Comparative Metamorphosis

A Carolina Essentials™ Investigation

Overview

This change-over-time, construction of an explanation activity serves 2 purposes. First, students observe development of 3 different insects from the larva or nymph stage through the adult stage. Second, students complete a comparative development study of metamorphosis, observing complete and incomplete metamorphosis. Students hone their observation skills while their drawings serve as traditional, biological qualitative data. Student drawings are used to explain the life cycles of the 3 insects. If well cared for, the insects may be kept in habitats for their life span and used for additional activities.

Life Science
Grades: 5–8

Essential Question

What are the life cycles of insects?

Investigation Objectives

1. Identify the stages of complete metamorphosis.
2. Identify the stages of incomplete metamorphosis
3. Compare the stages of the 2 types of life cycles.

Next Generation Science Standards* (NGSS)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations • Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples, or events.	**LS1.4.A** • Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy.	**Structure and Function** • Students model complex and microscopic structures and systems and visualize how their function depends on the shapes, composition, and relationships among its parts. They analyze many complex natural structures and systems to determine how they function.

Safety Procedures and Precautions

Treat all animals with care and respect.

Disposal

Non-native species should not be released into the wild. Any individual insects remaining may be kept in a permanent habitat or placed in a resealable bag and put in the freezer for 72 hours, and then disposed of as your state or district directs.

TIME REQUIREMENTS

PREP	ACTIVITY
30 min	20-30 min

Teacher Prep: 30 min
Student Activity: 20 to 30 min every other day for about 3 weeks until the insects reach the adult stage

SAFETY REQUIREMENTS

MATERIALS (PER GROUP)

1 Milkweed Bug Life Cycle Assortment or Milkweed Bug Culture Kit

1 Painted Lady Culture 33-Larvae Set

1 Painted Lady Culture Cup Set

1 Carolina™ Butterfly Sanctuary

2 Amazing Bugs® Habitats (1 for lady beetles and 1 for milkweed bugs)

1 Lady Beetle Larvae Set

1 Plastic Dual Magnifier, 3× and 6× or Discovery Lens Kit

HELPFUL LINKS

Milkweed Bugs CareSheet

Lady Beetle CareSheet

Painted Lady Butterfly CareSheet

REFERENCE KIT

None

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Student Procedure

1. Look at each insect with your naked eye. Make notes on your observation sheet.
2. Use the magnifier and look at each insect again. Pay special attention to the mouth parts. Make notes on your observation sheet.
3. Draw what you see in detail on your observation sheet.
4. Return the insects to your teacher after each observation.
5. Repeat the procedure until the adult insect emerges.

Teacher Tips

*Provide a habitat and **follow all care instructions for each of the 3 species** throughout the observation period.*

Each student or group will need one individual from each species. Each organism needs its own container as the lady beetle larvae will eat the other 2 species

Instruct students to look closely but not to touch the fragile, easily damaged insects.

Point out the mouth parts of each species. Use a document camera or pictures so students know what to look for.

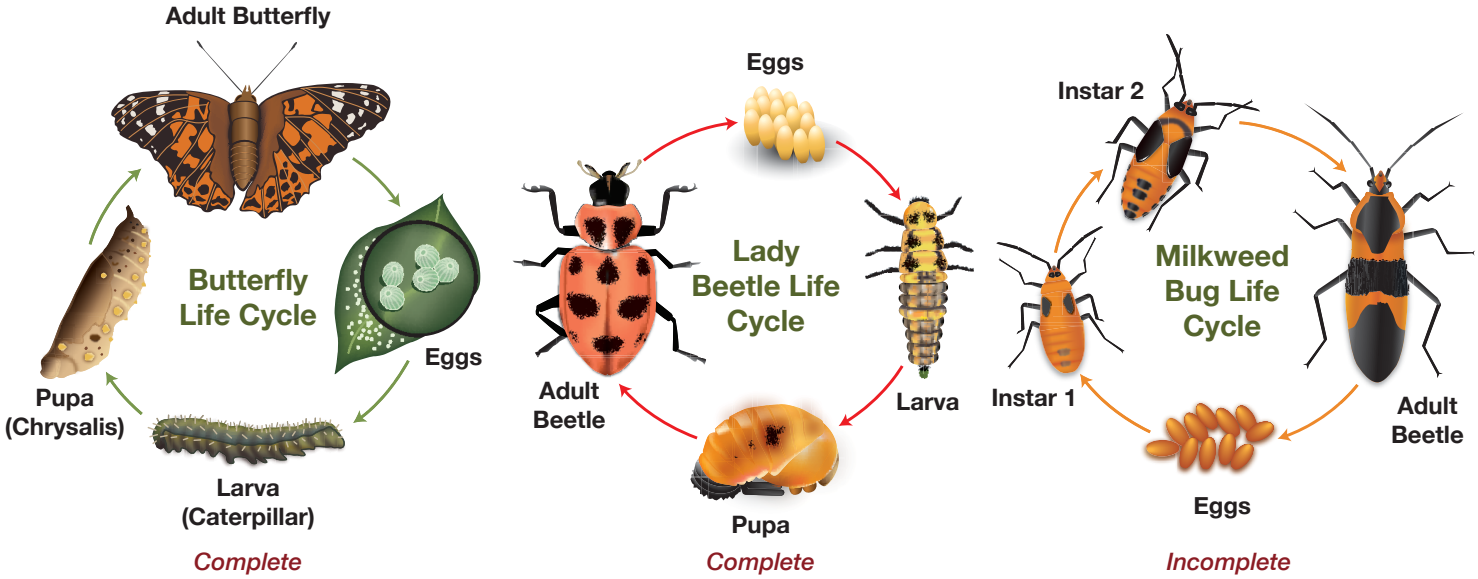
*Remind students that their drawing should be of what they **actually see.***

Take pictures of each stage of development for all 3 insects. Use them for documentation and as an assessment tool later.

Painted lady butterflies and spotted lady beetles exhibit complete metamorphosis. Milkweed bugs exhibit incomplete (simple) metamorphosis.

Data and Observations

See pictures of life cycles below for what each stage should look like. You may want to take pictures of each stage in the life cycle for documentation and as an assessment tool later.



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Analysis and Discussion

1. Use the drawings in your observation sheets to make life cycle diagrams for all 3 insects. Label the life cycle stages. Include the number of days in each life cycle stage.

   Student answers may vary in time frame but should be similar to the cycles below.

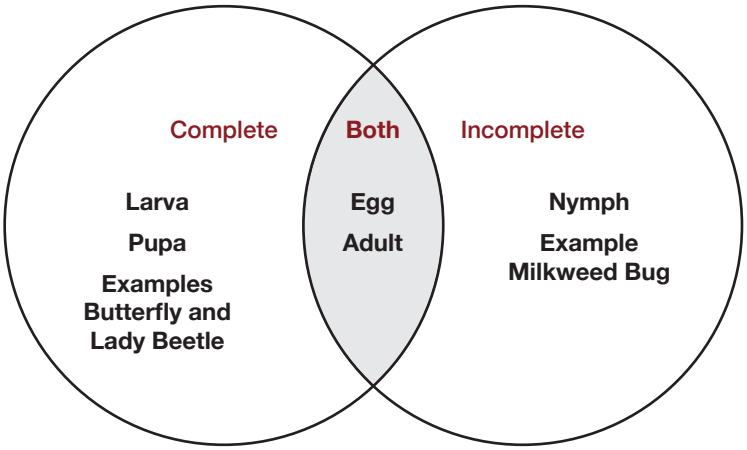
   Approximate times for each stage:

	Painted Lady Butterfly	*Lady Beetle*	*Milkweed Bug*
Egg	*3 to 5 days*	*4 to 6 days*	*4 to 7 days*
Larva	*5 to 10 days*	*10 to 14 days*	*N/A*
Pupa	*7 to 10 days*	*3 to 12 days*	*N/A*
Nymph	*N/A*	*N/A*	*5 instars, 20 to 40 days*

2. Label each of the 3 cycles as complete metamorphosis or incomplete metamorphosis. Explain your thinking.

   See picture above for the labeling. Student thinking should be based on the number of distinct stages that the insect goes through.

3. Draw a Venn diagram for the stages of metamorphosis. Label one circle **Complete** and the other circle **Incomplete**. Label the shared area, **Both**. Fill in the sections of the Venn diagram. Include the name of an insect for each type of life cycle.



4. **Optional assignment:** What are 2 advantages and disadvantages of each type of metamorphosis?

   Answers may vary.

   Complete metamorphosis

   Advantages: *Typically, adults and larvae do not compete for the same food source, do not have the same predators, and occupy different habitats.*

   Disadvantages: *Adults and larvae do not share the same food, which can be a disadvantage in food-poor environments; short adult life span; only adult has true mobility.*

   Incomplete metamorphosis

   Advantages: *No vulnerable pupa stage; parental protection can occur; mobility throughout life cycle.*

   Disadvantages: *Nymphs compete with adults for food and habitat; share the same predators.*

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TEACHER NOTES