:

- on leaves
- on and in stems
- on rocks
- in openings of wood bark
- in the soil
- and even on water!



Some female mosquitoes lay single eggs on the water's surface, while others lay a batch of 100 or more eggs in what scientists call a *raft*.



UC Statewide IPM Project  
© 2000 Regents, University of California



UC Statewide IPM Project  
© 2000 Regents, University of California

Egg



UC Statewide IPM Project  
© 2000 Regents, University of California



UC Statewide IPM Project  
© 2000 Regents, University of California




# You can identify an insect by its egg!

- Insect eggs come in a variety of shapes, colors and patterns **unique to each insect.**
- The eggs usually have a strong outer coating that provides protection from the weather.

➤ *Click on each picture to discover what insect laid the eggs. What do lady beetle eggs look like?*

Birth

Depending on the *type of insect*, it emerges from the egg in one of three forms

Nymph	Naiad	Larva
<p><b>A nymph is a smaller version of the adult insect.</b> This means they look a lot like the adult. As they grow, most nymphs will develop wings.</p>	<p><b><u>Naiad</u> are nymphs born in the water.</b> Some have gills and all have a body that swims easily in water. They also look a lot like the adult and will grow wings to fly.</p>	<p><b>Most insects are born as larva.</b> Larva look very different from the adult. Their growth includes an extra development stage.</p>
		





## Quick Check!

- What can you learn from looking at an insect egg?
- Have you ever seen insect eggs in the garden? Describe what they looked like and where you saw them.
- Describe how a nymph or naiad is different from a larva.





# Growth



## How do insects grow?

# Growth



## Insects grow through a process called *Metamorphosis*

**Metamorphosis means to change shape or form.**

- Insects must shed their hard outer exoskeleton covering as they grow.
- When soft inside body parts get too big for the insect, the hard covering splits open and falls away to reveal a new, larger covering.
- This is called **molting**. Molting is an important part of the insect life cycle.

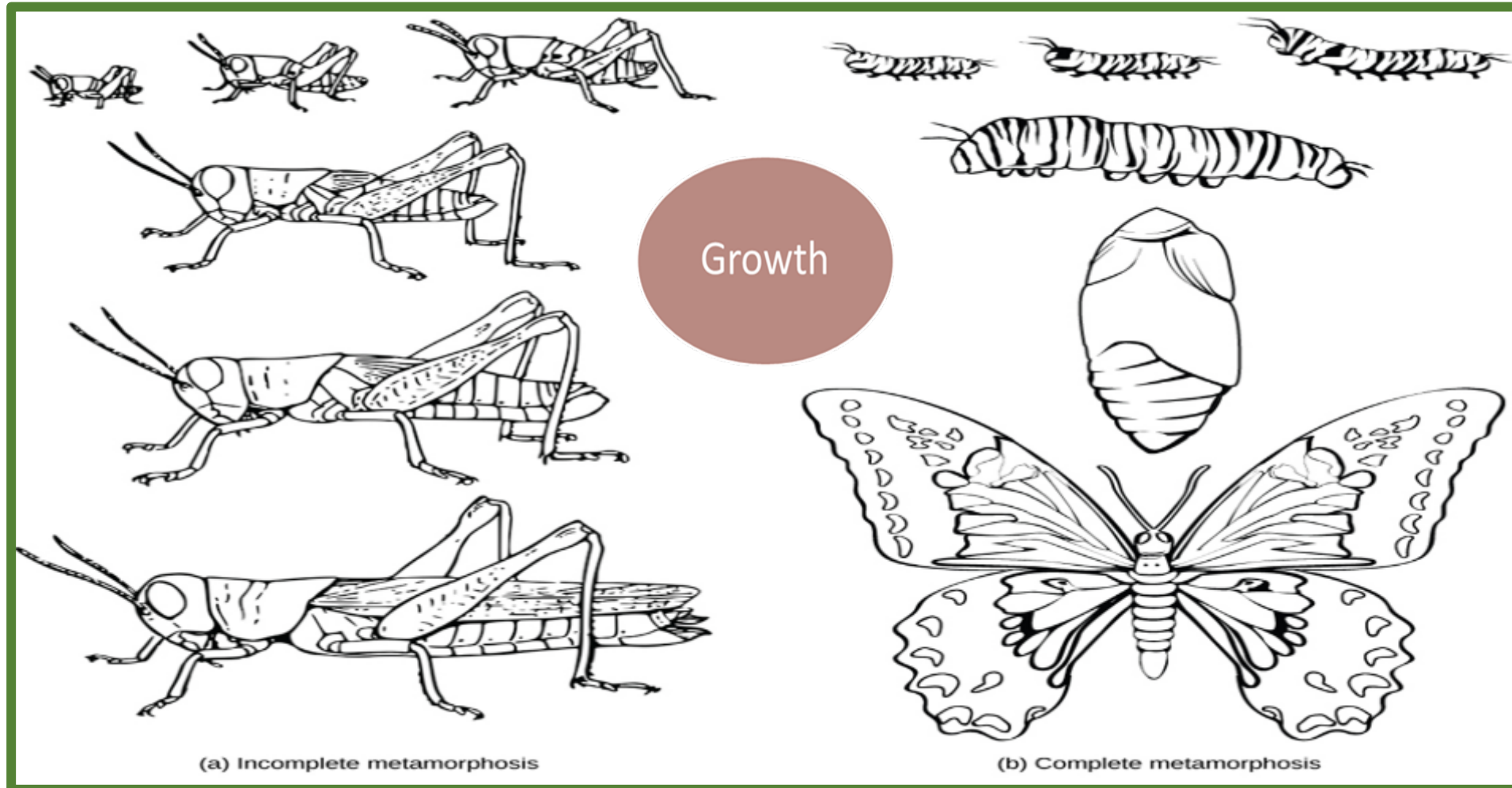
*Click on each image to observe the molting*



# There are two types of metamorphosis

Simple

Complete



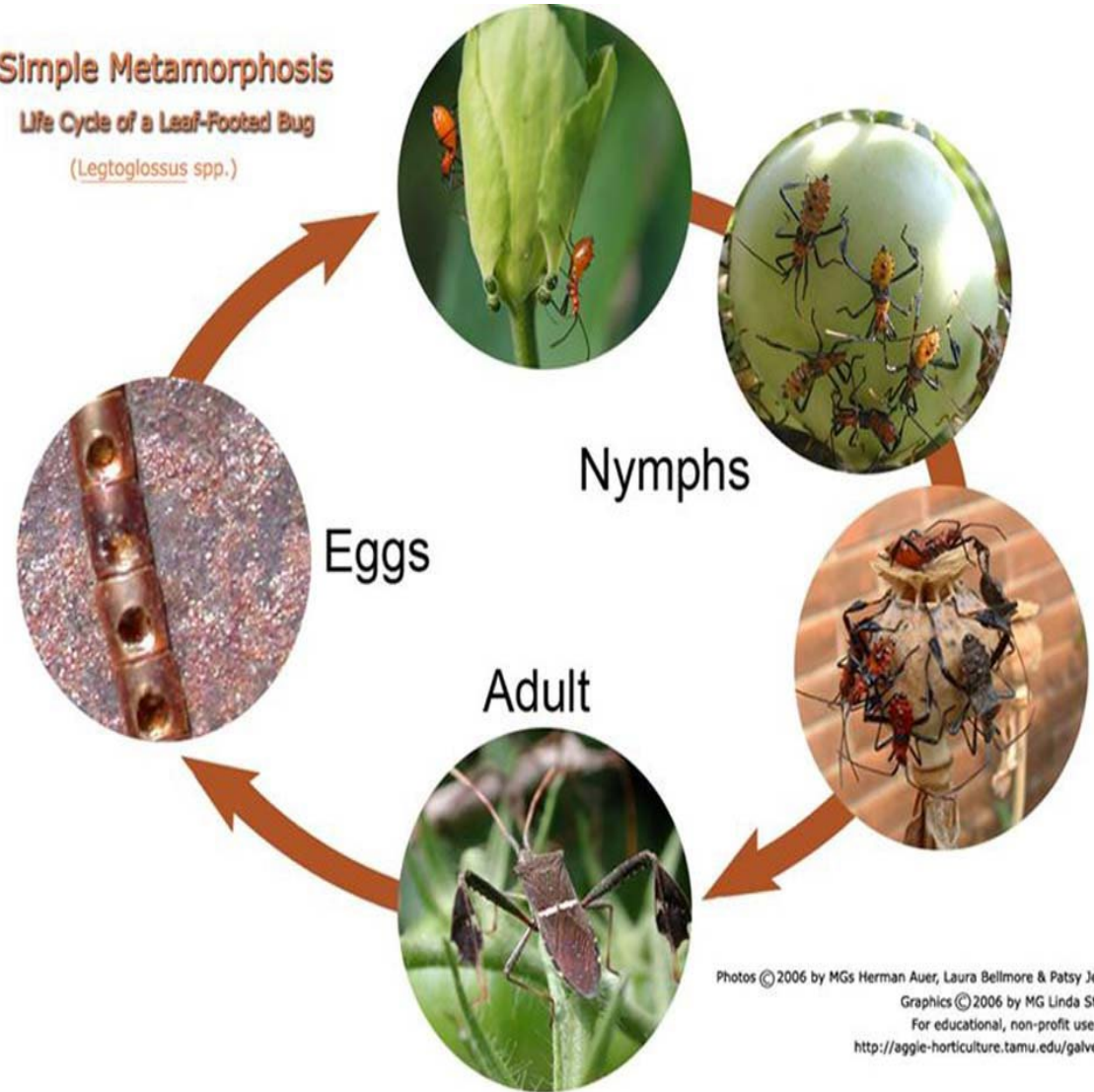
Growth

# Simple Metamorphosis

Scientists often use the word *incomplete* to describe this form of metamorphosis.

- This is because the insect does not make a complete transformation. An adult still looks a lot like the nymph.
- Both nymphs and naiads (nymphs in water) go through this life cycle.
- Simple metamorphosis has 3 stages: **Egg-Nymph-Adult**

Simple Metamorphosis  
Life Cycle of a Leaf-Footed Bug  
(*Leptoglossus* spp.)

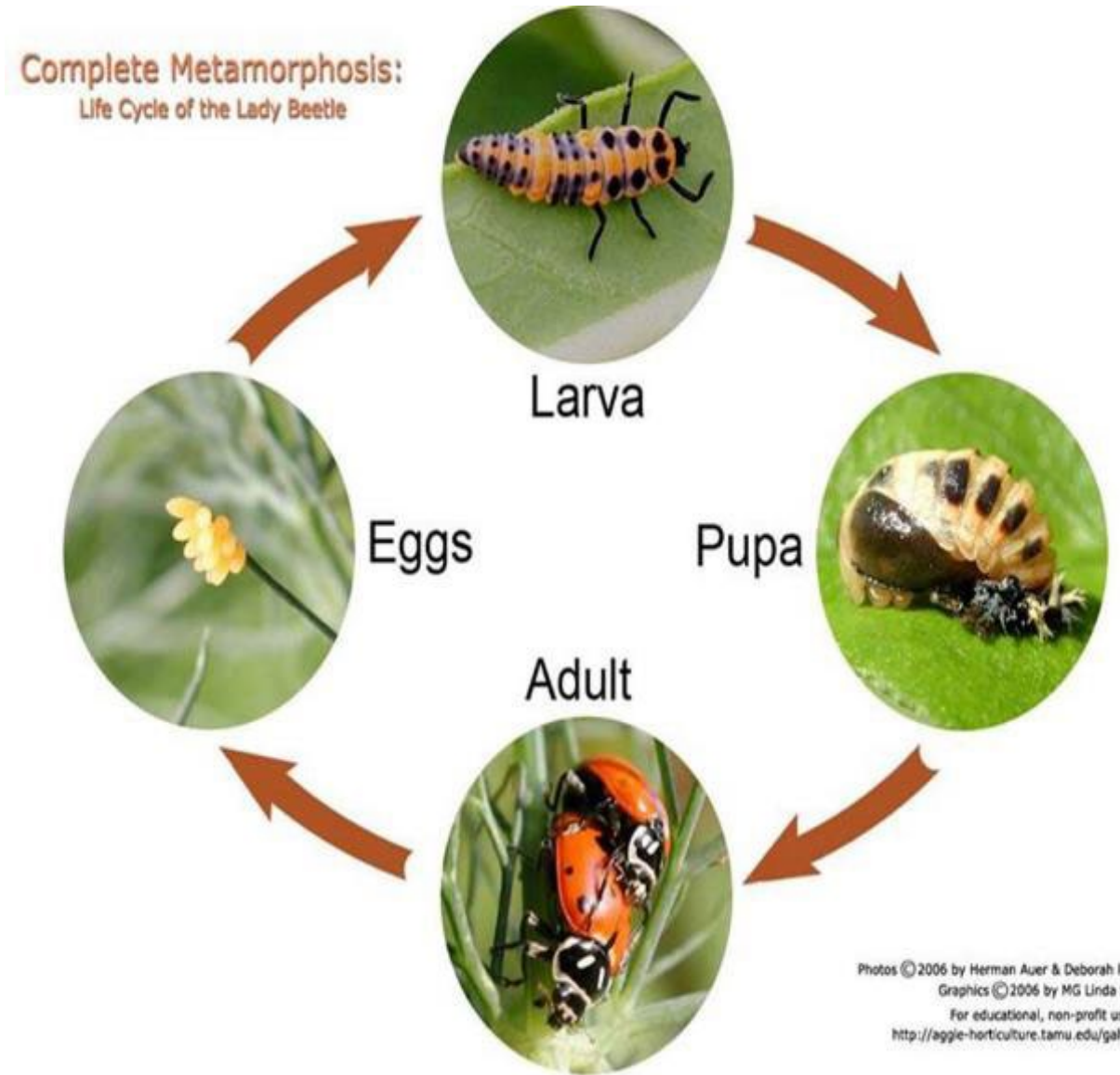


Growth

# Complete Metamorphosis

**Most insects go through this life cycle.**

- It is called complete because it ends with a major change in how the insect looks.
- Larvae go through this life cycle.
- Complete metamorphosis has 4 stages: **Egg-Larva-Pupa-Adult**
- A larva eats a lot of food to prepare for the pupa stage. The pupa is at a resting (non-eating) stage as the larva turns into an adult.







# Quick Check!

- Explain why insects molt.
- Describe how simple and complete metamorphosis are different.
- What type of metamorphosis did you observe in the *Anchor Phenomena*?





# Adulthood



An insect's final stage of life

# Producing the next generation

**The most important role of the adult insect is reproduction.**

- Depending on the type of insect, the adult may die soon after mating and laying eggs.
- Most adult insects live for less than one year because they are cold-blooded and cannot survive winter weather.
- However, some adults live for only a few hours and some live for decades!



(c) Kathy Keatley Garvey



# How long do these adult insects live?

- Adult **dragonflies** live for 7-56 days. However, as underwater nymphs (naiads), dragonflies may have already lived for up to 5 years!
- Both adult **grasshoppers** and **lady beetles** live for about 1 year.



# Video: Insect Life Cycles







# Quick Check!

- What is the most important role for adult insects?
- How long do most insects live?
- **Video question:** Is a caterpillar a type of larva?



# *Phenomena in the Garden:*

## Observing for evidence of insect life cycles

Look for these or other common garden insects typically observed during warm weather.



Green Lace Wing



Lady Beetle






Cabbage Butterfly






Hawk Moth

- Divide students into four groups.
- Assign each group an insect tally sheet for recording observations. (Slides 25-28)
- Repeat the tallying process throughout the warm weather season, providing opportunity for students to reflect on why tally counts of adults, larvae and eggs seem to vary.
- Compile results as a class using the class tally. (Slide 30) *For other insects a blank slide #29 is provided for teacher use.*

# Lacewing: Garden Observation Results


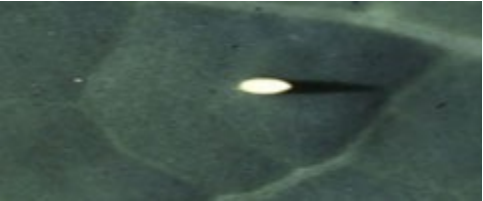

	Date:  How many did you observe?	Date:  How many did you observe?	Date:  How many did you observe?	Total Number Observed
				
				
				

# Lady Beetle: Garden Observation Results




	Date:  How many did you observe?	Date:  How many did you observe?	Date:  How many did you observe?	Total Number Observed
				
				
				



# Cabbage Butterfly: Garden Observation Results

	Date:  How many did you observe?	Date:  How many did you observe?	Date:  How many did you observe?	Total Number Observed
				
				
				


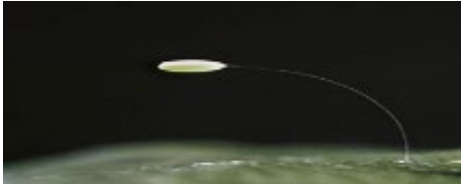










# Hawk Moth: Garden Observation Results

	Date:  How many did you observe?	Date:  How many did you observe?	Date:  How many did you observe?	Total Number Observed
				
				
				





# Class Tally of Garden Observation Results

Adult Insect	Total Observed	Eggs	Total Observed	Larva	Total Observed
					
					
					
					



# Develop a Model To Describe the Phenomena

**Revise or draw a new diagram showing how insects grow. Include both observable and unobservable details.**

- Label all important parts of the diagram.
- Use arrows to show how all parts interact.
- Write an explanation describing how insects grow.

# ***Extend Your Understanding:***

## **Observing an Insect's Life Cycle in the Classroom**

Several types of insects can be humanely kept in captivity to observe their full life cycle.

**Simple Metamorphosis:**

[mealworms](#) and [crickets](#)

**Complete Metamorphosis**

[lady beetles](#) and [silkworms](#)

- ✓ Considerations regarding [monarch](#) butterflies.
- ✓ All-inclusive kits may be ordered from scientific supply companies or may be available as part of your school's science program resources.





# Vocabulary

- Exoskeleton
- Metamorphosis
- Molt
- Naiad
- Nymph



# Exoskeleton

- Exoskeleton means a skeleton on the outside of the body.
- Insects do not have a skeleton that grows within a skin covering. Instead, they have a hard outer covering that supports their body shape.



# Larva

Insects develop in separate stages.

- A larva does not look like the adult insect and changes shape as it develops.

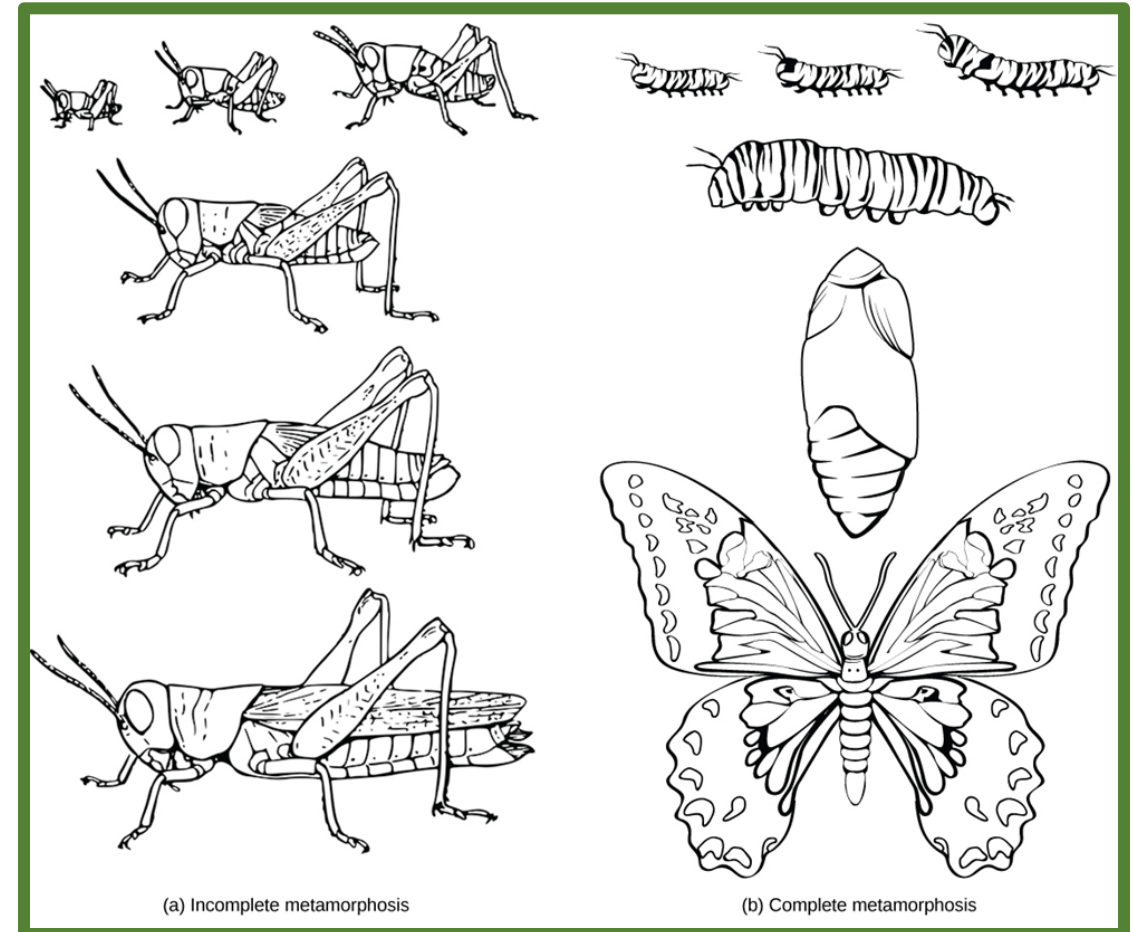
(Plural is spelled *larvae*)





# Metamorphosis

To change shape or form.



# Molt

Shedding an outer hard covering to continue growing.



# Naiad

**Pronounced [nī,ad]**

A category of insects that are nymphs born in the water.



# Nymph

A category of insects that look much like their adult stage except for being smaller and lacking wings.





# Teachers: Please Provide Your Input!

Master Gardeners would appreciate your feedback on this lesson. The survey is anonymous but does require a Gmail account to access.

➤ Please click on the link to complete a brief survey.

[MG Lesson Survey](#)



**University of California**

Agriculture and Natural Resources

■ UCCE Master Gardener Program

# California Next Generation Science Standards

## Second Grade

**LS4.D: Biodiversity and Humans** ▪ There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)

## Third Grade

**LS1.B: Growth and Development of Organisms** ▪ Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)

**LS3.B: Variation of Traits** ▪ Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1)

# California Next Generation Science Standards

## Science and Engineering Practices:

- Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2)
- Make observations (firsthand or from media) to collect data which can be used to make comparisons. (2-LS4-1)
- Develop models to describe phenomena. (3-LS1-1)
- Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1)

## Cross-Cutting Concept:

- Patterns of change can be used to make predictions. (3-LS1-1)



# Resources

- [Beneficials in the Garden: Insect Metamorphosis](#): Candice Hawkinson, Linda Steber, Galveston County Master Gardeners
- [Insect Life Cycles](#): Wizzie Brown, Texas A&M Agrilife Extension
- [Insect Science Investigations for Children](#)
- [Easter Egg Hunt Answers](#): Pests in the Urban Landscape, UC Statewide Integrated Pest Management
- [Entomology for Master Gardeners Part 2](#): University of Kansas, Department of Entomology
- [Featured Creature, American Grasshopper](#): University of Florida, Entomology & Nematology
- [For consistency's sake: the precise use of larva, nymph and naiad within Insecta](#): Systematic Entomology; Royal Entomological Society
- [Go Bug! Insect Life Cycle Game](#): California Academy of Sciences

# Resources *Continued*

- [Grasshoppers and Crickets](#): Growing With Science
- [Keep Monarchs Wild](#): Xerces Society
- [Let's Hear It for Ladybugs!](#): Rachel Bradbury, Rachel Wilson, Amy Lunceford
- [Life Cycle and Biology](#): British Dragonfly Society
- [Metamorphosis Facts For Kids](#) : kiddle.com
- [Metamorphosis in Arthropods](#): American Museum of Natural History
- [Metamorphosis: Nature's Ultimate Transformer](#): Ask a Biologist, Arizona State University
- [Mystery Critters](#): National Science Teaching Association
- [Silkworms](#): suekayton.com

# Resources *Continued*

- Kiddle.com
- University of California Integrated Pest Management
- Wikipedia
- **Images:** Creative Commons; Galveston County Master Gardeners, Santa Clara County Master Gardener Rebecca Schoenenberger; Stock; UCIPM, Jack Kelly Clark
- **Videos:** Insecthaus TV; Jared Davidson; National Geographic UK; I Puta Sudiarta; Children's Museum Houston



# Master Gardeners

The University of California Cooperative Extension (UCCE) Master Gardener Program (MGP) is an educational program designed to teach and effectively extend information to address home gardening and non-commercial horticulture needs in California.

UCCE is the outreach arm of UC's division of Agriculture and Natural Resources (ANR). Master Gardener volunteers (MG volunteers) promote the application of basic environmentally appropriate horticultural practices through UCCE-organized educational programs that transfer research-based knowledge and information.



University of California

Agriculture and Natural Resources

UCCE Master Gardener Program

# Gardening Questions?

## UCCE Master Gardeners of Riverside County Contact Information

**Email Helpline:** [anrmgriverside@ucanr.edu](mailto:anrmgriverside@ucanr.edu)

**Website:** [Riverside County Master Gardeners](#)



**University of California**

Agriculture and Natural Resources

■ UCCE Master Gardener Program